

MOOC 11 Skin disorder and Pressure Injuries

Chapter 3: Pressure Injuries

Case scenario 1

Mr M is a 70-year-old man who is suffering from hypertension and stroke with lower limbs weakness for 6 months. He is reluctant to move and always loves to sit on his wheelchair and watch TV. Recently, his skin is remarkably red in colour over his buttock and legs area especially sever over the sacrum area. He also complains of pain over his buttock and legs.

What's wrong with him?

Is there anything you could do?


You will find the answers in this Chapter. Let's start!

3.1 What are pressure injuries?

According to the European Pressure Ulcer Advisory Panel (EPUAP), National Pressure Injury Advisory Panel (NPIAP) & Pan Pacific Pressure Injury Alliance (PPPIA) (2019), a pressure injury is localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, comorbid conditions, and condition of the soft tissue.

Pressure injury (PI) updates:

- New terminology
- Pressure injury previously called pressure ulcers, bedsores, pressure sores or decubitus. Now we use 'Pressure Injury'
- Friction was eliminated in the definition of pressure injury since it is not a causative factor in the development of pressure injury
- Staging system
 - Numbering was changed from Roman numbers (I, II, III, IV) to Arabian numbers (1, 2, 3, 4)
 - The term "suspected" was removed from the 'Suspected Deep Tissue Injury' of staging system and now used 'Deep Tissue Pressure Injury'

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- International guidelines recommend that risk assessment be conducted within the first 8 hours of hospital admission

(Edsberg, et al., 2016)

Pressure injury can happen to anyone at any age. It's not uncommon to see older adults with pressure injuries or at risks of developing pressure injuries.

Infection is the most common major complication of pressure injuries. Pressure injury could be a serious problem which increases the risk of morbidity and mortality. It imposes significant burden to caregivers and causing considerable financial burden to healthcare system. It also has great impact to the quality of life.

Epidemiology

- Incidence varies widely in different clinical settings
- Globally, Stage 1 and Stage 2 pressure injuries represent over half of all pressure injuries among hospitalized adults. The most frequently affected anatomical locations are the sacrum followed by heels and hips (Li et al., 2020)
- In USA, overall prevalence of pressure injuries was 10.1%. Estimated 3 million patients had pressure injuries yearly, with costs of treatment up to \$17.8 billion (Hajhosseini, et al., 2020)
- Pressure injuries prevalence 0.3%–46% and incidence 0.8%–34% among older adults across 14 countries worldwide (Hahnel, et al., 2016)
- Kwong et al. (2016) revealed that incidents of pressure injuries in four private, government-subsidized nursing homes in Hong Kong ranged from 2.5% to 25%
- Local studies found that (Kwan, 2017):
 - 8.9% of older patients admitted to a geriatric convalescence hospital had pre-existing pressure injuries
 - 17% of older residents with advanced dementia had a pressure sore in residential care settings
 - Incidence of hospital-acquired pressure injuries under Hospital Authority of Hong Kong 0.45 per 1000 bed-days
- Pressure injury can develop so fast. Older patients with serious acute conditions lying on a trolley while waiting for assessment and admission in AED can develop PI within a short length of stay i.e. 2 to 4 hours (Gefen, 2008)

Common sites of pressure injuries (picture)

- Any area subjected to prolonged pressure
- Usually over a bony prominence, commonly at the sacrum, buttocks and heels when the patients are lying supine position
 - The greater trochanters and the ischial tuberosities when the patients lie in the lateral or sitting position

How do we differentiate Stage 1 pressure injuries?

Differentiation of tissue injuries


- Blanchable hyperemia – no tissue damage
 - Area that appears red and warm will blanch (turn to light colour) following fingertip pressing down
- Non-blanchable hyperemia – stage 1 PI
 - Redness that persists after fingertip pressing down
 - Indicates tissue damage and is commonly in the first stage of pressure injury development
 - Reversible if the pressure is relieved and the tissue protected

Staging of pressure injuries

According to the level of damaging, pressure injury is differentiated into several staging including Stage 1 to 4, Unstageable and Deep Tissue Pressure Injury.

Do not reverse stage a pressure injury. Once a Stage 4 always a Stage 4. For examples:

- A Stage 4 pressure injury does not become a Stage 3, then Stage 2, then Stage 1, then “intact skin” as it heals
- A stage 4 pressure injury that has closed (healed) is classified as “healed stage 4 pressure injury” but not a Stage 0

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Stage 1	Intact skin with non-blanchable erythema of a localized area usually over a bony prominence. Discoloration of the skin, warmth, edema, hardness or pain may also be present
Stage 2	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 or sero-sanguinous filled blister
Stage 3	Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are <i>not</i> exposed. Some slough may be present. <i>May</i> include undermining and tunneling
Stage 4	Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present. Often include undermining and tunneling
Unstageable	Full thickness tissue loss in which the base of the pressure injury is covered by slough (yellow, tan, grey, green, or brown) and/or eschar (tan, brown or black). The depth of wound is unknown
Deep Tissue Pressure Injury	Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear

Alert for any warning signs of pressure injuries over bony prominence:

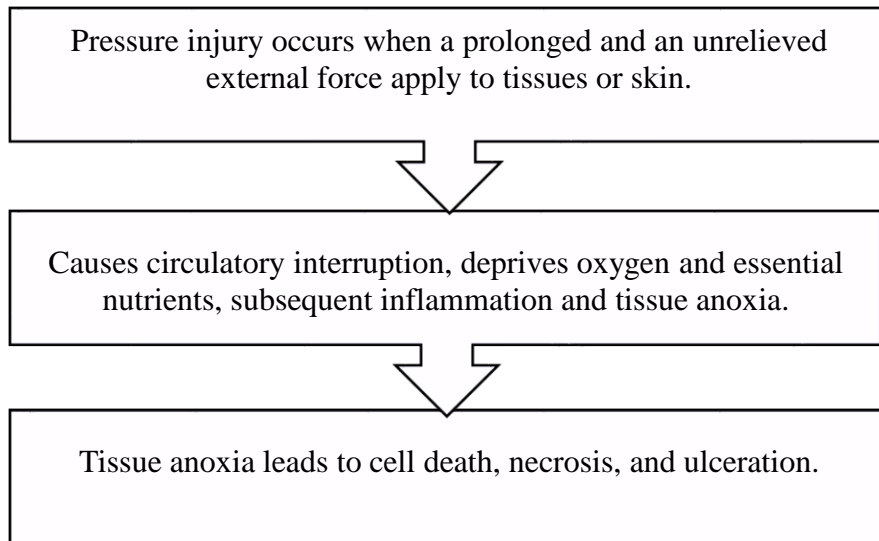
- Unusual changes in skin color or texture
- Swelling
- Pus-like draining
- An area of skin that feels cooler or warmer to the touch than other areas
- Tender areas
-

Complications of pressure injuries can be life threatening!

- Seek medical advice if the warning sign does not relief after pressure relief intervention
- If any sign of infection occurs, seek medical advice immediately

3.2 What causes pressure injuries?

Pathophysiology



In the early stage of pressure injuries, it shows up as persistent redness in light-colored skin. In dark-colored skin, the area may appear red, blue or purplish color.

Multiple factors may cause pressure injuries

- Pressure – prolonged pressure on the skin and underlying soft tissue >>> insufficient oxygen and nutrients supply
- Shearing forces – a mechanical force exerted against the skin while the skin remains stationary and the bony structures move such as elevate the head of bed >30 degree, the body skeleton actually slides down in relation to the skin
- Tissue tolerance – tolerance of soft tissue for pressure and shear
- Moisture – incontinent, microclimate, wound drainage

All factors interact with each other that influences the level of risk for pressure injury

- Pressure
- Shearing force
- Friction

Factors associated with increased risk of pressure injury

- Tissue Tolerance - diminishes the skins tolerance to pressure
 - Intrinsic factors
 - Chronic illness, nutrition, demographics, skin temperature, oxygen delivery
 - Extrinsic factors
 - Shear, friction, moisture
- Pressure - increases exposure of the skin to excess pressure
 - Impaired sensory perception
 - Impaired mobility
 - Impaired activity

Who are at risk of pressure injury?

- Advanced age
- Immobility or inactivity e.g. bed or chair-bound
- Incontinence (fecal more so than urinary)
- Impaired sensory perception e.g. neuropathy, stroke
- Poor nutritional status
- Comorbidities e.g. diabetes, or peripheral vascular disease
- Prolonged pressure on tissues e.g. medical devices (oxygen mask, Foley's catheters)
- Altered skin moisture (excessively dry or moist)

Why are older adults more prone to develop pressure injuries?

Older adults are the high-risk group of pressure injury. As we age, age-related changes make us more prone to develop pressure injuries:

- Decreased metabolism, body fat and muscle mass
- Cellular senescence
- Changes in skin pH
- Decreased immune function
- Vascular changes, altered tissue perfusion
- Nutritional status changes
- Poor hydration

These changes affect skin integrity and tissue healing, and raise the risk of pressure-related skin injury.

3.3 Identifying older adults at risk of pressure injury

Assessment should be performed on admission for care planning and monitoring.
Reassessment for any changes of health condition.

Comprehensive assessments of pressure injuries

- clinical history
- pressure injury risk scale
- skin assessment
- pain assessment
- mobility and activity assessment
- nutritional assessment
- continence assessment
- cognitive assessment
- assessment of extrinsic risk factors

Alert to the risk factors

- Physical and mental condition
- Skin status
- Continence status
- Malnutrition
- Pressure damage caused by medical devices
- Chronic illnesses
- Activity
- Mobility
- Friction & shear

Pressure injury risk assessment scale

Risk assessment is essential for prevention of pressure injury and plan for the care. In addition, clinical judgment is also the key in managing pressure injury.

- Standardized risk assessment tools for pressure injuries

The Norton scale and the Braden Scale for Predicting Pressure Injury Risk were widely used to foster early identification of patients at risk for developing pressure injuries.

Norton Scale

- Developed in the 1960s by Norton
- Five subscale scores, added together for a total score that ranges from 5-20
- A lower Norton score indicates higher levels of risk for pressure injury development
- Scores: 9 or below=Very High Risk, 10 to 13 =High Risk, 14 to 17 =Medium Risk

Braden Scale

- Developed in 1988 by Barbara Braden and Nancy Bergstrom
- Consists of six subscales and the total scores range from 6-23
- A lower Braden score indicates higher levels of risk for pressure injury development. Generally, a score of 18 or less indicates at-risk status

Items included in the Norton scale and Braden Scale

	Norton	Braden
Mobility	+	+
Moisture exposure	+	+
Physical activity	+	+
General condition	+	-
Nutrition	-	+
Friction/shear force	-	+
Sensory perception	-	+
Mental status	+	-

Documentation

- General skin condition and risk assessment
- Position: indicate frequency and time client's position was changed
- Record pressure injury:
 - characteristics of the wound (i.e., presence of granulation tissue)
 - Location and size (i.e., depth, width)
 - Stage
 - Type of preventive measures / care given
 - Treatment and progress

Exercise

After studying the previous chapters, what will you do for the below case?

Case scenario 2

Amy is a 78-year-old woman who is living in a residential care home. She is suffering from Parkinson's disease and diabetic mellitus. She has double incontinence. Her body mass index is below 18 kg/m² which is lower than normal. She always rests on her bed and seldom go to the activity room or dining room.

- a. Do you think she is at risk of pressure injury?
- b. How would you assess her risk of pressure injury?
- c. What is your care plan to prevent pressure injury?

Let's return to case scenario 1 Mr. M's situation:


After assessment, he was at high risk of pressure injuries. He used to sit on his wheel chair all day long that made him more prone to develop pressure injuries. There were also warning signs: red skin colour and complaint of pain. If there was no skin breakdown, Stage 1 pressure injury was suspected. Prompt intervention should be provided in order to relieve the pressure and protect his skin with proper care.

Various strategies can help to improve his situation. Care plan can be decided according to the risk assessment that we have done. Let's move on to Chapter 3.4 to know more about the intervention and management.

3.4 Prevention and Management of Pressure Injuries

Prevention is always the golden rule. It is the most cost-effective treatment for pressure injuries.

The key is how we take appropriate prevention and in case of developed pressure injuries, how we manage it.

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Prevention of pressure injuries

3.4.1 Skin care

3.4.2 Pressure Redistribution

- Proper positioning
- Reduce friction and shearing forces
- Use of pressure relieving devices
- Optimize mobility

3.4.3 Nutritional support

3.4.4 Education

3.4.1 Skin care


Skin care is playing an important role in prevention of pressure injuries.

- Keep skin dry and clean
- Proper continence care, check and change napkins frequently to avoid skin maceration
- Do not vigorously rub skin that is at risk for ulceration
- Use skin emollients to hydrate dry skin and protect the skin from exposure to excessive moisture to reduce risk of skin damage
- Frequent skin inspection
 - Frequent assessment for any warning sign
 - Perform the assessment at any time e.g. personal care, bathing, positioning etc
 - Inspect any sign of erythema and blanching over body pressure area
 - Early detection and treatment accelerate recovery and reduce complications of pressure injuries

3.4.2 Pressure Redistribution

Proper positioning

- High pressures over bony prominences, for a short period of time, and low pressures over bony prominences, for a long period of time, are equally damaging. Passive or active mobilization is recommended
- Proper repositioning should be undertaken to reduce the duration and magnitude of pressure over vulnerable areas of the body
- Frequent turning, formulate reposition schedule / turning schedule at least every 2-4 hours

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Example of repositioning /turning schedule:

1000-- Prone position

1200--Left Sim's position

1400--Supine position

1600--Right Sim's position

1800--Prone position (*Generally, seldom use in Hong Kong*)

- Avoid **pressure on the pressure injury and high-risk areas**
- Keep proper body alignment while repositioning
- Use support device or foams wedges to separate skin areas in contact each other and to assist with maintaining positions
 - Use cautiously because these devices can become an additional source of pressure if they are not properly placed
- Follow the “Rule of 30” in positioning

Reduce friction and shearing forces

- Keep bed as flat as possible while turning. Limit Fowler’s position to only 30 minutes at a time
- Use enough personnel to lift the client up in bed or chair rather than pulling or sliding skin surfaces
- Use lifting devices to raise patient in bed
- No dragging client across the surface in the bed

Proper sitting position

For chair-bound cases:

- Proper sitting position is important in preventing pressure injuries
- Plan the sitting schedule to shift weight for prevention of pressure injuries
- Perform pressure relief exercise
- Provide pressure-reducing support surfaces e.g. gel, air, or foam cushion

Pressure relief exercises for wheelchair/chairbound clients

Regular pressure relief techniques are effective for prevention of pressure injury.

Before the chair exercise, remember to check that the wheels are locked or the chair is stable and undone the seat belt.

1. **The forward lean** – Lean forward as far as you can – imagine that you are trying to rest your chest on your knees! This movement is particularly good for relieving pressure on the coccyx.
2. **Leaning side-to-side** – Whilst seated, shift your body weight onto your left side to lift your right side out of your seat. Then repeat on the other side. This movement relieves pressure from the buttocks and the lower back.
3. **The push-up** – If the upper limbs are strong enough, use the wheelchair armrests (or wheels if you don't have any) to push up out of the seat with your arms. You should straighten your arms fully so that your elbows are locked. Then ensure that the buttocks and lower back are fully out of the seat.

Performing each movement for 10 seconds for every 15 minutes of wheelchair use.

Any of the three movements mentioned above can be performed independently, or with assistance, depending on individual mobility levels. For frail cases, seek for health care professional advice for the best way of chair exercise.

Use of pressure relieving devices

- Support pillows or foam wedges
- Flotation gel pads
- Trapeze bar
- Bed cradles
- Heel protectors
- Bed / mattress
 - Polyurethane foam overlays
 - Gel-filled overlays
 - Air-filled overlays
 - Water-filled overlays
 - Alternating pressure mattress
 - Low air-loss bed

Optimize mobility

- Assess level of immobility for appropriate intervention
- Increase mobility level
- Encourage active exercise and perform passive exercise as indicated
- Adhere to turning and sitting schedule

3.4.3 Nutrition support

Role of nutrition in pressure injuries


- Malnutrition is an independent risk factor of pressure injury development
- Nutrient is essential for tissue regeneration
- Optimize circulation around wound site

Challenges in nutrition Management

- Various impacting factors that affect nutrient requirements
 - Infection
 - Malabsorption
 - Chronic diseases
- Requirement differs from different staging of pressure injuries
- **Nutrition review and close monitoring plays a key role**

Nutritional Risk Factors

- Malnutrition
 - Measured using MNA-SF (validated in older adults)
- Pressure injuries staging
 - Later stage = greater malnutrition risk
- Unintentional weight loss
 - Strong indicator of poor nutrition
 - Pattern of 3-month weight change
- Oral intake
 - Appetite and amount of food consumed
 - Reason (taste changes, chewing ability, food choice...)
- BMI
 - Obese adults have a higher risk due to poorer circulation and greater capillary pressure, skin friction etc

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However, it's controversial. Some researchers argued that obese adults have extra body fat stores that reduced the risk of PI, rather than adding pressure on the skin, provide an enhanced subcutaneous cushion to ease the pressure.

- Mobility
 - Greater risk if bed bound, spinal cord injured, etc

Delayed healing due to nutrition issues

1. Screening – suggest reviewing regularly (monthly)
 - MNA-SF
 - Staging of pressure injuries (refer to previous chapter)
2. Risk identification
 - MNA-SF Chinese version
 - A guide to completing the Mini Nutritional Assessment – Short Form

Risk identification - delayed healing of pressure injury site

High Risk	Moderate Risk	Low Risk
<ul style="list-style-type: none"> • Stage 1 or 2 + BMI >21 (if >65yo) or BMI >18.5 (if <65yo) plus one of the following: <ul style="list-style-type: none"> • Unintentional weight loss <10% in 6m • MNA-SF less than 11/14 (Moderate to high risk) • 50-99% normal oral intake for >5 days • Stage 1 or 2 plus one of the followings <ul style="list-style-type: none"> • BMI <20 if >65yo or BMI <18.5 if <65yo • Unintentional weight loss • BMI <20 and unintentional weight loss • MNA-SF <8/14 (high risk of malnutrition) • <50% normal intake for >5 days • Stage 3 and 4 PI 	<ul style="list-style-type: none"> • MNA-SF 8-11/14 (moderate risk of malnutrition) 	<ul style="list-style-type: none"> • MNA-SF >11/14 (low risk of malnutrition) • Stage 1 PI

Actions if the older adult is identified as...

- **Low** risk of delayed healing
 - Give healthy eating information to ensure balanced diet
- **Moderate** or **high** risk of delayed healing
 - Dietetics referral
 - High protein high energy diet
 - Adequate fluid intake
 - Use supplements where necessary
 - Multivitamins
 - Arginine

Monitoring by Dietitian

- 2-3 weeks intervention → repeat screening
- Adjust protein/energy content until wound healing is observed
- Prioritization over chronic disease management, but still consider special medical conditions (renal diseases, food allergy, etc)

Common nutrition strategies used

- Small frequent meals
 - Split main meals into 2 meals
 - Include healthy snacks between meals (up to 3-4 snacks daily is optimal)
 - Yoghurt, fruit, nut, scrambled eggs, wholemeal biscuits, etc
 - Avoid low energy density food to maximise energy intake
 - Salad → stir fried choy sum
 - Water, tea → milk/ nutritional formula/ soy milk/ juice
 - Jelly → cake, biscuit
- Food fortification
 - Oil in the meal
 - Add margarine into oatmeal/congee
 - Use more vegetable oil to stir fry food
 - High energy beverage/food
 - Fatty fish
 - Full cream milk
- Minimize food restriction

- Eliminate food phobia due to worries on increasing blood cholesterol/blood pressure etc
- Prioritizing energy and protein intake in a meal over low fat, low sugar etc
 - Consume rice and meat first before vegetable
 - Allow them to eat meat with some fat until wound healing is observed
 - Still need to consume enough fruit and vegetable for effective wound healing (without compromising energy intake)
 - Splitting meal is key
- Improve appetite as the main goal

- Supplementation
 - As indicated by doctor or dietitian
 - Calorie-containing drink may be useful as a high energy beverage option such as full cream milk & nutritional formula
 - Important to try all food options (frequent meals, fortification) before commencing supplementation
 - Arginine supplement is only found effective in PI stage 2 or above, such as Abound and Arginaid
 - Require close monitoring by medical professional if arginine supplement is to be used
 - Multivitamin Supplement can be considered if the older adult's appetite is very poor and unable to consume enough fruit and vegetable

Case Study – Mary Q1

- 70-year-old female, no observable PI
- Independent, sedentary most of the time
- No special medical issues in the past months
- Very responsive in chatting
- No habit of measuring body weight (measured on the day: 59kg, 160cm)
- In the past year, appetite is not as good as before, and feel full if eat less food
- Action?

Case Study – Mary Q2

After 1 year, you see Mary again...


- PI stage 1
- Rarely leave home in the past year
- Weight measured: 49kg (17% loss in 1 year)
- Getting thinner than before and listless
- Feel full as soon as eating, and stomach acid refluxes all day long, eating less than before
- Other conditions are the same as last year
- Risk?
- Action?

Summary of nutritional support

- Nutritional assessment is essential
- Provide appropriate nutrition intervention, based on individual need
- Maintain adequate nutrition – protein, calories, vitamins, fluid
- Monitor and evaluate the nutritional outcome, with reassessment of nutritional status at frequent intervals while an individual is at risk

3.4.4 Education

- Educate patient, family members and caregivers
- Educate causes and risk factors of PI development and ways to minimize risks
- Provide information and technique:
 - Understanding pressure injury
 - Risk assessment tools
 - Use of support devices

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- Skin assessment
- Proper skin care
- Appropriate positioning
- Documentation of appropriate data


3.5 Treatment in pressure injuries

- **Debridement** - remove dead tissue from the pressure injury to help healing
 - Types of debridement:
 - surgical sharp
 - conservative sharp
 - autolytic
 - enzymatic
 - mechanical
 - larval (*also called Biological debridement, but this is not common in Hong Kong*)
- **Dressings** - wound care with appropriate dressing is crucial to facilitate the wound healing
 - alginate dressings – made from seaweed and contain sodium and calcium, which are known to speed up the healing process
 - hydrocolloid dressings – encourages the growth of new skin cells in the ulcer
 - other dressing types: foams, films, hydrofibres/gelling fibres, gels and antimicrobial dressings may also be used
- **Antibiotics** for severe wound infection

Multidisciplinary team care approach

- Geriatricians, nurses, dietitians, physiotherapists and occupational therapists
- Evaluate the contributing factors and formulate the care plan for pressure injury management


-- End of Chapter 3 --

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