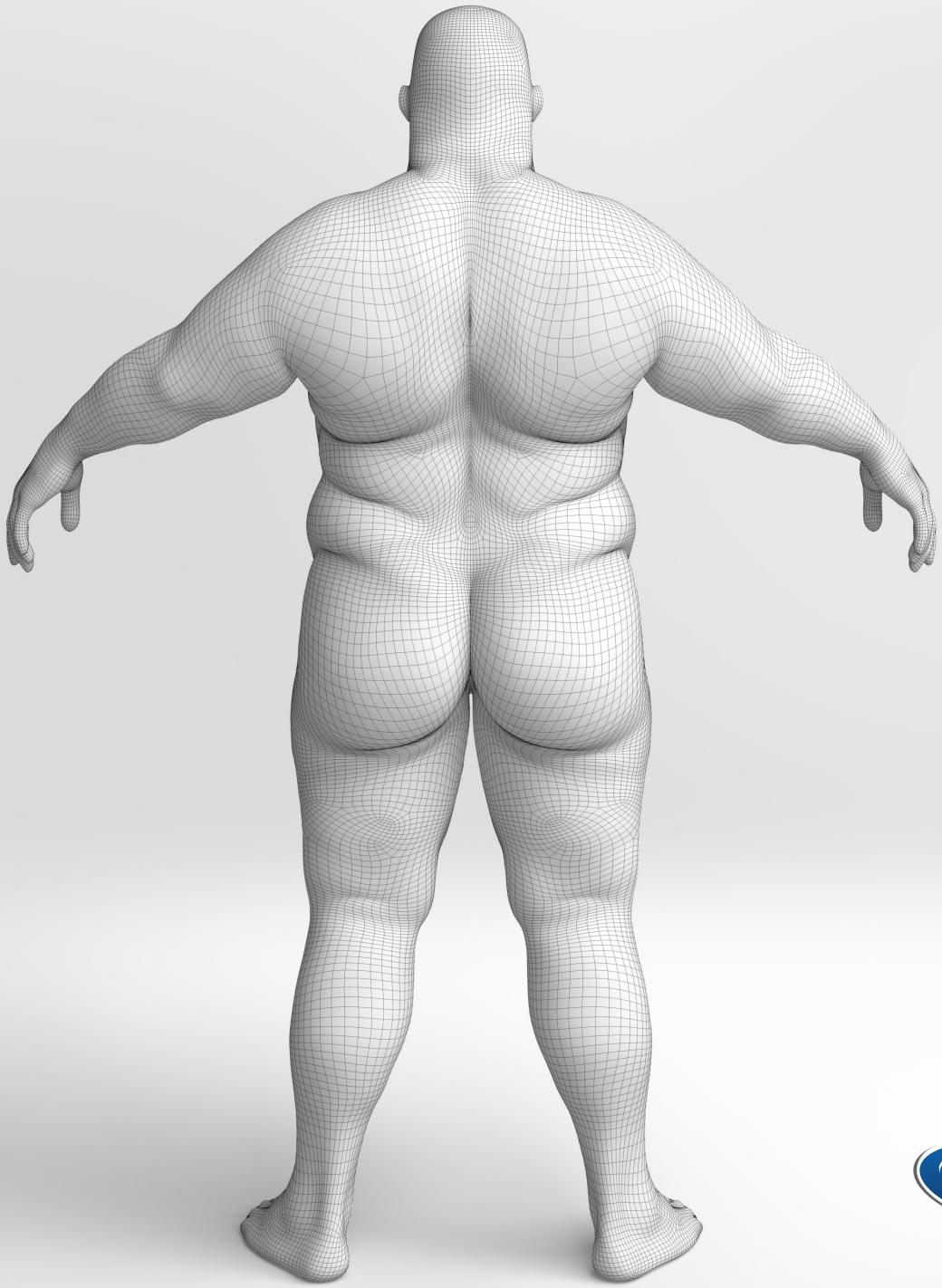
An introduction to Plus-Size



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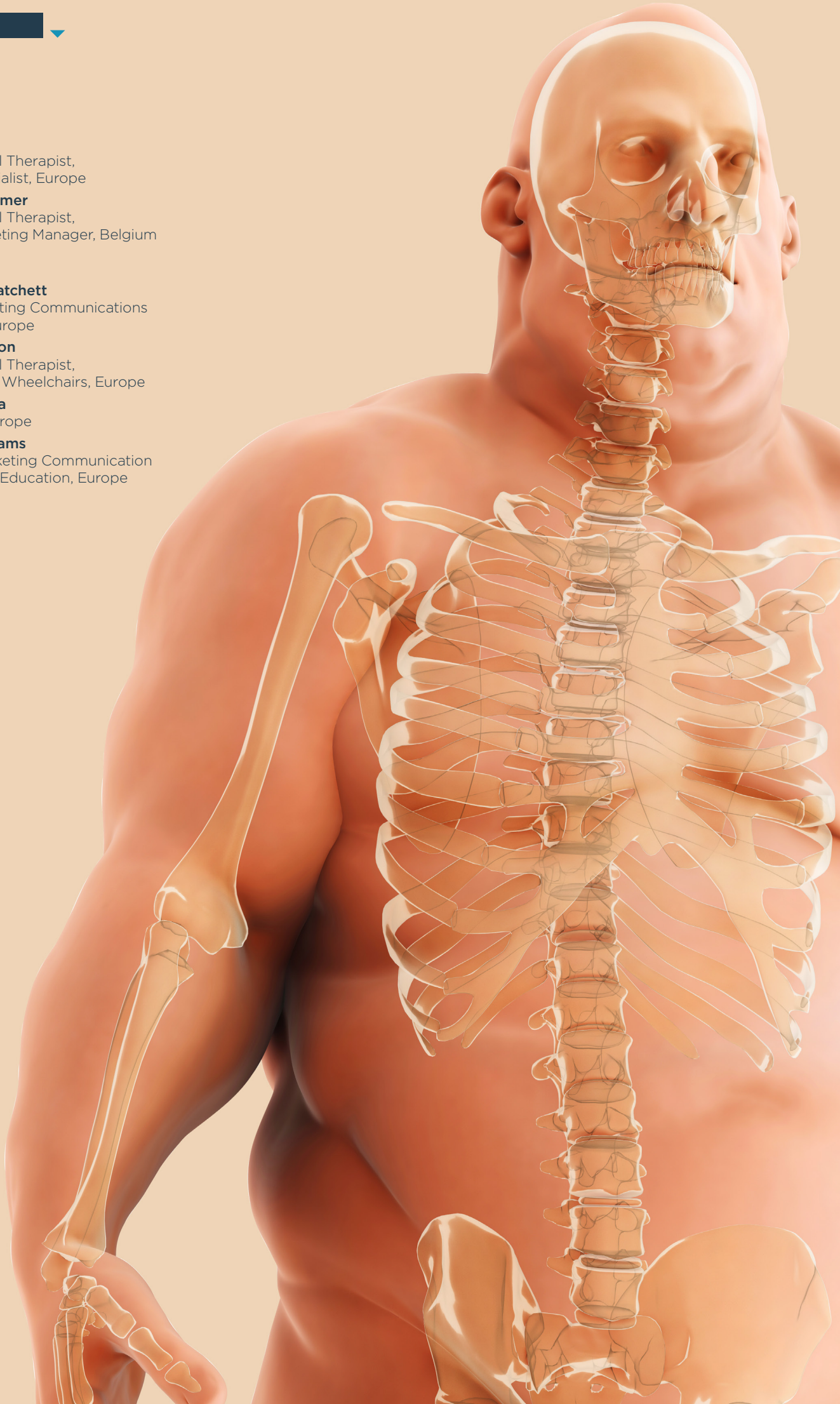

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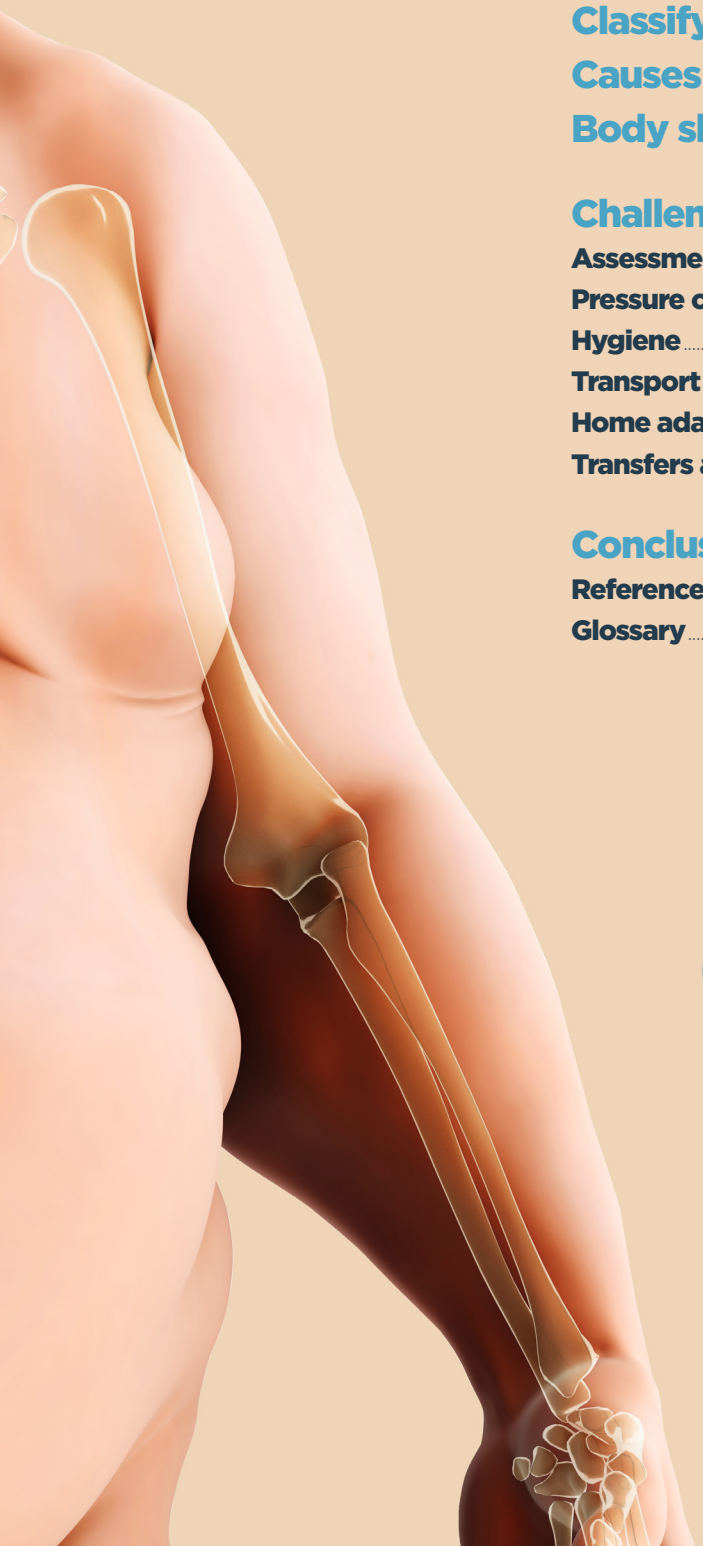


Worldwide, obesity has more than doubled since 1980
(The Lancet, 2014)

24-hour care

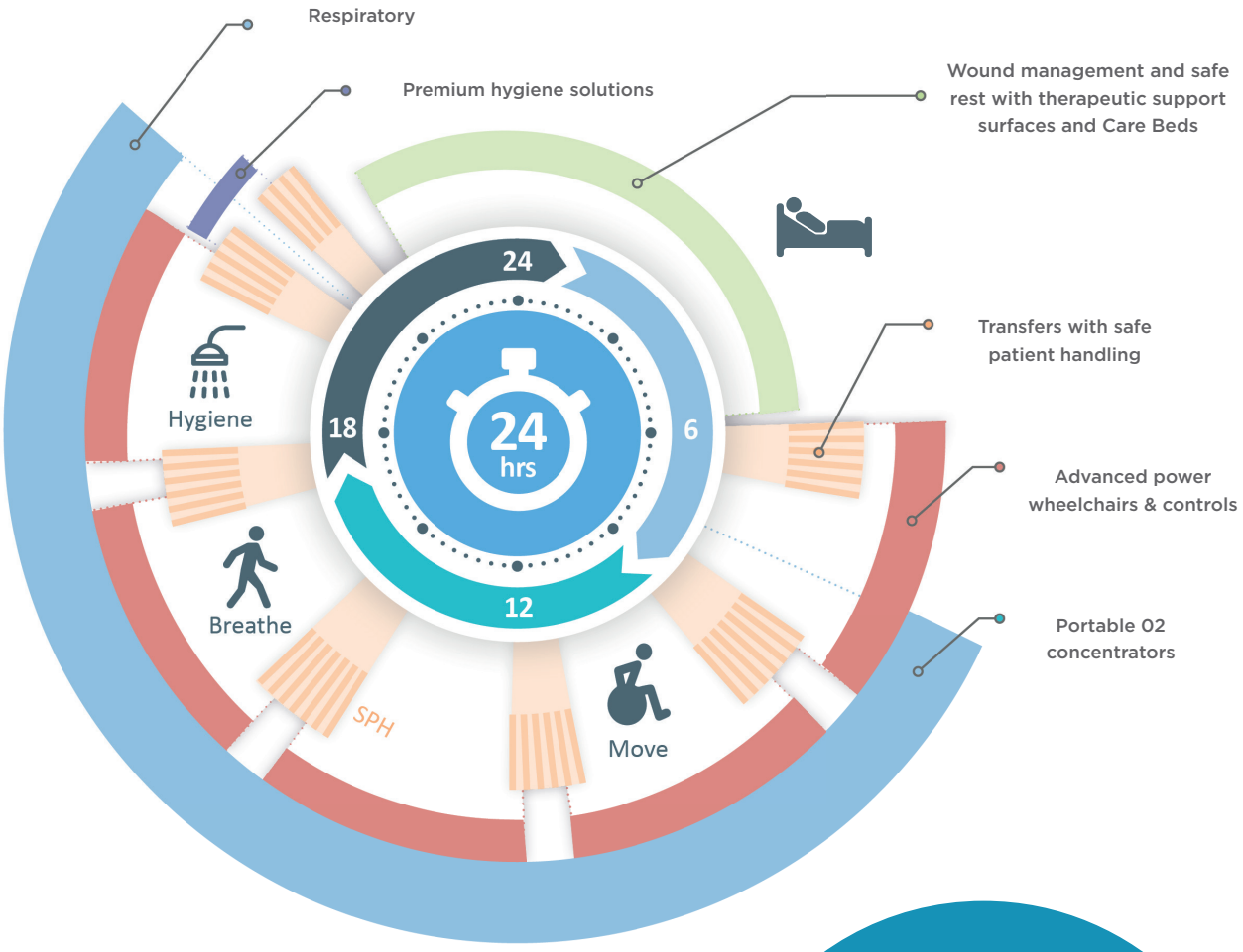
24-hour care is a holistic approach that assesses all the positions a person uses over the course of a day, from lying in bed to sitting in an armchair or wheelchair to standing. The aim is to optimise functional postures, which enhance the health and well-being of the individual whilst at the same time helping to promote greater social inclusion and community participation.

Assessing or identifying the positions an individual adopts whilst lying in bed at night is just as important as identifying the position adopted in an armchair or wheelchair during the day. The aim of seating in a wheelchair is to promote comfort, function, symmetry, where possible, and prevent deformity. It is, therefore, essential that this is continued when the individual is out of the wheelchair.

The overall aim of 24-hour care is to improve an individual's function and communication in sitting, lying and standing, whilst at the same time promoting comfort to enhance an individual's ability to participate in their desired roles and occupations within their chosen environment (Mortsenson and Miller 2005, NHS Purchasing and supply Agency; Rigby, Ryan and Campbell 2009; Wynn and Wickham 2009).

A holistic assessment approach is key in enabling the clinician to identify the postural devices and equipment solutions that meet the individual's total care needs within a 24-hour period, in order to keep them, their families and their caregivers safe, independent and functional.

A 24-hour approach should be applied to every individual, therefore, it's important whilst reading through this booklet to consider the 24-hour care needs of the plus-size person.



The aim is to optimise functional postures, which enhance the health and well-being of the individuals

The challenges faced

The number of overweight people is increasing and these individuals often require a specific approach when it comes to care. There is, however, a lack of awareness of how best to do this so Invacare has compiled this booklet to provide the best advice and information not only for the individual themselves, but also for their family and their caregiver.

Many terms are used for people with an increased amount of body fat, however, in this publication, we chose to use the term 'plus-size'. Previous publications in this area have researched into the terminology and 'plus-size' was the preferred term. The reason for not using the term 'Bariatric' is because it tends to be used to describe the field of medicine and focuses on the causes, prevention, treatment and management of obesity and its associated diseases (Mosby's Medical Dictionary, 2006), rather than the person themselves.

Many challenges exist when working with this group of people. The person could be diagnosed with a specific bariatric condition such as morbid obesity, or there is a secondary complication in place such as lymphoedema or elephantiasis, for example. Alternatively, a plus-size individual could have sustained an injury which alters their health.

Equipment

Everyday tasks such as visiting the toilet or getting in and out of bed can present difficulties for plus-size people, especially if their usual levels of agility are debilitated by illness or medical complications. Finding suitable product/aid solutions for a plus-size person can be a real challenge and every case needs to be dealt with on an individual basis.

A lot of products/aids available tend to address the extra weight (i.e. safe patient load) of a plus-size person, but don't take into consideration different body shapes and centre of gravity changes. A well-designed aid will take all this into consideration with unique adaptations specific to plus-size people. The assessment is key here to find the correct solution as factors such as age, health status, weight, weight distribution, body shape, mobility, comorbidities and equipment requirements will be considered.

Being or staying mobile is very important for everyone, and especially so for plus-size people. Finding the right aids can be the first step towards getting out of bed and re-engaging in activities. The funding systems in each country, however, don't always see this bigger picture and so the funding provided is often not enough.

Environment

- Aside from the obvious different body shape and physiological changes, there are often psychological and environmental issues to address for plus-size people. Plus-size people may worry about whether their shape or size may inconvenience family members or caregivers and have concerns about equipment failure and getting through doorways, for example.

To provide adequate space and a safe environment for a plus-size person, the caregiver needs to consider both the home (or facility) and external environment (Health Care Design Magazine, 2012). Each environment offers unique challenges and will influence the safe handling procedures, the choice of equipment and control measures implemented. A risk management process is often conducted, which includes task analysis, safe systems of work and control measures. It also has links to education, training and handling strategies that are fit for purpose and meet individual needs (Cheung et al., 2006; Ruszala, 2010; Rush and Cookson, 2011).

Plus-size The Statistics

- Sleep apnoea is present in 41% of patients with a body mass index (BMI) greater than 28 and the prevalence can be as high as 78% in patients referred for bariatric surgery (Garvey et al, 2015).

32% OF THE WORLD'S POPULATION ARE **OBESE** (BMI ≥ 30 kg/m2)

68% OF THE WORLD'S POPULATION ARE **OVERWEIGHT** (BMI ≥ 25 kg/m2)

14%
of children and adolescents are overweight or obese worldwide

62%
of the world's obese live in developing countries

90%
almost 90% of people living with type 2 diabetes are overweight or obese

ZERO
The number of countries succeeding in decreasing obesity in last 33 years

3.4 million
deaths caused by being overweight and obese

More than **50%** of the world's **671 million** obese people live in 10 countries: US, China, India, Russia, Brazil, Mexico, Egypt, Germany, Pakistan and Indonesia

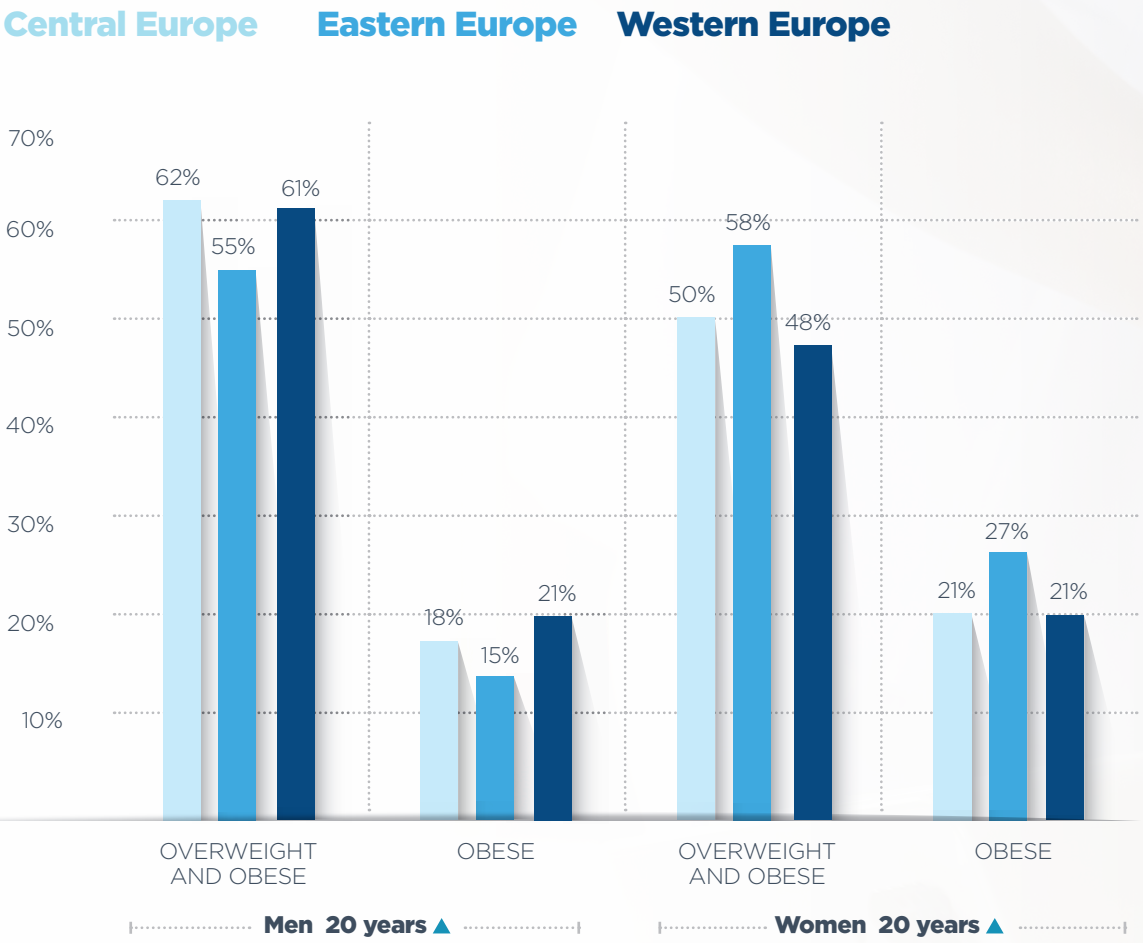
In the UK, 64% of adults are classed as being overweight or obese

Almost 3 out of 4 Indians are overweight and 1 out of 3 are obese

Source: The Lancet (2014), Vol 384, August 30, 2014

Plus-size
The Statistics

Prevalence of overweight and obese
Gender and groups in European regions, 2013

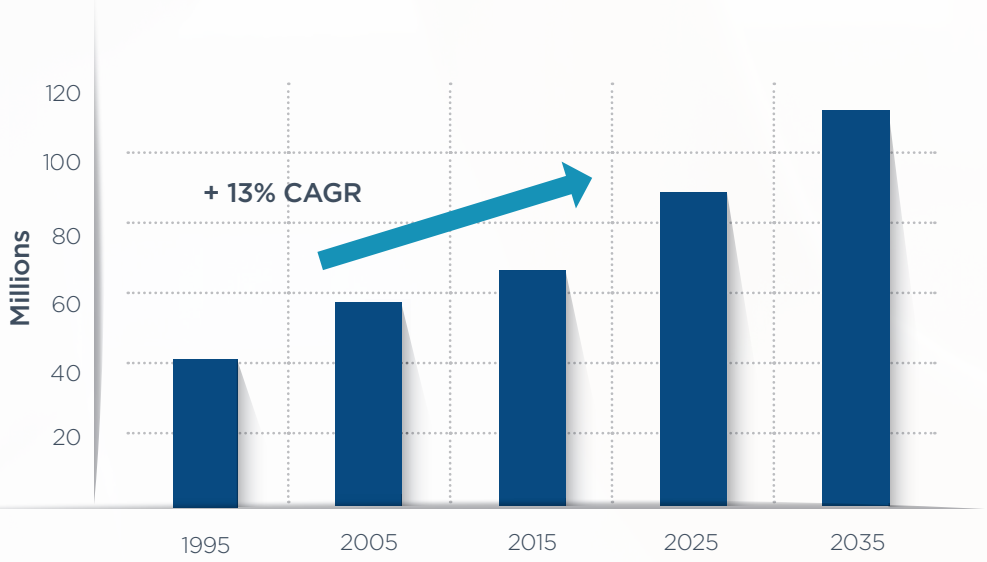


Note: Obesity = BMI ≥ 25 and obesity = BMI <30kg/m². The prevalence of overweight and obesity for men and women separately and for 17 age groups (from 2-4 years to 80≥years)

Source: The Lancet (2014), Vol 384, August 30, 2014

Obesity patterns (BMI ≥ 30)

Number of obese people, aged 20+

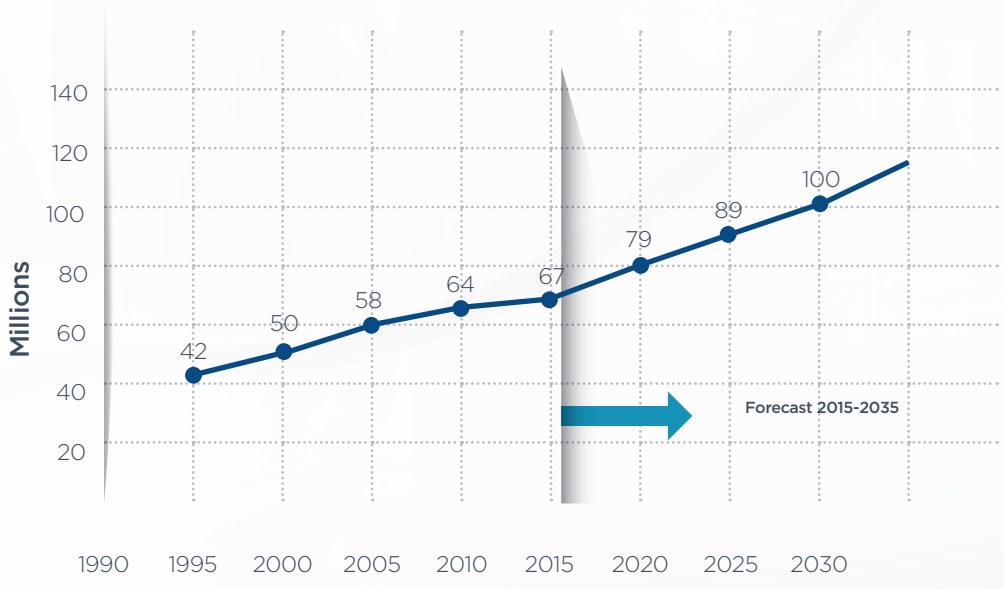


Western Europe

Source: The Lancet (2014), Vol 384, August 30, 2014

Obesity patterns (BMI ≥ 30)

Number of obese people, aged 20+



Western Europe

Source: The Lancet (2014), Vol 384, August 30, 2014

Typically, the weight of a plus-size person is defined as having a BMI of over 35 kg/m2

Plus-size
The Statistics

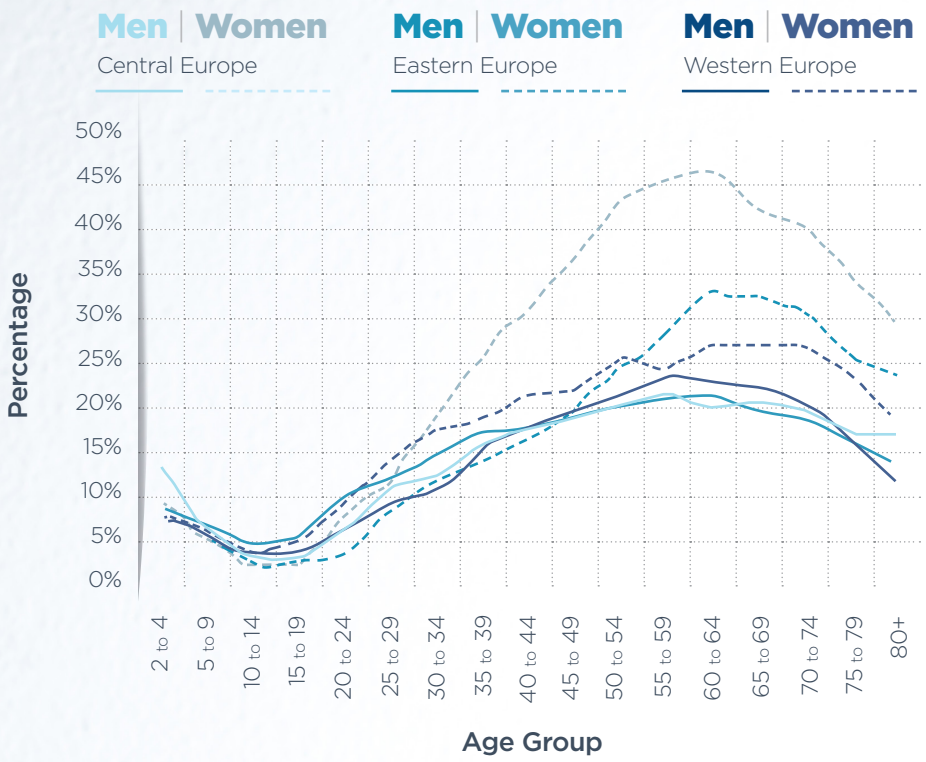
BMI classification

The classification of weight category by BMI

Classification	**BMI** (KG/M2) **Principal Cut Off Points**	**BMI** (KG/M2) **Cut Off Points for Asians***
Normal Range	18.5-24.9	18.5-22.9 23.0-24.9
Overweight	25.0-29.9	25.0-27.4 27.5-29.9
Obese Class 1	30.0-34.9	30.0-32.4 32.5-34.9
Obese Class 2	35.0-39.9	35.0-37.4 37.5-39.9
Obese Class 3	≥40.0	≥40.0

▶ For Asian populations. classifications remain the same as the international classification, but the public health action points for interventions are set at 23, 27.5, 32.5 and 37.5 kg/m2.
Source: Adapted from the World Health Orginisation (WHO) 2004.

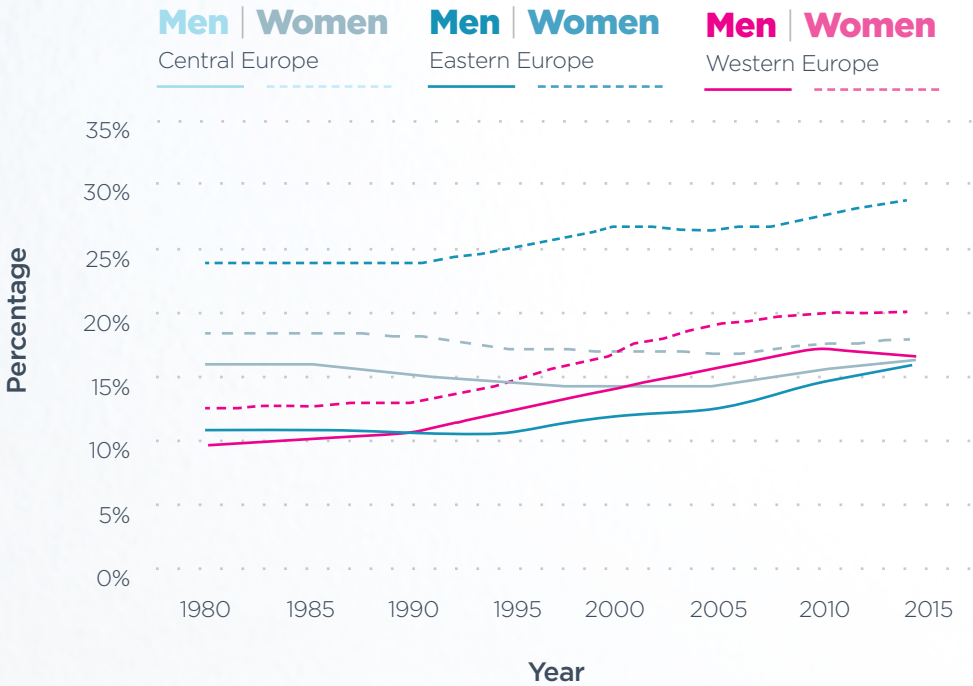
Obesity according to age group



Note: Obesity = BMI <30kg/m²

Source: The Lancet (2014), Vol 384, August 30, 2014

Obesity in adults by year



Source: The Lancet (2014), Vol 384, August 30, 2014

Classifying weight

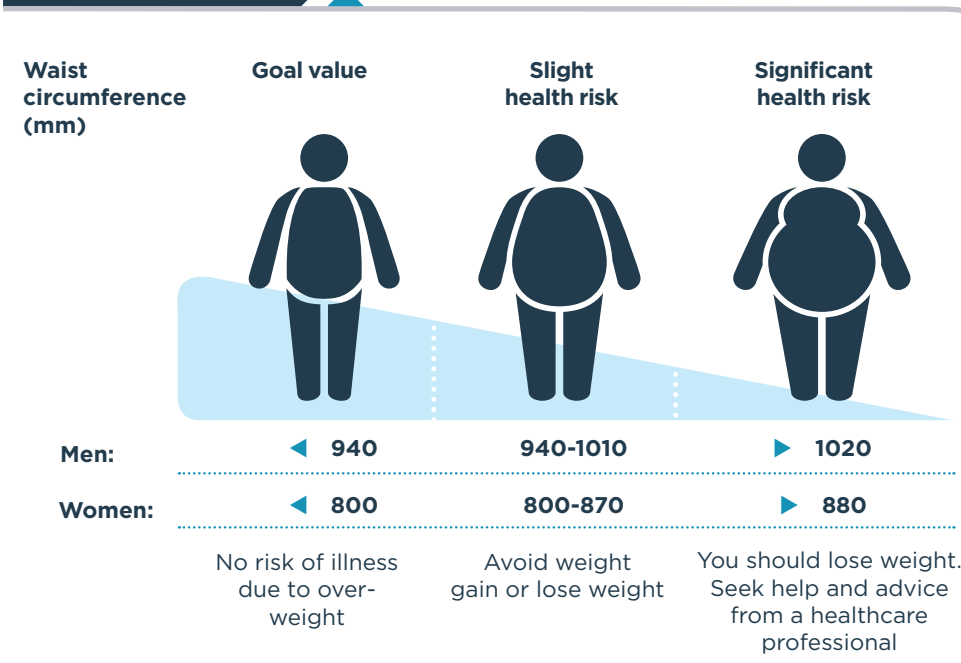
Excess pounds do more than increase a person's weight, they increase the risk of major health problems. Fortunately, losing weight can reduce the risk and it is important to remember that a certain amount of body fat is necessary for energy storage, heat insulation, shock absorption and other functions.

This is best defined by using the Body Mass Index (BMI). The BMI is calculated using a person's height (m) and weight (kg), and is strongly correlated with total body fat content in adults.

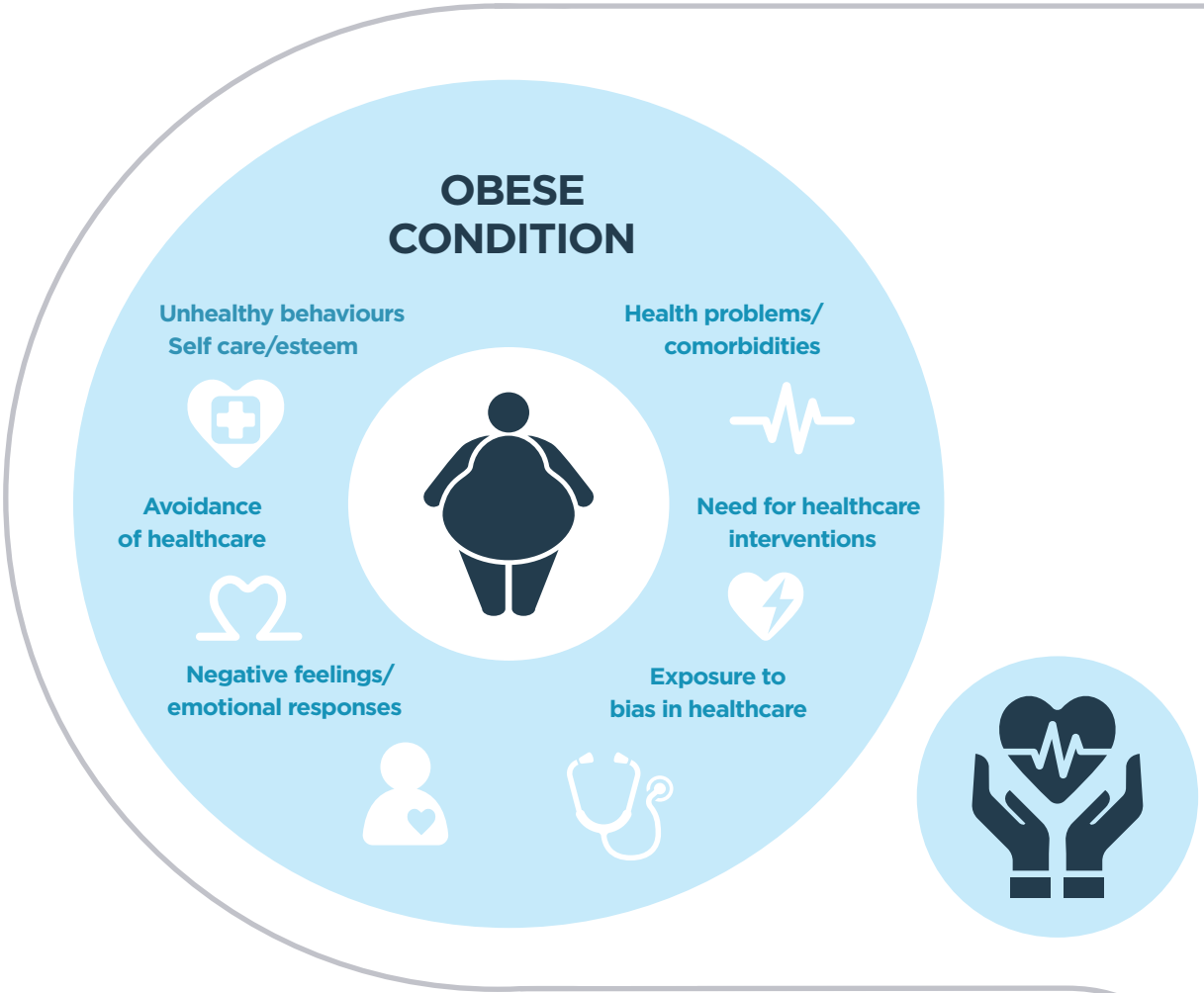
Typically, the weight of a plus-size person is defined as having a BMI of over 35 kg/m2. A plus-size person with comorbidities tends to have a BMI of 40 kg/m2 or is 45 kg over the ideal weight (National Institute for Health and Clinical Excellence, 2006).

Hirani (2010) used the BMI and waist circumference measurements to gather anthropometric data on prevalence of obesity. The National Institute for Health and Care Excellence guidelines also recommend the combination of BMI and waist circumference to assess health risks associated with obesity.

Identify risk



Causes of obesity

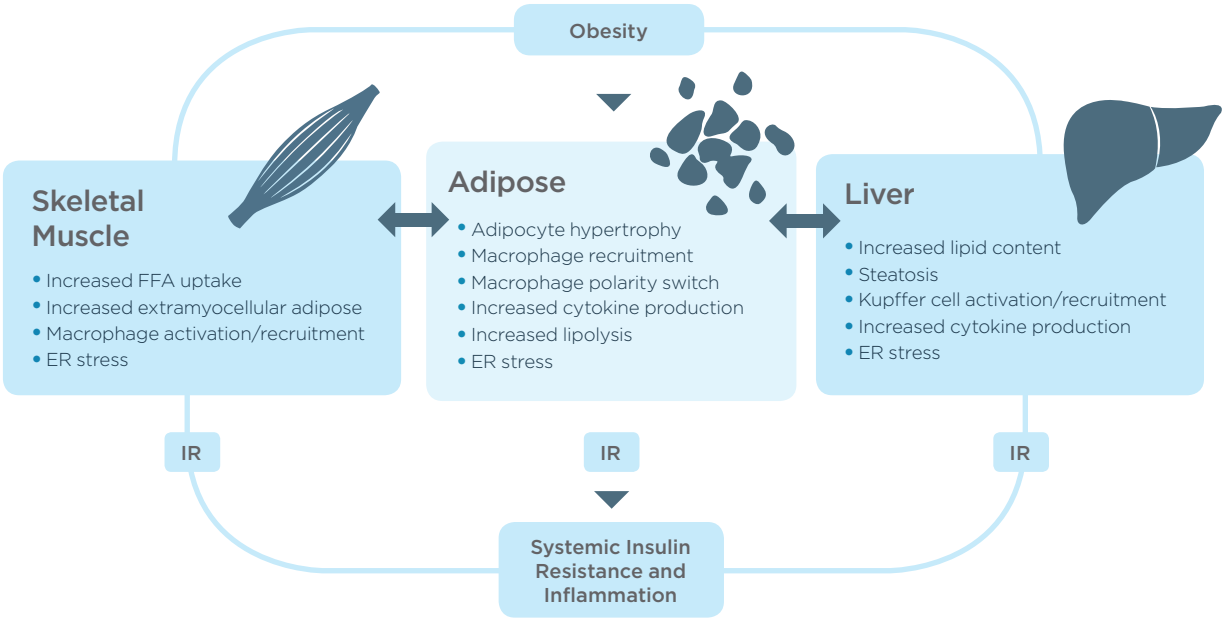


- **The balance between calorie intake and energy expenditure determines a person's weight.** If a person eats more calories than he or she burns (metabolises), the person gains weight as the body will store the excess energy as fat. If a person eats fewer calories than they metabolise, they will lose weight.
- Therefore, the most common causes of obesity are overeating and physical inactivity. Ultimately, body weight is the result of genetics, metabolism, environment, behaviour and culture.

Type 2 diabetes

- Insulin resistance is the condition whereby the effectiveness of insulin transporting glucose into cells is diminished. Fat cells are more insulin resistant than muscle cells. The pancreas initially responds to insulin resistance by producing more insulin and if it can produce enough insulin to overcome this resistance, helping blood glucose levels to remain normal.

  This insulin resistance state (characterised by normal blood glucose levels and high insulin levels) can last for years, however, once the pancreas can no longer keep producing these high levels of insulin, blood glucose levels begin to rise, resulting in type 2 diabetes. Type 2 diabetes is associated with central obesity which means excess fat around their waist, resulting in an apple shape.



Cancer

- Between a third and fourth of all cancer cases worldwide are related to excess weight and physical inactivity, according to the World Health Organisation. In the case of women, the risk is related to the fact that body fat produces oestrogen, a hormone related to the development of cancer. Cancer recovery in plus-size individuals may be slower and less effective than recovery in others.

Cardiovascular disease

- Heart attack and stroke are two of the most common cardiovascular diseases associated with plus-size people. People at any age with abdominal fat are at increased risk of heart conditions, with it doubling the probability according to the Nurses' Health Study. The fat prevents the normal blood flow which could also cause other diseases such as myocardial hypertrophy, cardiomyopathy and congestive heart failure. The heavier you are, the more at risk you become.

Hypertension

- High blood pressure is common amongst plus-size people due to the accumulation of fat in the abdominal area. The abdominal adiposity is responsible for the production of hormones called cytokines that cause hyperinsulinemia, the same ones that result in type 2 diabetes.

  Due to the hyperinsulinemia, the absorption of sodium is increased, alongside kidney abnormalities, which are related to hypertension. Weight loss, even a small amount, has a major impact in lowering blood pressure.

Respiratory conditions

- Being plus-size can compromise the normal function of the lungs and airways, which results in asthma and Obstructive Sleep Apnoea. According to a 1999 study, children who suffered from obesity had a 77% increased risk of developing asthma. Sleep apnoea (short but repetitive moments of inability to breathe during sleep) can ultimately cause systemic hypertension, myocardial ischaemia, cardiac arrhythmia or a stroke.

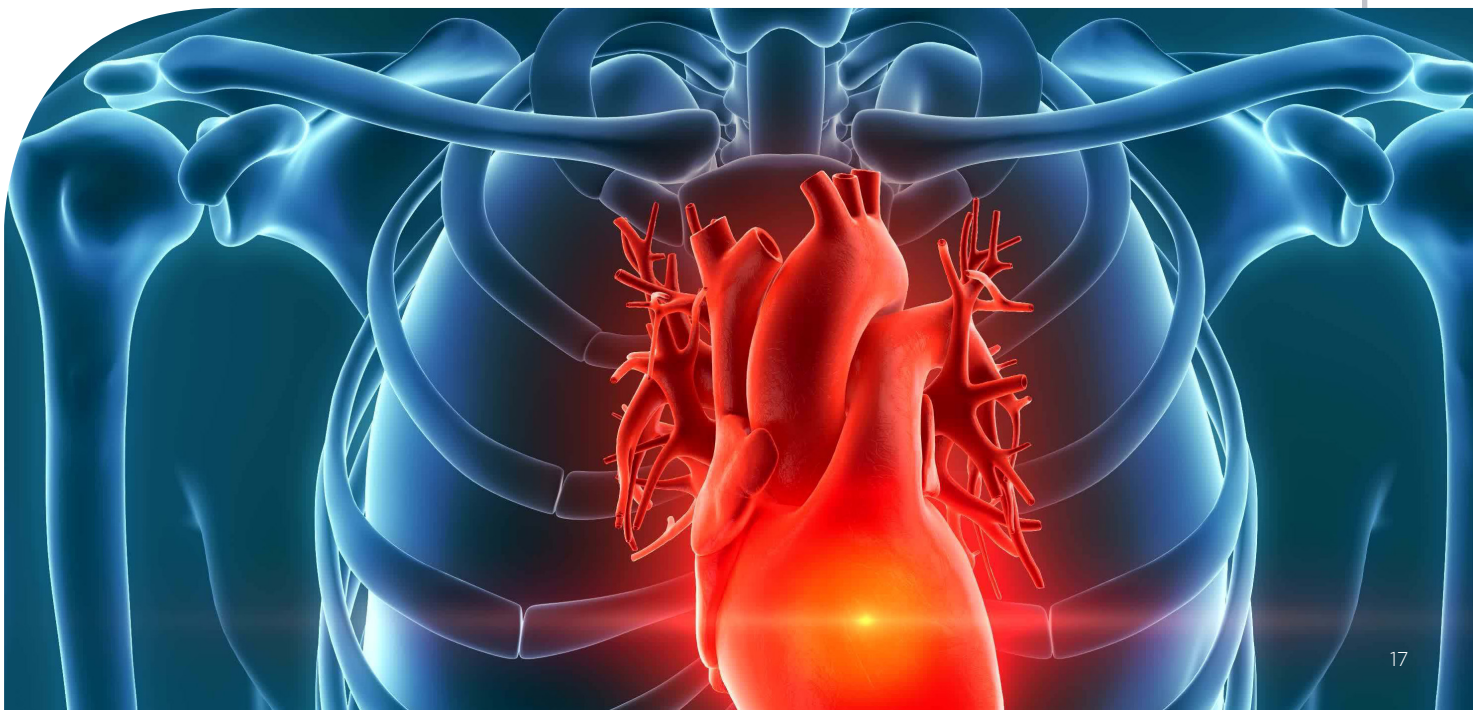
Metabolic disorders

- It is estimated that more than 40% of Americans over 50 years old suffer from Metabolic Syndrome due to being overweight. The disease is characterised by the large waist perimeter and it is caused by the body's distribution of fat. It can, in addition, lead to the accumulation of fatty acids in the portal vein, which increases the amount of fat in the liver and muscle cells.

Other diseases

- In addition to the mentioned comorbidities, there are also other rarer diseases that are associated with plus-size. These include congestive heart failure, fatty liver syndrome, gall bladder disease, depression, stress (and other social or psychological disorders), menstrual irregularities, osteoarthritis and acid reflux disease (GERD).

  Not only does the existence of comorbidities influence a person's overall health, it also directly impacts the treatment they receive. Plus-size people with at least one other disease are more eligible for surgical weight loss.



Body shapes

- Plus-size people can have a wide variety of body shapes in addition to differences in BMI. Two people may weigh the same, however, how their weight is distributed i.e. their body shape, may be completely different.

  Body shapes are based on waist to hip ratio and are commonly classified into categories. Each body shape poses its own functional challenges in relation to transfers, mobility and equipment selection.

Apple (android)

1

- **Commonly referred to as being "apple shaped", this body shape describes individuals who have excessive weight distributed around their stomach or abdominal area, otherwise known as abdominal or central obesity.**

The type of fat associated with this body shape is known as visceral fat. It's a gel-like fat, which wraps around major organs including the liver, pancreas and kidneys and has a strong correlation between cardiovascular disease and type 2 diabetes. Typically, the apple shape is more common in males than in females. Men tend to be referred to as having a "pot belly" or "beer belly".

This type of shape is associated with:

- **Upper body obesity**
- **Abdominal obesity**
- **Android or male obesity**
- **Centralised obesity**

Apple ascites

a

- Ascites is the accumulation of fluid in the abdominal (peritoneal) cavity, which causes the abdomen to extend and become rigid. Although the exact cause of ascites development is not completely understood, most theories suggest an increased pressure in the blood flow to the liver, known as portal hypertension.

  The basic principle of ascites development is similar to the formation of oedema - an imbalance of pressure, in this case in the inside of the abdominal cavity and outside. As well as their connection to cardiovascular disease, ascites can also be related to liver disease, cirrhosis or kidney disease.

In general, plus-size people with an apple ascites distribution have:

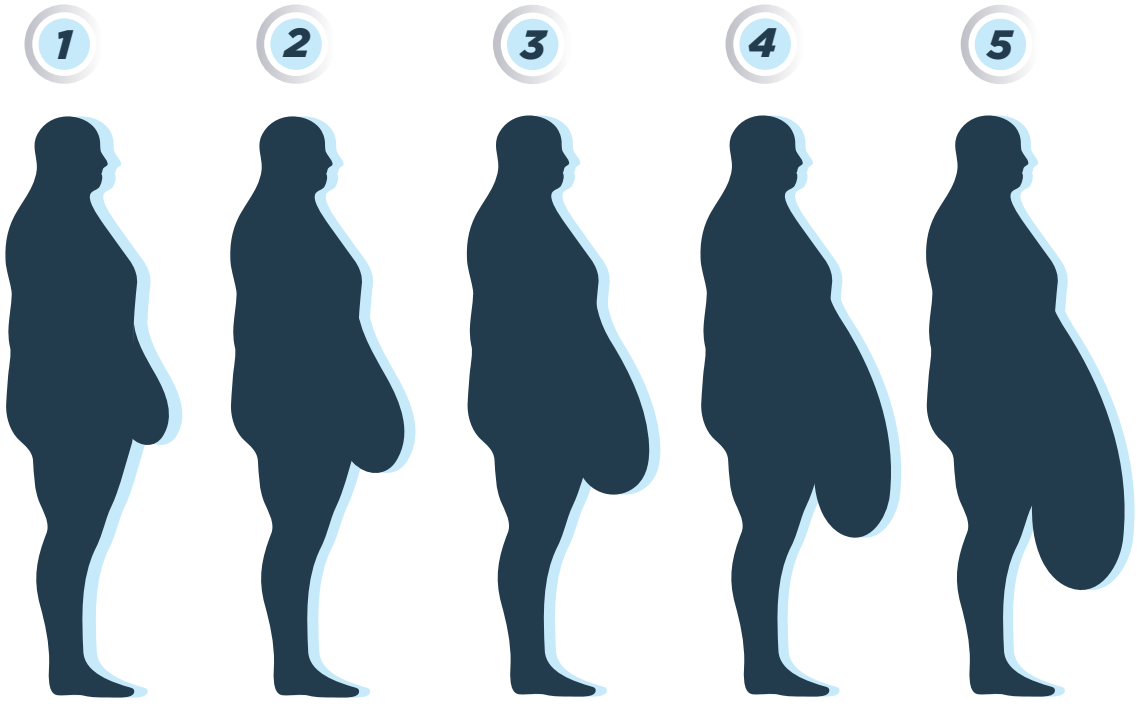
- **A high waist to hip ratio – hip to waist ratio is the circumference of the waist divided by the circumference of the waist.** Waist to hip ratio (WHR) is used to determine health. When the waist ratio is higher than that of the hips, the person could be at risk of developing serious health issues.
- **The person may have difficulty lying flat on their back (supine) or on their front (prone) and need several pillows under the head end of the bed when lying on their back to achieve what is known as a semi-fowler position.** This is when the head of the bed is elevated between approximately 30-45 degrees to assist breathing.
- **Breathing becomes more difficult as excessive weight on the chest puts additional strain on the respiratory muscles, meaning they must work harder.** Further, excess adipose tissues in the abdominal wall restricts movement of the diaphragm restricting movement in and out of the lungs.

b

Apple Panniculus

A panniculus or pannus is the term used to describe a hanging mass of subcutaneous fat in the lower abdomen. Commonly referred to as an "abdominal apron", the mass consists of skin, fat and in some situations the contents of the abdominal cavity following a hernia (most commonly of the bowel).

Panniculi can vary in size and severity, therefore, there is a grading system from 1-5 to differentiate them:



1	2	3	4	5
Panniculus barely covers the hairline of the mons pubis but not the genitalia	Extends to cover the genitalia	Extends to cover the upper thigh	Extends to cover the mid-thigh	Extends to cover the knees or beyond

- **The complications of a panniculus, especially Grade 3 or higher, is the effectual shortening of the person's seat depth. It can prevent contact with a back support and can also cause lordosis and compromised balance in sitting, standing and during ambulation.**

Diet and/or exercise alone will not reduce the size of a panniculus - surgical removal is the only option. This type of surgery is called a panniculectomy and helps improve other health conditions, or to improve quality of life for the individual. Please note, it should not be confused with the cosmetic tummy tuck surgical procedure.

In general, plus-size people with an apple pannus distribution have:

- **High waist to hip ratio**
- **A mobile chest or mobile umbilicus**
- **A variable supine tolerance and may find it difficult to lie flat on their back**
- **May tolerate a prone position**

Pear Shape

Pear shaped is the term used to describe someone who carries their excess weight around their bottom and thigh region. Typically, excessive tissue can be distributed either medially (towards the inside of the thighs – known as Pear Abducted) or laterally (towards the outside of the thighs – known as Pear Adducted). The major difference with the two types of "pear shapes" is the location of the feet. This is a major consideration if the person is going to use a wheelchair.

2

- Lower body obesity
- Gluteal-femoral obesity
- Generalised or peripheral obesity
- Gynoid or female obesity

a

Pear Abduction

Excessive tissue on the inside of the thighs will cause the hips and legs to abduct (fall outwards) when seated. This can make positioning or supporting the legs and feet a challenge, as the individual is not able to sit with their legs together and straight as is typically the 'norm'.

- A very low waist to hip ratio
- Majority of tissue below the belt line and femur in abducted posture
- Severely painful knees due to valgus stress
- Tendencies to move from supine to sit via long sitting and avoid log rolling

Pear Adduction

b

In the case of pear adducted body shapes, excessive tissue on the outside of the thighs means the individual will require a wider seat. The lower limbs in this case can typically achieve a midline (straight) position as the weight is distributed to the outside rather than the inside, making positioning of the hips, legs and feet far easier.

- A very low waist to hip ratio
- Lower adducted extremities that are in-line with the body
- Tendencies to move from supine to sit via long sitting or may seek rolling technique

Gluteal Shelf

3

Excessive tissue located around the buttocks creates a posterior (rearward) protruding mass of tissue commonly referred to as a shelf. Individuals with excessive gluteal tissue will most likely encounter problems positioning themselves right back in a seat as their excess tissue prevents them contacting the back support. This can change the individual's centre of gravity, which is especially important if considering wheelchair provision.

In general, plus-size people with a gluteal shelf have:

- **A mixed waist to hip ratio with either excessive posterior tissue in gluteal region or limited supine tolerance**

Anasarca

4

Anasarca is a severe and generalised oedema with widespread subcutaneous tissue swelling. Subcutaneous tissue is found beneath the lowermost level of the skin and is where adipose (fat) cells are found. Anasarca is not a disease entity on its own - it signifies a severe underlying disease.

What is oedema and why does it occur?

Oedema can be described as an abnormal presence of excessive fluid in the interstitial space (fluid that lies in between cells). About 60% of our lean body weight is made up of water, of which two thirds (40%) lies within the cells (intracellular) and one third (20%) lies outside the cells (extracellular).

Oedema is caused by an accumulation of excess fluid in the interstitial space between the cells. This occurs due to changes in pressure (or forces) between the interstitial space and the extracellular space. When this happens, fluid moves between the two spaces, causing fluid levels to change.

- Localised oedema means that the oedema is localised to a specific region of the body, commonly due to venous/lymphatic causes, allergy or inflammation
- Generalised oedema involves more than one part of the body simultaneously and is most commonly due to cardiac, hepatic, renal or endocrine causes

Challenges/ Solutions

Assessment

- **During the assessment stage, the clinician will gather information and use it to form the basis of their equipment prescription and rehabilitation programme.**

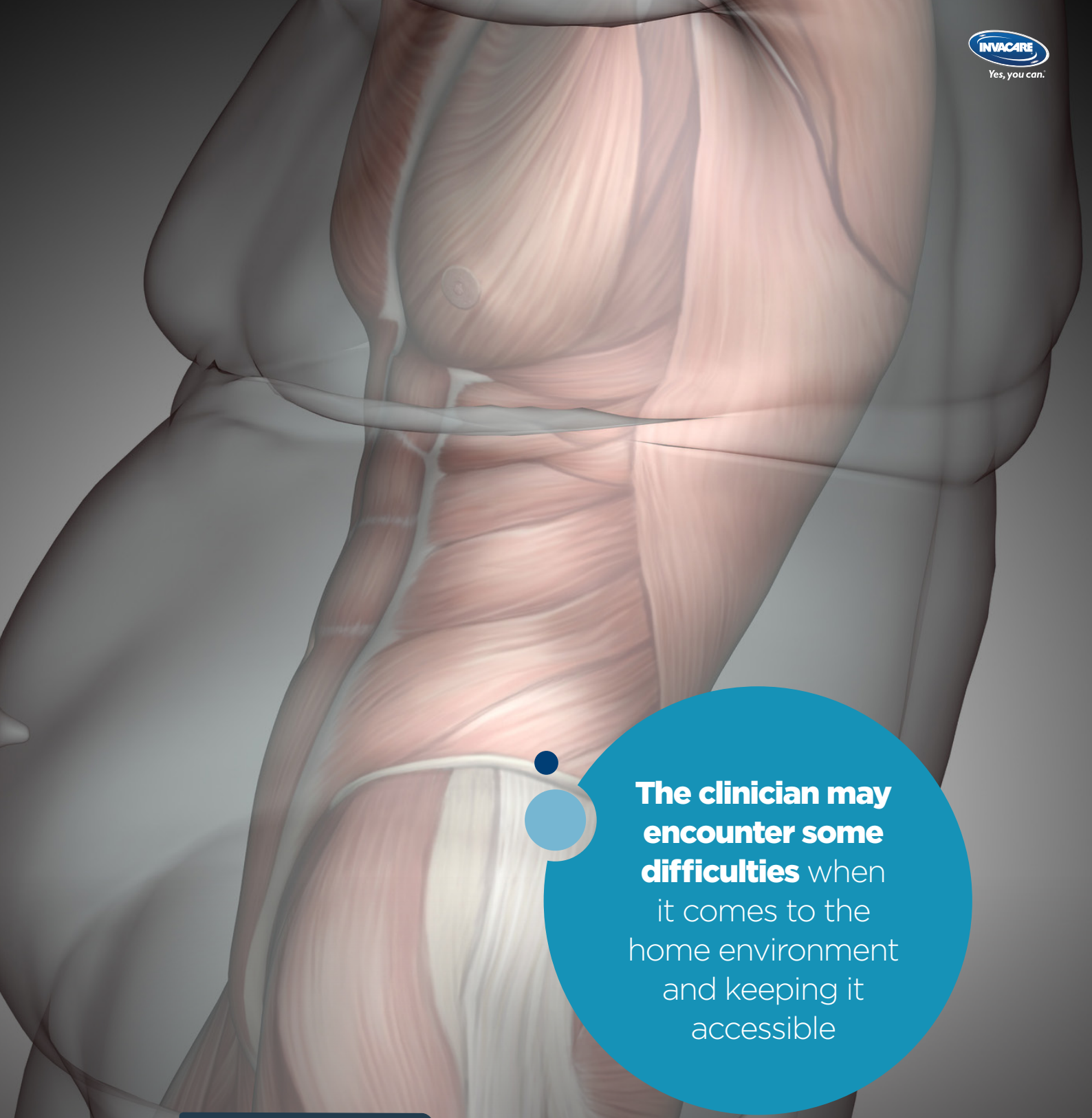
Assessment tools exist which can help support this process. Many facilities use their own assessment procedures and documentation, which is relevant if the outcomes of the assessment are documented. This is not only essential, it also aids the review process at a later date, allowing comparisons to be drawn.

The Person

- **This part of the assessment will include assessment of physiological and neurobehavioral factors, cognitive and psychological factors and spiritual factors.**

The following should be considered:

- **Medical, social background and history**
- **Goals/aims of the person**
- **Observation of presenting posture**
- **Current and past skin integrity issues**
- **Assessment of the neuromuscular system,** for example, identifying skeletal deformities, assessing joint range of motion (ROM), testing muscle strength and assessing sitting balance.
- **Cognitive skills and psychological factors** (this part of the assessment will look at independence, safety, quality of the individual's ability to undertake daily activities and the ability to move efficiently through the environment).



The clinician may encounter some difficulties when it comes to the home environment and keeping it accessible

The Environment

The accessibility of the physical environment needs to be reviewed by mapping out all the commonly used buildings, pathways and obstacles the person may encounter.

It is also important to get an idea of the socio-cultural background of the individual. Many people have a support system in place to assist them with activities of daily living (ADL's). It is important to understand an individual's support system and how it influences the successful outcomes.

The general process of the assessment is of course no different for a plus-size person. The clinician may encounter some difficulties when it comes to the home environment and keeping it accessible, but this will be covered later on in the booklet.

Assessing the body shape of a plus-size person is essential when it comes to equipment prescription as incorrect assessments and measurements may warrant equipment choices that are completely nonfunctional. It is also important to remember that every type of body shape will require different equipment and handling methods.

Weight & measurements

How to determine an accurate weight

Start by obtaining an accurate history of the individual, including a weight history to determine if there has been recent weight loss or gain.

Many will not know their current weight and the prospect of having to be weighed can be a very daunting and emotional experience. It's important to give the individual time, understanding and respect when weighing them and make sure that this is done in a private environment away from onlookers.

How to get accurate measurements

Measuring is essential. Always measure the individual when they are sitting on a firm surface. This may require the assistance of 2 to 3 people to do it safely and accurately.

Measuring someone on a soft surface is not recommended as the surface will accommodate the soft tissue, making the measurement more difficult and likely to be inaccurate. Try where possible to have the person sit on a height adjustable therapy mat or plinth, ensuring that their feet can touch the ground.

Hip width measurement

To obtain an accurate hip width measurement, it is useful to use something wide and firm against the lateral aspects of the greater trochanter in place of your hands. Many clinicians use transfer boards at the side of the hips for this purpose. It is important to take the seat depth from the most posterior point to behind the popliteal fossa.

It is not uncommon for a morbidly obese person to have a significantly larger lower leg circumference or oedema/ lymphoedema, which would functionally shorten the seat depth measurement. In these situations, it is recommended to measure from the posterior aspect of the pelvis tissue to the posterior aspect of the calf tissue at the seat edge.

i

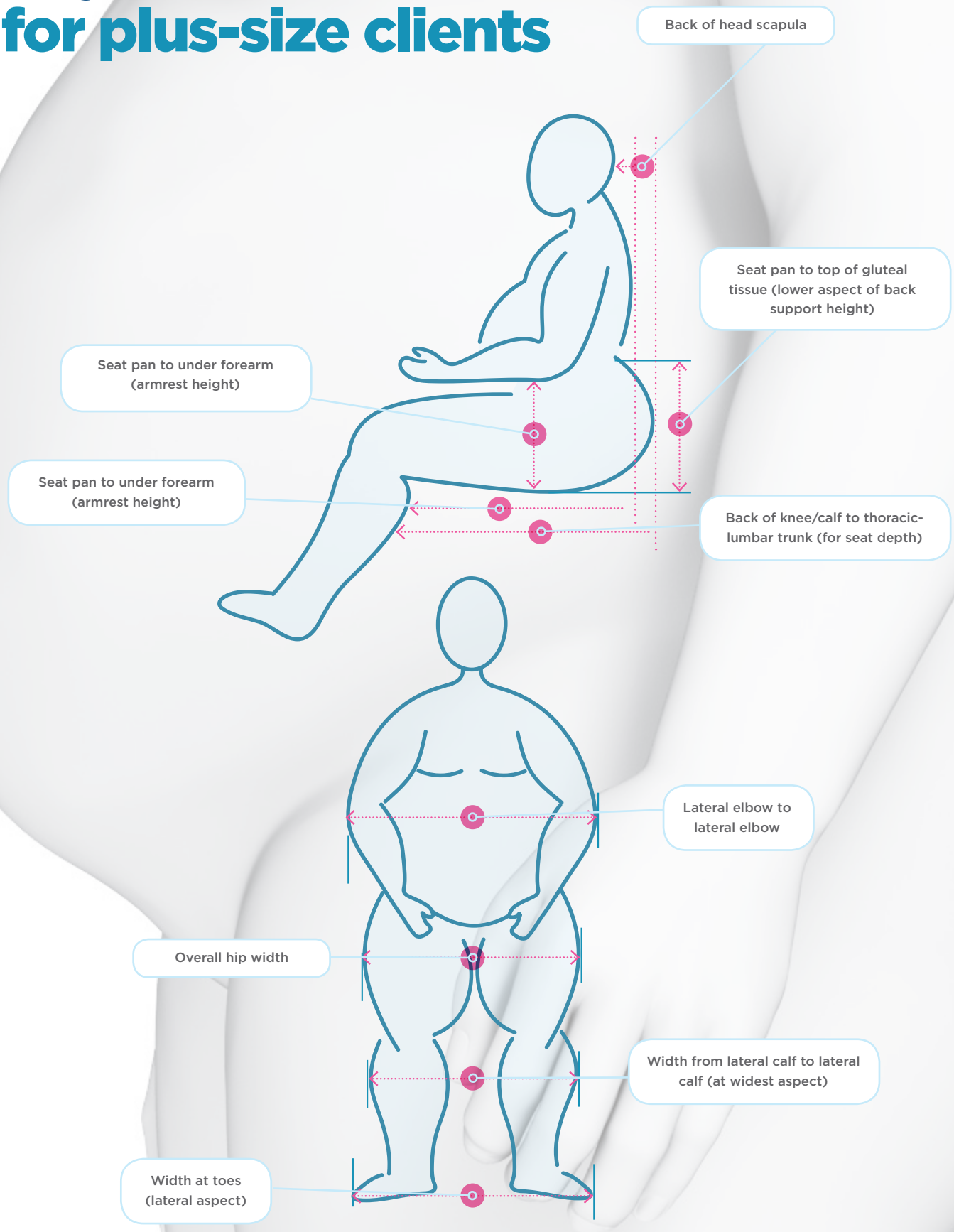
Gluteal tissue

To measure the depth of excess gluteal tissue, first measure from the popliteal fossa or from the posterior aspect of the calf tissue, if the person has a significantly large lower leg circumference, as mentioned above, to the most posterior aspect of the gluteal tissue.

Secondly, measure from the popliteal fossa or calf tissue to the most posterior aspect of the individual's back or (trunk) above the gluteal tissue, as this will provide guidance on what depth of seat is required. Measuring the height of the excess gluteal tissue is valuable when it comes to determining at what height to mount a back support on a wheelchair. However, it is worth bearing in mind the profile (height) of the cushion that will be used in conjunction with it.

ii

Key measurements for plus-size clients



Specific assessment considerations based **on body shape for wheelchair provision**

Apple (android) shape/ Apple ascites & Apple pannus

What defines an Apple shape?
Apple shapes carry their excess weight around their abdomen.

Common issues
This can cause anterior (forward) instability on a manual wheelchair, for example, or even on a mid or front wheel drive powerchair. Commonly, the mass of adipose tissue around the abdomen can affect sitting tolerance in relation to the back-support angle and, in some cases, causes sliding.

Recommendations
A chair with a reclining back support that allows the angle to be opened is an important consideration, not only for comfort, but also for respiration and other physiological functions. A reclining back support can also be useful for those individuals whose excess abdominal tissue exerts extra pressure on their femurs (thighs), causing their hips to abduct (fall outwards). For females, this can be unsightly and affect clothing choices. From a positioning perspective, it can make foot placement on the foot supports more challenging and can cause the outer aspect of the lower leg to come in to contact with the footrest hangers, leading to a risk of pressure build up and skin breakdown if left unchecked.

Transfers in/out of the chair can become difficult. Fitting full length arm support pads is an easy solution. Seat to ground height should also be checked to maximise independence.

In the case of apple pannus body shapes, large grade panniculi may need to be supported. It's imperative to pad all edges and sharp points of contact of the wheelchair to avoid any skin damage. Furthermore, if prescribing a tilting system, try to anticipate where gravity may displace tissue during the weight shift.

i

Pear Abducted/ Pear Adducted/ Pear Gynoid

What defines a Pear shape?
Pear shapes carry their excess weight below their waist. People with a pear shape tend to have excess tissue which is distributed more medially (towards the inside of the thigh), also known as pear abducted or more laterally (towards the outside of the thigh), referred to as pear adducted. A person who has a pear gynoid shape tends to have fat stored around the hip area.

Common issues
People with a pear shape tend to have hip abduction issues due to the excess tissue and they can find it difficult to place their feet on foot plates when in wheelchairs. Their lower limbs tend to make contact with wheelchair hangers, which can result in pressure build up and a risk of skin breakdown. When sitting down, if the chair width is too narrow, it can cause rubbing or marking of the skin and if arm supports are too wide apart, it can create pelvic obliquity and scoliosis. Pear shape people may also have difficulty going through doorways and into bathrooms.

Recommendations
Excessive tissue on the inside of the thighs prevents the individual from bringing their legs together, whilst excessive tissue on the outside of the thigh will likely mean a wider seat is needed. It's important to also consider the footplate position for those with excess medial tissue, whilst arm support position and trunk/back support width will likely be more of an issue for those with excess lateral tissue.

ii

Gluteal shelf

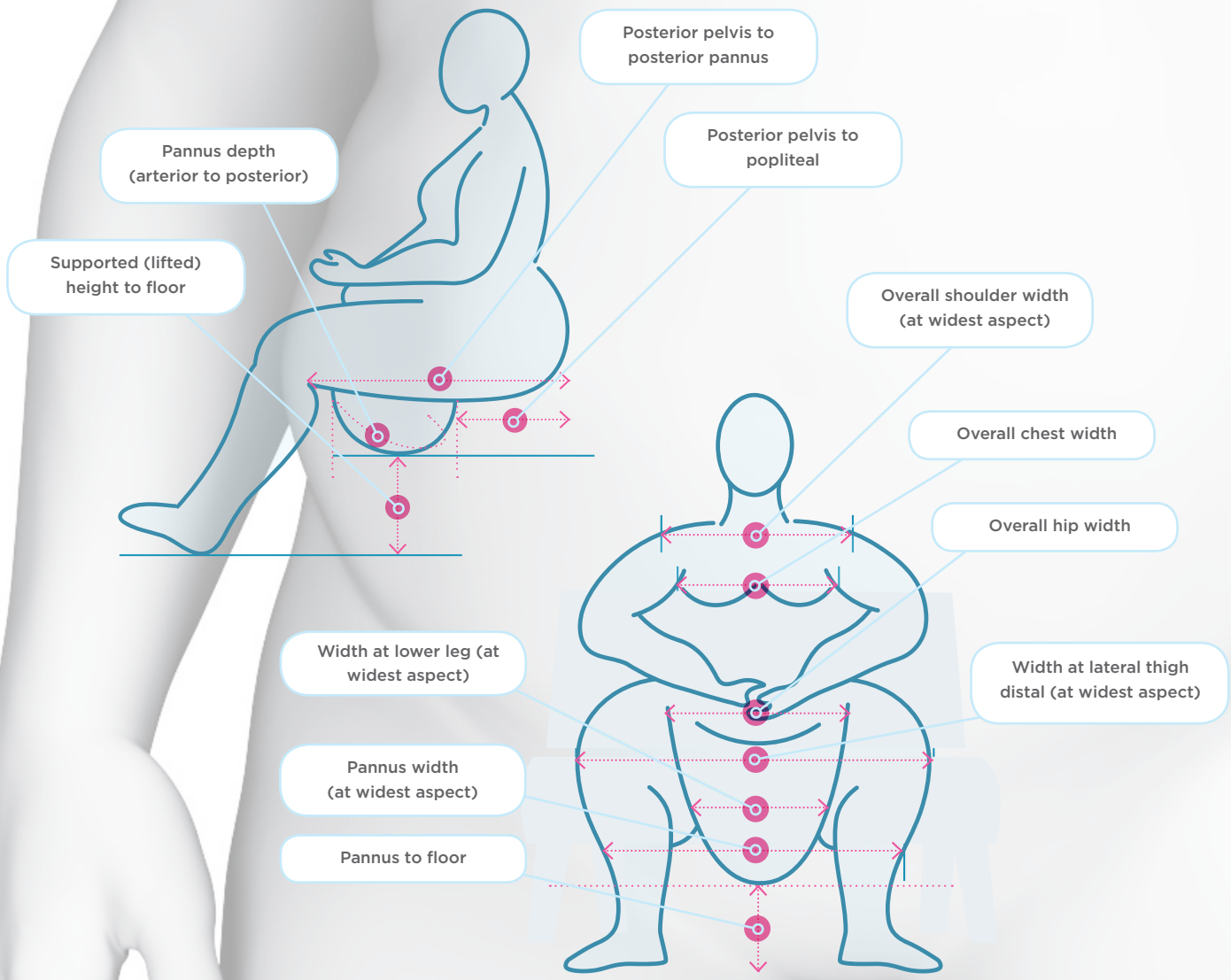
What defines a Gluteal shelf?
A person with a gluteal shelf tends to have excessive buttock tissue in the posterior lumbar region which creates a protruding shelf.

Common issues
Excessive gluteal tissue or a gluteal shelf can prevent the person from contacting the back support on a wheelchair. Often the posterior aspect of the gluteal tissue is in contact with the back support but the person's trunk is not. This lack of adequate spinal support can contribute to back pain and limit their sitting tolerance. The individual's centre of gravity will also be more forward in relation to the mobility base, increasing anterior instability and making manual propulsion difficult due to the distance the individual is sitting anterior to the rear wheels. Too much weight can also be placed on the front castors, which limits forward movement and turning, making manoeuvring the chair especially difficult.

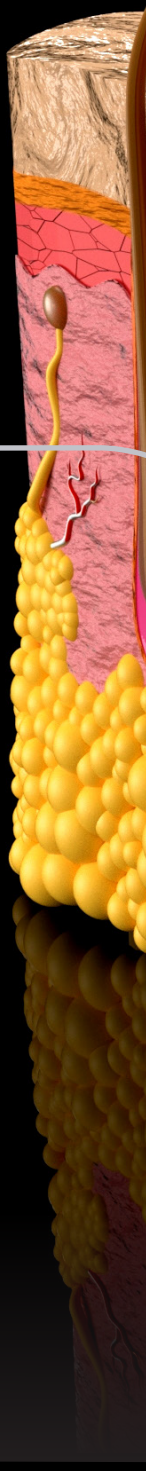
Recommendations
The key to maximising the performance of any manual wheelchair or powerchair is distribution of weight in relation to the chair's drive (propulsion) wheel. The individual's weight will affect the centre of gravity and the overall performance of the chair. An adjustable rear wheel position can help or moving the castors further forward, accommodating for the forward centre of gravity of the individual, will provide better mobility.

iii

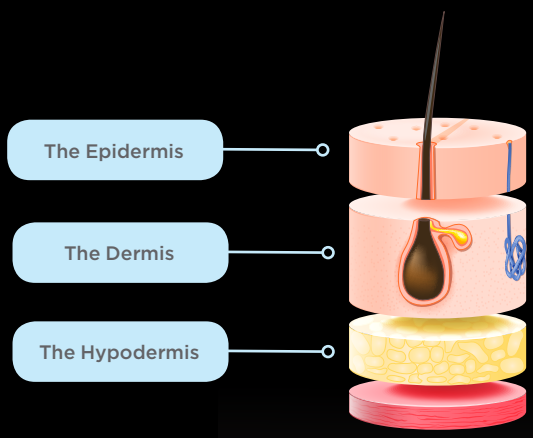
Panniculus Measurements



Pressure care and skin integrity



- The skin is the body's largest organ and is made up of three layers within which millions of cells work together to maintain the skin's integrity (i.e. keep the skin healthy and intact).



1. The epidermis

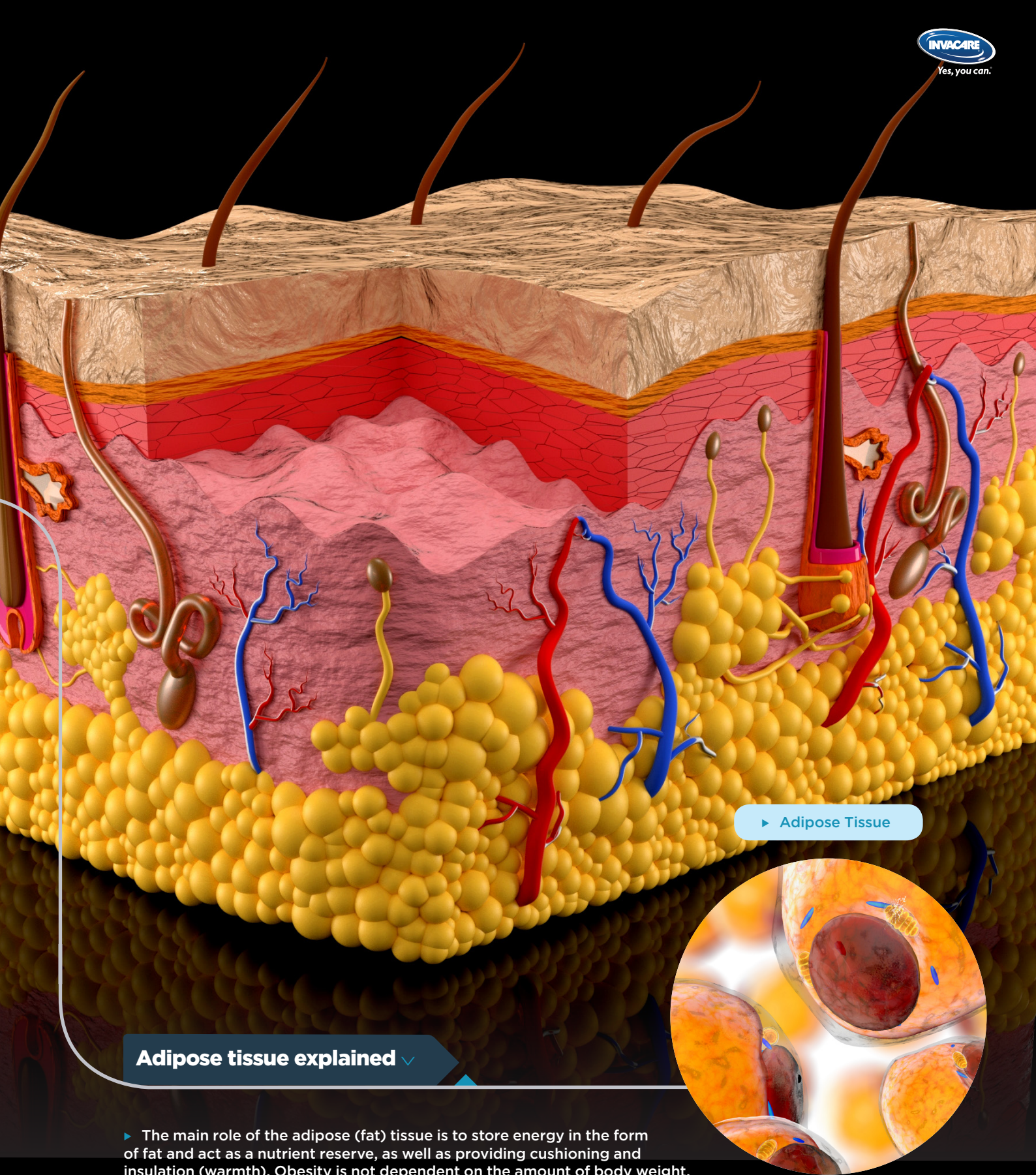
- The top or outermost layer of skin
- Provides a waterproof barrier and creates our skin tone

2. The dermis

- Located beneath the epidermis
- Contains tough connective tissue, hair follicles and sweat glands

3. The hypodermis

- Located deep beneath the other layers of skin
- Made of adipose (fat) tissue and connective tissue



▸ Adipose Tissue

Adipose tissue explained

▸ The main role of the adipose (fat) tissue is to store energy in the form of fat and act as a nutrient reserve, as well as providing cushioning and insulation (warmth). Obesity is not dependent on the amount of body weight, but on the amount of body fat (adipose tissue) that is present. Although primarily located beneath the skin, the adipose tissue can also be found around internal organs.

▸ Although commonly described as avascular (having a lack of blood vessels) a study by Markman and colleagues took a closer look at the anatomy and physiology of adipose tissue and found it is separated into lobules. Each lobule is made up of thousands of fat cells carrying large vessels and neurons. Plus-size people have a greater number of large vessels, which results in a reduced capillary density. This is due to the newly created fibrotic and rigid environment within the adipose tissue, restricting capillary proliferation. It is then down to the large vessels to deliver oxygen, which are not as efficient as the capillaries, leading to vascular insufficiencies.

Plus-size skin challenges

1. Difficulties reaching certain areas of the body:

- An example of this is excess skin around the abdomen, known as the pannus, or being able to clean oneself properly after toileting. Each can result in poor personal hygiene. Urine or faeces may be left on the skin and even if it's for a relatively short period of time, it can contribute to skin breakdown.

2. Circulation:

- This can be an issue for those who are plus-size as blood doesn't travel well through adipose tissue. In addition, these individuals are more at risk of diabetes, which is also known to cause poor circulation. Compromised circulation impairs the skin's ability to heal itself as oxygen, nutrients and minerals are not able reach the cells and tissue. These are essential for healing.

3. Friction (skin rubbing together):

- Friction between the thighs is extremely common. Friction can lead to skin breakdown and infection.

4. Skin folds

- Large, deep skin folds make it more difficult for plus-size individuals and their caregivers to assess and monitor changes in the skin.

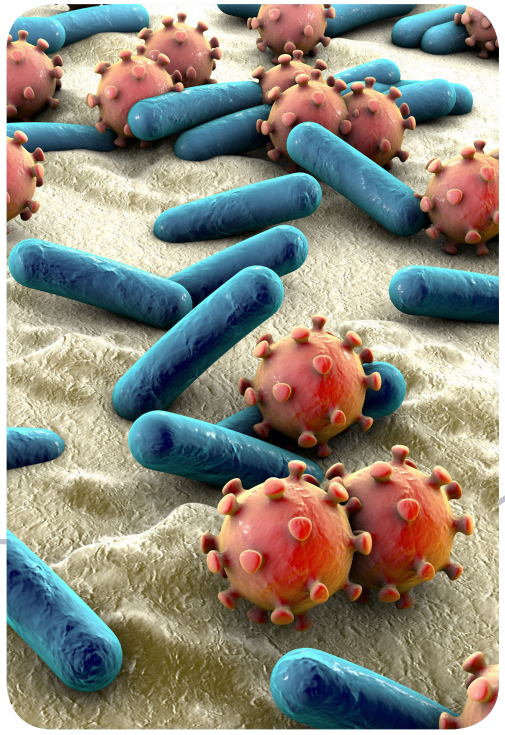
5. Physical immobility

- This is the main cause of skin injury as it can often lead to pressure ulcer formation. This is usually because of the inability to adequately turn or reposition the plus-size individual when lying down.

Skin infections

Skin infections in plus-size people can range on a spectrum from simple benign conditions to life threatening necrotising infections. Obesity increases the risk for skin infections due to:

- Excessive skin folds that trap humidity and moisture, inducing maceration and related microbial overgrowth
- Lymphatic flow is hindered, decreasing oxygenation of surrounding tissues
- Increased tension on wound edges may predispose to poor wound healing or actual dehiscence of a closed wound
- Skin pH tends to be higher, increasing risks for candida which thrive in alkaline environments



Common skin related problems

The following explains some of the skin related problems plus-size people may experience. Please note, this list is by no means exhaustive and further reading is recommended.

Pressure ulcers

According to the National Pressure Ulcer Advisory Panel (NPUAP), a pressure ulcer is defined as a localised injury to the skin and/or underlying tissue usually over a bony prominence, because of pressure, or pressure in combination with shear.

As well as developing in more common areas such as the buttocks, sacrum and heels, pressure ulcers in plus-size individuals also occur in uncommon areas and are referred to as atypical pressure ulcers. They are commonly found below a large pannus, but can occur anywhere on the body, including the neck, upper back, upper medial thigh, flanks and posterior legs/ankles. What may not be so evident is the development of an atypical pressure ulcer which is located deep within skin folds, which create pressure on each other. Thorough daily skin inspection is therefore critical.

Lack of repositioning

Tissue perfusion i.e. the ability of substances to move in/out of tissue is decreased for longer periods of time in those who are plus-size, as skin and tissue becomes subject to the pressure and weight of other tissue on it. This means that oxygen, nutrients and essential minerals are prevented from passing within the cells which can lead to eventual cell death.

An effective individual repositioning schedule should be undertaken to relieve pressure from vulnerable areas. It is also important that the position/location of intravenous lines, catheters and tubes are checked on a regular basis to prevent rubbing or pressure build up on the skin. Poorly sized beds and equipment can also cause skin integrity issues, therefore, it's essential that equipment meets the individual's weight and body shape requirement.

Poor nutrition

Poor nutrition is another risk factor for skin breakdown and pressure ulcer development. Plus-size individuals are frequently malnourished as their weight may be due to increased ingestion of high-density energy foods that are high in fat and sugars, and low in vitamins, minerals and other micronutrients.

Venous insufficiency

Venous insufficiency is a problem with the blood flow from the veins in the legs, back to the heart. Venous insufficiency can cause chronic wounds on the legs and can severely delay wound healing, increasing the risk for infection. Once venous function in the lower extremity is disrupted, fibrosis and clots occur in the capillaries, which subsequently decreases the diffusion of oxygen and nutrients needed to supply tissue and support wound healing. The 'gold standard' for treatment of lower limb venous insufficiency is compression via either garments or dressings. Elevation of the lower extremities also aids venous return.

Skin problems (continued)

Diabetic foot ulcers

It is estimated that diabetic foot ulcers occur in about 15% of people with diabetes. Foot ulcers and infections are one of the main reasons for diabetic patient admissions to hospital. Osteomyelitis, amputation or death can occur from a diabetic foot ulcer. Because of poor circulation and neuropathy in the feet, cuts or blisters can easily turn into ulcers that become infected and will not heal. This is a common—and serious—complication of diabetes and can lead to a loss of the foot, the leg or life. Osteomyelitis is the most common complication of diabetic foot ulcers and/or diabetic foot infections.

Irritant dermatitis

Perigenital irritant dermatitis, due to urinary and/or faecal incontinence, is another common problem. Despite the best of intentions, plus-size individuals may not be able to toilet effectively. Large skin folds, a pannus grade 3-5, or excess hip tissue may impede access for self-care. Urine or faeces left on the skin can contribute to skin breakdown.

Lymphoedema

Lymphoedema is caused by impaired flow of the lymphatic system. The lymphatic system is a network of specialised vessels (lymph vessels) throughout the body thats purpose is to collect excess lymph fluid with proteins, lipids and waste products from the tissues. This fluid is then carried to the lymph nodes where waste products are filtered and infection-fighting cells called lymphocytes are contained.

The excess fluid in the lymph vessels is eventually returned to the bloodstream. When the lymph vessels are blocked or unable to carry lymph fluid away from the tissues, localised swelling (lymphoedema) is the result. Treatment for lymphoedema should aim to reduce limb size, promote lymph drainage and prevent infection. Cellulitis and skin breakdown can be avoided by daily cleansing with mild soap and water, using compression socks/stockings or compression wraps and elevating the affected limb. It is always important to ask someone who presents with lymphoedema if they have been referred to a lymphoedema specialist as ongoing treatment will be required.

Intertrigo (Interiginous dermatitis)

Intertrigo is an infectious or noninfectious inflammatory condition of two opposed skin surfaces. The maceration of the skin due to excess moisture and friction can occur within deep skin folds, or more commonly, under a large abdominal pannus. This may progress to more intense inflammation with erosions, oozing, fissures, exudation, maceration, and crusting. These intertrigal fissures can be several inches in length and painful due to their depth. Risk factors for intertrigo, and especially its most common form candida (fungal) intertrigo, include obesity, hyperhidrosis (excessive sweating), diabetes, incontinence and certain medications

Necrotising fasciitis

Most commonly referred to as the flesh-eating disease, necrotising fasciitis is a severe disease with sudden onset that spreads rapidly.

Typically, the infection enters the body through a cut or break in the skin and people commonly complain of severe pain which may seem excessive given the external appearance of the skin. It can be classified into four categories and treatment is normally debridement (cutting away) of the skin. Prevention is possible through a skin care regime and regular handwashing. A person is more at risk of developing necrotising fasciitis if they are morbidly obese and suffer with type 2 diabetes.

Cellulitis

Cellulitis is a bacterial infection affecting the inner layers of the skin, namely the dermis and subcutaneous tissue. Typical signs and symptoms are an area that is red, hot and painful.

Diabetics are more susceptible to cellulitis than the general population because of impairment of the immune system; they are especially prone to cellulitis in the feet as the disease causes impairment of blood circulation in the legs, leading to diabetic foot or foot ulcers. Poor control of blood glucose levels allows bacteria to grow more rapidly in the affected tissue and facilitates rapid progression if the infection enters the bloodstream. Therapy for cellulitis involves good skin cleansing, possible topical antimicrobial therapy using advanced dressings for open wounds, and systemic antibiotic therapy.

Hygiene

"Hygiene is the science and practice of the establishment and maintenance of health".

Webster's Dictionary

Personal hygiene is one of the most basic, and most important, nursing care activities and includes oral care, the bathing process and incontinence management. When performed proactively with evidence-based protocols, it helps to prevent pneumonia, sacral pressure ulcers and other problems related to skin breakdown. Interestingly, however, a search of internet based guidelines, policies and protocols contain no explicit evidence relating to skin hygiene protocols and there was also a lack of validated assessment tools for the plus-size population.

Much of what is available is based on clinician made recommendations at local level, which includes regular observation for pressure ulcers (including those in atypical areas such as skin folds) and the need for regular positioning.

Skin hygiene

Plus-size people have an increased risk of changes to their skin. An altered epidermal barrier leads to increased water loss, which results in dryness of the skin (Guida et al, 2010); erythema is also more pronounced (Loffler et al, 2002). Erythema is superficial skin redness due to increased blood flow. If the skin is gently pressed, blanching occurs (whiteness under the skin) and the redness disappears, but once the pressure is released, the redness reappears. Changes in microvascular reactivity and even collagen formation can occur.

Plus-size people can have large skin folds and these areas offer a warm and moist environment which may lead to heat rashes, blocked and inflamed sweat glands (Rush and Muir, 2012) and an increase in bacteria (Pokorny, 2008). Consensus amongst skin hygiene practices recommend the skin must be kept clean and dry, however, there is little evidence about how to best achieve this. Keeping the area clean, using a mild soap with a low pH level, and dry is best practice in preventing skin damage in this region. Topical application of antifungal powder after washing or emollient cream to protect the skin from moisture damage may be recommended. Exposing the areas to air with careful repositioning can also help to reduce moisture build up.

As the prevalence of plus-size individuals increase, the requirement for assistance with their hygiene care rises. Coupled with the lack of evidence, there is a growing need for further research into this challenging area. Nurses and individuals need help, guidance and support to select the best possible interventions that will meet individual personal-hygiene needs and preserve skin integrity.

Involving individuals in their care

Personal hygiene can be a significant challenge for people who are morbidly obese and have lymphoedema, so getting them involved in devising strategies to maintain their own skin hygiene can help address issues related to personal hygiene, as well as incontinence. It can also help educate people and get them actively involved in their care. People are often reluctant to discuss issues such as the inability to perform self-care after toileting, incontinence, or accidental soiling of clothing/bandages or treatment equipment so an empathic, clinical approach to sensitive issues builds people's confidence. Therapists and healthcare professionals can problem solve challenging hygiene issues with their knowledge of assistive devices, adaptive equipment, and help educate people and their caregivers.

Oral hygiene

b

▸ **Obesity can change the pH of the skin but it can also change the pH level inside our mouth, which can cause inflammation and bacterial buildup.** Along with lifestyle risks (e.g. smoking, increased sugar intake, foods that are acidic, broken teeth, diabetes), lack of dental care and periodontal disease, certain medications can also increase the risk of poor oral hygiene.

Toileting

On average, people go to the toilet eight times a day. There are guidelines in place that recommend wider and higher toilet seats should be provided in bariatric care environments, with a minimum turning radius of 1.8 m to accommodate those who use a wheelchair.

A suitable toilet is essential to ensure the plus-size person can sit securely on the WC and are also in the right position over/on the seat and pan. Ideally, the person should sit with their back supported against the cistern and their torso and legs forming a 90° angle.

Their buttocks need to be supported but slightly parted to enable effective bowel evacuation. Excess tissue or body weight can often cause the person to be sat too far forward on the WC which will mean their bottom does not cover the seat opening. This can cause the individual to feel perched on the toilet and unstable, which could increase their risk of falling.

Support system

When toileting, it is common for people to use the basin for support when lowering or raising themselves. A separate support system should be in place for plus-size people as the basin may not withstand the downforce load. Strategically placed grab rails are one solution. Many suppliers offer heavy duty supports in their range that tend to have an aluminium core for additional strength along with an additional number of fixings for added security.

Weight loading

The toilet itself needs to be able to withstand the weight load of a plus-size person as well as the seat and brackets. Conventional WC's and most wash/dry toilets bear up to 127 kg where-as most bariatric aids will withstand up to 346.5 kg.

Toilet seat - dimensions

A bariatric seat tends to be deeper (60 mm) and wider (480 mm) compared to conventional toilets. There are seats that will safely support those up to 363 kg. There is also a bariatric (or monk's) bench that can be used which may be more comfortable.

Toilet lift

Bariatric toilet lifts are appropriate for those who can stand and walk unaided, or with minimal assistance, as they assist the individual to transfer on/off the toilet independently or with little or no assistance. The lift is fitted over the existing WC and replicates the natural movement of standing and sitting whilst keeping the individuals feet firmly on the floor. This helps the person to maintain their centre of gravity and balance.

Toilet frame surrounds

There are many options available including a padded standard toilet or horse-shoe seat, which is mounted on a steel frame and is positioned over the top of the toilet. There are versions available with armrests for added support that can bear up to 349 kg.

Shower chair/commode

A shower chair/commode has an appropriately-positioned opening in the padded seat to enable access to the toilet pan without the person having to transfer on to the toilet from the chair. This can be a much safer option, especially in smaller environments, and helps reduce the number of transfers required. Bariatric versions of these are available.

Wash and dry automatic shower toilet

A wash and dry toilet eliminates the need for comprehensive intimate care as it combines a toilet, bidet and drier in one. The toilet cleans and dries the individual after use, removing the need for manual cleansing with toilet tissue. Cleaning with toilet tissue requires manual, mental and physical dexterity, as well as, flexibility and balance. It requires intimate hand: body contact, either by the person themselves or their carer. Cleaning with a shower only requires the ability to sit in the right place and trigger a mechanism, which is usually a small paddle like button situated behind the individual's elbow, that they can easily operate.

Showering

Bariatric shower/commode chairs are like a standard shower/commode chair, but the frame is made with wider diameter tubing that provides extra strength. The castors are also more robust as the weight tends to be distributed towards the front of the chair. The footplates can be removed or flipped up to assist with transfers.

For the morbidly obese, a well-proportioned shower cubicle or wet floor shower area is the most ideal. A heavy-duty level access tray, with a slip-resistant surface, will suit both ambulant people and those in a chair. Wall-mounted shower chairs are available in bariatric sizes, however, please remember that the weight the shower chair can support will depend on the quality of the fixings and the wall it is attached to, as well as the chair itself.

d

Bariatric shower trolley

ii

For those with severely limited mobility, the base on a bariatric shower trolley is high enough to accommodate a mobile hoist, which is ideal if the person needs to be transferred from their bed to the trolley using a sling and hoist system. Waterproof padded cushions on the trolley form a comfortable base and sides. The sides also drop-down level with the base when doing a transfer. This type of trolley is suitable for wound care as well as washing.

Bathing

e

To support plus-size people when bathing, there are bariatric bath boards and steps available, which come in various heights. This enables the person to bath independently by stepping in/out of the bath. Most bath boards are made from smooth reinforced plastic, with stainless steel fittings. Adjustable brackets with a serrated face and rubber buffers help secure the board in place, while rubber pads under the slats help prevent the bath board slipping on the rim of the bath. It's important to check the maximum user weight on all products.

For individuals who don't have enough mobility in their hips and knees to lift their legs into the bath, either a walk-in tub or a bath with a powered lifter can enable them to continue enjoying the pleasure and therapeutic benefits of a soak in hot water.

Transport and mobility

Plus-size people have physiological, mechanical and metabolic differences from non-plus-size people, and this can adversely affect nearly every organ in the body and produce secondary illnesses that may be life threatening. Severely obese people are approximately six times more likely to develop heart disease and 10 times more likely to develop diabetes and kidney failure than non plus-size people.

Weight bearing issues

Many plus-size people are unable to engage in weight-bearing activities (involving actions in which the legs and feet are supporting the weight of the body). These exercises build bone mass in young people, which is maintained in adulthood. If there is insufficient weight-bearing activity taking place, the bone mass diminishes and osteoporosis can develop. Given this difficulty, questions present themselves as to whether obesity can cause immobility. Immobility can be defined as the result of any disease or disability that requires complete bed rest or causes extreme limitations of activities.

Loss of muscle mass

For those who are morbidly obese, even a low level of effort can become difficult and so people tend to move less as time goes on.

With less movement comes more weight gain, which further increases the impact on their bodies. At the same time, inactivity leads to a loss of muscle mass, so movement becomes even harder. Loss of lean muscle mass in plus-size people is a concern as it is not unusual for severely obese people who are normally mobile, to spend a few days in a hospital bed and then are not able to stand. Offloading-atrophy is a serious complication and can cause extended immobility in people who are severely obese. Specialist equipment then becomes essential.

Mobility can be further impacted by issues with breathing and respiration. Plus-size individuals suffer from decreased lung capacity due to the amount of adipose tissue within the body. This causes the lungs to reduce in size, putting an increased demand on the body for oxygen during episodes of physical activity.

Osteoarthritis

Without question, carrying extra weight compromises mobility as additional pounds make movement more difficult and sometimes uncomfortable.

Plus-size people often have back and knee pain and are prone to developing arthrosis, also known as osteoarthritis (OA). The main cause of OA is mechanical stress on the articular surface of the cartilage, where the cartilaginous tissue cannot withstand this stress. In cases with people who are plus-size, carrying extra weight causes stress on the joints as the cartilage can break down causing pain, swelling and problems moving the joint. As it worsens over time, the bone may break down and develop growths called spurs. Fragments of bone or cartilage may also chip off and float around in the joint and in the final stages of OA, the cartilage wears away leaving bone rubbing against bone, which can lead to joint damage and pain.

Assisted living

The long-term effects of immobility and of plus-size related conditions, such as high blood pressure, diabetes, heart disease and osteoarthritis on the body, **lead to a decline in the ability to perform** daily living activities and to be independent.

As individuals become less able to care for themselves, they may need to be admitted to an assisted living centre or a nursing home to ensure their care needs are met. With the global escalation in obesity, healthcare facilities have a duty to ensure they are prepared to manage and treat those who are plus-sized. Safely transporting and mobilising plus-size individuals in a manner that respects the individual's dignity and care needs, whilst at the same time ensuring the safety of those working with this group of people, is essential. This is accomplished when healthcare facilities have a plan in place that supports plus-size safe patient handling and mobility to optimise individual outcomes, reduce the risk of caregiver injury and promote a size-sensitive culture.

Equipment

Suitable plus-size equipment is essential. There are many details that need to be taken into consideration, such as the weight of the person, their body proportions, physical dimensions, range of movement, mobility and transfers. It is not just about making equipment bigger and increasing the maximum user weight or safe working load, more manufacturers need to place emphasis on the fit of the equipment. A lack of suitable plus-size seating is a major problem as it can result in a person spending significant amounts of time in bed. Many plus-size individuals, however, can only tolerate lying flat for short periods due to respiratory related issues and for some, excessive skin folds around the neck can pose a risk of suffocation. Many therefore, resort to sleeping in armchairs to try to achieve a more upright position, however, this can lead to issues with skin integrity as traditional armchairs provide no skin protection.

Walkers

Walkers vary considerably both in width and weight capacity and it is important to note if the wheels only move in one direction. Door widths within the home and community must accommodate the width of the walker as well as space for the caregiver if they are walking beside the individual. Specially designed walkers are available to accommodate the unique needs of the plus-size person. E.g. For a person with a large abdominal pannus, there is a walker available that supports the pannus. If the pannus isn't supported, it would displace the person's centre of gravity, which would put them at risk of falling.

Wheelchairs

When it comes to plus-size wheelchairs, one size does not fit all! The width of the wheelchair should closely match the width of the individual without causing pressure points. A wheelchair that is too narrow could lead to skin injury, such as bilateral pressure ulcers over the hips. A wheelchair should also not be too wide for a person. The seat depth, weight capacity and positioning on the foot plates also need to be considered to ensure correct functionality.

Removable arm supports are also helpful, especially for transfer purposes and if the wheelchair is manually operated, consider the use of a power add-ons. Please bear in mind that this could add additional length to the wheelchair, increasing its overall footprint which may affect access both within the home or within the community. Powerchairs may require at least a 6-foot turning radius and scooters may also require additional front-to-back clearance.

Equipment (continued)

Portable floor based lifts or mobile lifts

▶ Floor-based lifts can be 685 to 1016 mm wide and 1371 to 1828 mm long. Additional space may be required if the legs on the lifter need to be fully spread for stability. As compared to ceiling lifts, these lifts take up a lot of storage space and need extra floor space/room when moving a person due to their expanded capacity. When it comes to safe patient handling, please note that limiting the number of turns and manoeuvres that carers are to perform is essential, therefore, a ceiling lift is always preferred rather than a portable floor-based lift due to the potential for push/pull injuries (Marras, 2014). If the lift is to be used to assist people in the bathroom, ensure that the lift will fit into the bathroom, it will accommodate sharp corners, that thresholds between doorways have been removed or lowered and that the castors of the lift are designed for smooth movements across floor surfaces.

Gantry lifts

▶ A gantry lift is similar to an overhead lift; however, it is portable and can be moved from room to room (not with the person in situ). This type of lift is placed over the bed of an individual and functions similarly to an overhead/ceiling lift, allowing easier transfers. Please note, a risk assessment should always be carried out and although a gantry lift may be easier than a portable floor based lift or mobile lift, the number of carers involved may still be the same dependent upon the individual's needs/weight.

Ceiling or wall-mounted lifts

▶ **Permanently installed lifts require fewer personnel and less space than floor-based lifts**

Overhead lifts can be mounted using ceiling attachments or wall attachments, depending on the building structure and design of the room. Ceilings in all areas where patient handling occurs should be at least 2.4 m high. Ideally, 2.7 m ceilings are recommended to accommodate ceiling lifts. Low ceilings may interfere with the ability to handle, lift, or mobilise the individual safely. If ceilings in the bathroom are lower than the bedroom, the lift system in the bedroom may have to be lowered to create a direct connection between bedroom and bathroom.

Ceiling lift coverage must be designed to allow access to any point where a plus-size person goes, including transferring from their bed into a chair or stretcher, into the bathroom, into the seating area, as well as an entry or door. Room-covering systems are necessary for plus-size people as they allow them to be handled anywhere in the room with a 360° rotation. These lifts also allow more flexibility and easier positioning in the bed or the bathroom.

Public transport

▶ **For those individuals who are still mobile and use public transport, this can also be a challenge because of the average size of the seats on trains and buses, for example. This isn't mentioning the problems experienced when it comes to those wanting to fly.**

Standard airplane seats are not designed for the plus-size person and many need two seats to meet their hip widths and for comfort. This raises problems with the airline and cost. Also, worth mentioning is furniture within waiting rooms at the doctor's surgery or the dentist chair – for those who are plus-size, day-to-day life can become a huge challenge.

Ambulance transport

Due to the increase in plus-size numbers worldwide and the high number of health-related issues they experience, admission to acute hospital care facilities is on the rise. Ambulance crews and paramedics are also faced with the challenges posed by the plus-size population, especially transportation from homes to hospital facilities. When people are extremely large, many staff might be required to lift and transport them to the ambulance, and in extreme cases, fire-fighters may be required to remove doors and widen walls within the person's house. Ambulance crews also experience difficulties when trying to move a larger person from their house using a standard backboard, as the person may not fit on the board and exceed the safe working load. This makes it difficult for the crew to carry and manoeuvre people whilst retaining their grasp of the board. Alternatively, the board may bend or break.

It is also important to note that the person must be lifted from ground level up to waist height and this requires significant upper body strength. Some morbidly obese people cannot tolerate lying flat for more than 10 minutes, whilst some cannot tolerate it at all because of breathing difficulties, which precludes this method of moving a person. Ambulance crews generally consist of two persons, but this is inappropriate for transporting or mobilising plus-size people.

Regularly, air ambulance is the preferred means of transporting some plus-size people to hospital when time matters, especially when dealing with trauma, heart attack or stroke (CVA). Depending on the helicopter, its configuration, time of year, fuel load, distances to be travelled, and crew size, etc., many plus-size people are too heavy to be transported by air and the journey must be made by traditional ambulance via road.

Home adaptations

The physical environment plays a critical role in the pathway of care for the plus-size person, not only inside the house but also outside. There are a lot of obstacles to overcome and take into consideration, but existing research into room designs in a plus-size care environment can help understand the different considerations to keep in mind.

a Outdoor

It is recommended for plus-size people to have their living environment on street level or on the ground floor. This will allow easier access into and out of the house and it will also have a more supportive floor. A 3x3 m room with a solid concrete floor can take approximately 2000 kg. Other levels of a building (e.g. an apartment) will take less weight because of the construction. It is important to keep in mind that medical aids for plus-size people are bigger, stronger and for that reason, heavier. Adding some furniture in the room will take it quickly over the 1000 kg (Rush and Cookson, 2011).

The outdoor space of the living environment should ideally be as flat and accessible as possible with limited obstacles, to make the transfer for the individual from their home to a transportation device as easy as possible.

Things to consider in the physical environment that can influence the accessibility and mobility of a plus-size individual are:

- **Manoeuvrability in small spaces**
- **Potential obstacles**
- **Doorway and small entrance access**
- **Ascending and descending obstacles: up and down kerbs or pavements**
- **Inclines and declines**
- **Side slopes**
- **Different terrains: grass, loose stones etc**

By adding ramps or grab bars in the outdoor environment (if possible) can help overcome obstacles.

b Indoor

The minimal size of a single room should be at least 16.61 m² according to a functional space experiment run by Loughborough University. Other studies state the room should be at least 3.1 m x 3.7 m. The Bariatric Room Design Advisory Board concluded that the optimal width should be 4.27 m and the depth be 4.57 m.

These are only experiments done to find out the minimal functional space for a room and are merely indications. They do not support normal daily activities for the family, storage space or room to accommodate special hygiene requirements.

For an individual in a home environment, it will not always be possible to create the ideal dimensions so choices and compromises will have to be made to keep it safe and liveable.

Other guidelines for space planning are available through many organisations, such as American Institute of Architects (AIA) and the Bariatric Room Design Advisory Board.

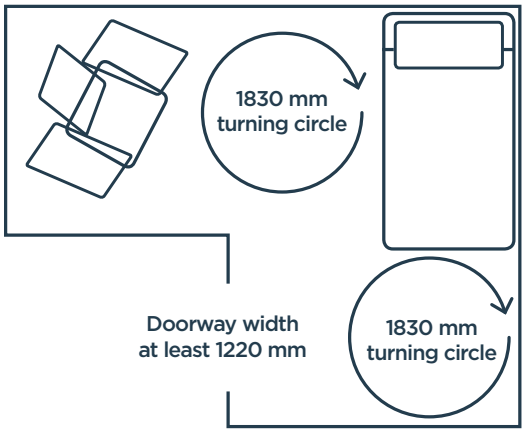
▶ Doorways in general are recommended to be at least 1220 mm wide and if the individual uses a wheelchair, a turning circle of 1830 mm should be considered.

Recommendations for door/corridor widths vary, however, studies emphasise the importance of including the individual when choosing equipment (bed, wheelchair or walker) along with the caregiver/family member to understand the total width required for clearance. (Andrade, 2004; Barista, 2005; Hoover & Smidth, 2005; Tizer, 2007; Collignon, 2008; Muir, 2009). It is important that the weight of every device or adaptation that is brought into the house or room is checked to make sure the flooring can take the extra weight.

c

Bedroom

A bed adapted to a plus-size individual can exceed 1200 mm with some beds expanding to 1500 mm when side rails are in place. The width of the bed is a key point to consider when setting up a bedroom, as well as its maximum user weight, to make sure it is suitable. A key recommendation is to ensure there is sufficient space between the bed and any other obstacles, as during falls, there is a risk the individual will hit or try to grab hold of something if objects are too close together.



Additional considerations for the bedroom

Manoeuvrability

Attention needs to be paid to movement and manoeuvrability, not only for the individual but also for the care team or family members, so they can safely and ergonomically assist the person. If the individual uses a wheelchair, the turning radius of the chair can be up to 1830 mm, whilst a walking frame will take up less space.

Access

Storage and easy access of medical aids in the room will also require space. This can leave room for extra furniture very limited.

Independence

To increase independence for the individual, small aids like grab bars and non-slip floors can make a big difference and keep the person mobile for as long as possible.

Support with transfers

Getting in and out of bed is a challenging task when carrying extra weight, so there are specialised bariatric beds available with electrical functions to support the individual when transferring in and out of bed. If doing a transfer independently is not possible, a lifter can help the caregiver or family members.

Ideally a ceiling lift could be installed giving the caregiver access to all sides of the individual whilst being lifted. It can also reduce caregiver injuries by up to 60% (Collins et al., 2006). If this type of installation is too costly or not possible, a mobile hoist is an option.

d

Seating

When choosing bariatric seating furniture, the following general guidelines should be considered:

- Steel reinforcement depending on the person's weight and the maximum user weight of the chair
- A seat width that fits the individual
- The seat height should not be too low to enable people to easily get out of the chair
- The height should not be too high otherwise it will be difficult for the individual to get onto the seat
- Armrests, with something to grab on to at the front of the armrest to help the person to get up - this construction should also be strong enough to hold the weight
- The seat angle can be 1° forward to assist the individual when getting up
- The seat itself should be firm

e

Bathroom

Doorways

It goes without saying that the route to the bathroom should be easily accessible with wide doorways and hallways. Sliding doors or two swinging doors can be installed but there must be at least 2740 mm of opening, however, this does provide more wall space. In a home environment, this adaptation is not always possible.

If a mobile lift is being used in the bathroom, there needs to be enough room for the mobile lift and the caregiver(s) to pass into the room. If space is too limited for a mobile lifter, there is the option to transfer the person to a shower commode chair.

Toilet

The toilet and sink should be mounted to the floor instead of hanging on the wall due to weight limits.

The toilet seat should be larger than a regular-sized toilet seat and have the capacity to take the additional weight. It is also important that the toilet isn't placed directly against the wall, to give the individual room to sit as comfortable as possible. If someone is assisting, there should be additional room for that person(s) to help with the transfer. Lastly, make sure that everything needed when on the toilet is within reach.

Shower

For the plus-size person, a shower is recommended rather than a bath for safety and hygienic reasons.

The size of the shower will have to accommodate manoeuvring and handling and requires less energy than a bath. If the individual has no mobility, other medical aids are available, such as a shower commode, however, this will take up extra space.

It is also advised not to enclose the shower between walls and some people may prefer to opt for a wet room instead.

The use of a long hand-held shower nozzle will help to reach certain areas of the body when showering, plus grab bars in the shower itself are very important as a fall is more likely to occur on wet floors.

Manoeuvrability

In the bathroom, open space is required for turning and manoeuvring, with or without aids, to keep the environment safe and comfortable.

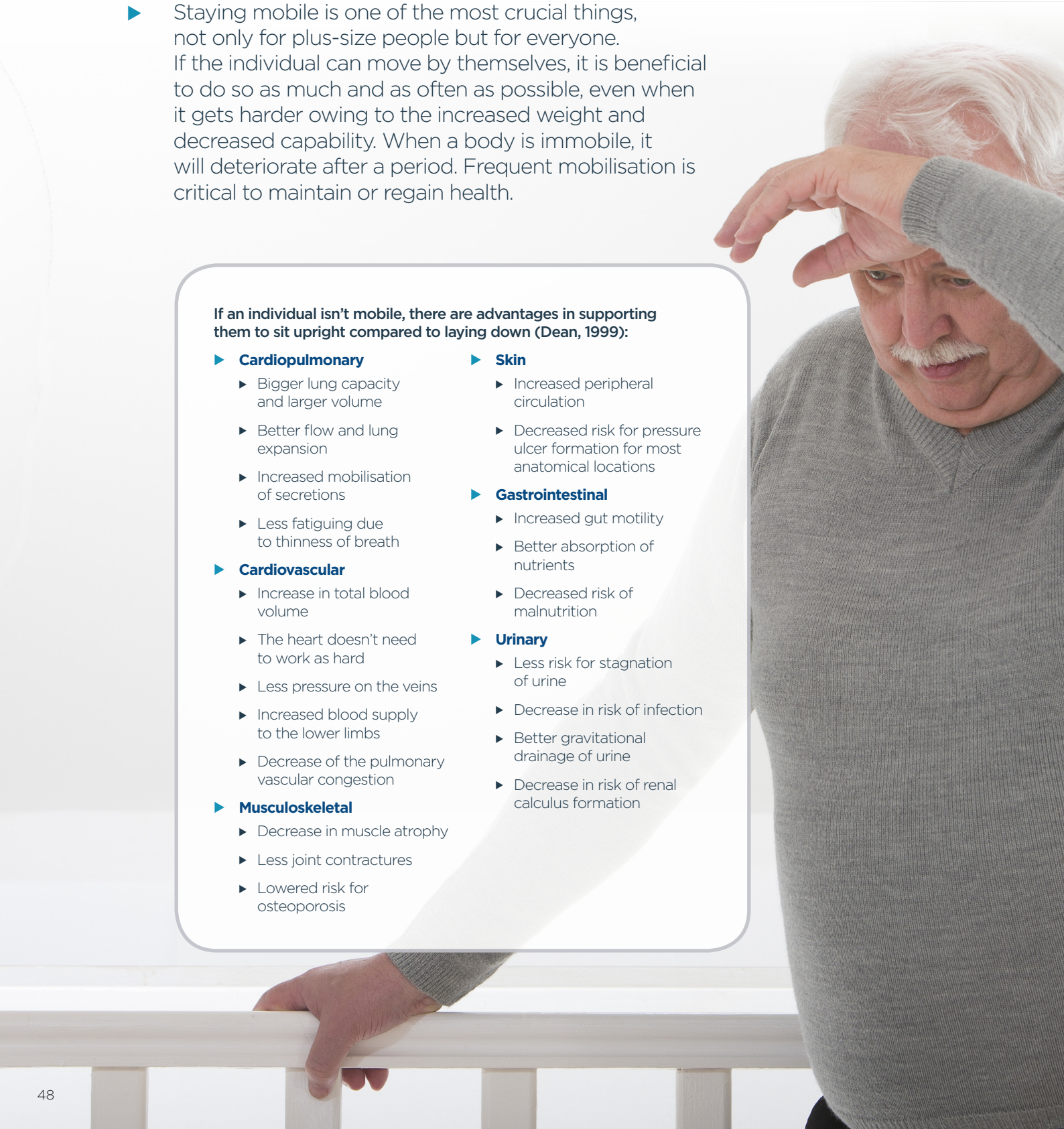
To increase independence for the individual, small aids like grab bars and non-slip floors can make a big difference and help keep the person mobile for as long as possible

Transfers and safe patient handling

- Staying mobile is one of the most crucial things, not only for plus-size people but for everyone. If the individual can move by themselves, it is beneficial to do so as much and as often as possible, even when it gets harder owing to the increased weight and decreased capability. When a body is immobile, it will deteriorate after a period. Frequent mobilisation is critical to maintain or regain health.

If an individual isn't mobile, there are advantages in supporting them to sit upright compared to laying down (Dean, 1999):

- **Cardiopulmonary**
  - Bigger lung capacity and larger volume
  - Better flow and lung expansion
  - Increased mobilisation of secretions
  - Less fatiguing due to thinness of breath
- **Cardiovascular**
  - Increase in total blood volume
  - The heart doesn't need to work as hard
  - Less pressure on the veins
  - Increased blood supply to the lower limbs
  - Decrease of the pulmonary vascular congestion
- **Musculoskeletal**
  - Decrease in muscle atrophy
  - Less joint contractures
  - Lowered risk for osteoporosis
- **Skin**
  - Increased peripheral circulation
  - Decreased risk for pressure ulcer formation for most anatomical locations
- **Gastrointestinal**
  - Increased gut motility
  - Better absorption of nutrients
  - Decreased risk of malnutrition
- **Urinary**
  - Less risk for stagnation of urine
  - Decrease in risk of infection
  - Better gravitational drainage of urine
  - Decrease in risk of renal calculus formation



a Medical conditions to consider during transfers

Some of the most common conditions of plus-size people when transferring/handling them are as follows:

- **Severe pain and discomfort:** Pain and inability to assist with transfer, therefore increased dependency level. Moving the individual can increase pain and impede their ability to assist safely with the transfer.
- **Hip and knee replacements/ joint instability/unstable spine/ fractures/contractures/spasms:** Pain, fall risk, increased injury, extending injury to the already affected joint, ligaments or bone. Weight-bearing transfers for plus-size people with these medical conditions put them at a risk of a fall or could extend the injury to the already affected joint, ligaments or bone. If moving them in a lifting device, the sling position and posture required could put pressure on the affected body parts, increasing pain and strain. Choose the least stressful way to transfer the individual, taking into consideration the body part or area that is affected.
- **Wounds/diaphoresis/poor skin integrity:** Interference in healing granulation or increased skin breakdown through shearing, rubbing, abrading and pressure from equipment (i.e. slings) during transfers.
- **Postural hypotension/ paralysis/paresis:** Fall risk, slip through sling, unsupported limb may be bumped, struck or caught. Individuals are at risk of falls and slips during transfers, so full support (supine) slings would be required to avoid falls and slippage.
- **Unstable spine/severe osteoporosis:** Pain and injury could occur if the individual is not correctly supported during transfers.
- **Splint traction/fractures:** If they are not properly supported, it could result in misalignment and extension of injury, impedance of healing and pain.
- **Respiratory/cardiac compromised:** Shoulder compression and respiratory distress. Transferring a person in a flat lying position or in a sling that compresses the shoulders and chest can cause respiratory distress. Angina or chest pain from coronary insufficiency can result if a person is required to move themselves more than they are physically capable of.

b Transfer equipment

- **When moving independently becomes difficult, medical aids can help, such as a walker, a hoist, an electric profiling bed or other aids.** The advantage of an aid is that it gives independency to the person for as long as possible or can help keep the number of caregivers to a minimum. When working with medical aids, it is very important to read the manual first and follow the instructions from the manufacturer.

There is a common misconception that plus-size people can be accommodated by simply asking for equipment designed for a "large size" with most of the attention focusing on a bed and lifter. There are, however, many aspects related to equipment that need to be considered. Choosing the right medical aid to help with transfers is not just a matter of having the correct measurement and weight capacity, for example, the different body shapes will require a different sling solution. The slings available for plus-size people are designed to accommodate the different needs (universal, bathing, toileting) and physical capabilities of the individual.

When the person needs to be transferred with the aid of a hoist, make sure the hoist and sling are suitable for the person's body shape and weight. Look at the safe working load of the hoist and sling and think about a very wide leg opening for stability. A risk assessment must consider the functionality and compatibility of the sling and hoist, with other equipment being used as part of the active or passive transfer.

c

Transferring with a hoist and sling

When using a hoist and sling, it is important to do a risk assessment and make sure the equipment meets the functional and comfortable needs of the task in hand and the individual. The choice should also look for compatibility with other equipment that is used. A key factor in the assessment is the physical and cognitive ability of the individual to follow instructions to assist in the transfer. The risk assessment will also determine the number of caregivers, the type of equipment and the techniques for each task.

To transfer the individual, specific guidelines must be adhered to and training is a must. The training should include the use of the equipment, which is integrated into the policies and procedures of the individual facility and is also available for home environments.

d

Other hoist options

If there is the possibility to install/use an overhead tracking hoist, there are fewer environmental risks as there will be more space and fewer obstructions.

Also, the health risks for the caregiver will be reduced as the ceiling hoist is easier to manoeuvre as it can be integrated in the structure of the building or free-standing with a pillar mounted system. The installation of the overhead hoist, however, has financial consequences.

A mobile hoist is another option, however, it is not designed to move an individual from one point to another but rather to raise them up and down.

Some of the safety precautions to consider when using a mobile hoist are:

- The safe working load of the hoist
- The safe working load of the sling
- The type of sling needs to fulfill the needs determined in the assessment: seated position, supine, head support etc.
- The type of transfer, for example, bed to toilet
- The type of spreader bar needs to ensure that there is a safe distance from the bar itself and the individual's face during transfer
- The width of the spreader bar needs to fit the sling
- Is there enough space to move the hoist: height of the hoist and the turning circle, other obstructions or equipment in the room?
- Keep the transport distance as small as possible
- In a home environment when using a standard bed, the bed may need to be lifted to be able to allow clearance for the hoist legs
- Leave the brakes of the hoist off during transfer to allow the hoist to take the weight of the individual without it tipping over

Tips when transferring a person

1. Check the weight capacity of all equipment
2. Clear the environment where the transfer needs to take place: remove chairs, tables or other equipment to create a safe environment
3. Adjust the equipment to the right height: generally, at waist height of the caregiver
4. The weight of the person will determine how many people need to assist the transfer
5. Depending on the choice of equipment, the individual can be transferred with a hoist from supine or in a seated position
6. Use the natural curvatures of the individual to insert the sling
7. Shear and friction should be kept to a minimum when applying a sling

e Independent sitting transfers

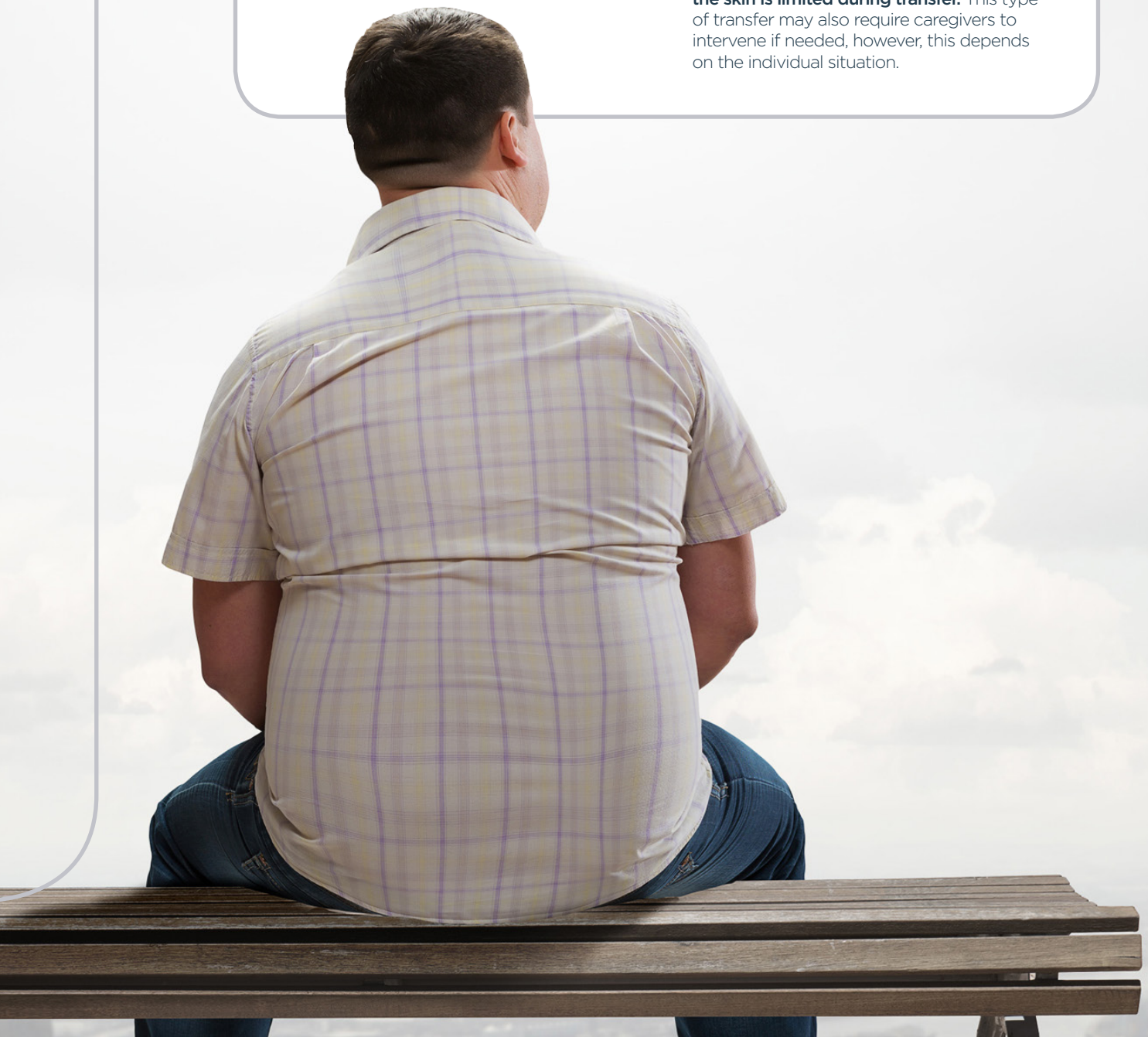
For somebody to move independently from one seated position to another (i.e. wheelchair to toilet seat) requires the following skills (Alexander, 2005; Nelson et al., 2009):

- **Postural balance to sit**
- **Hip and knee flexion beyond 90°**
- **Lean forward beyond the centre of gravity**
- **Extend the body against the gravitational forces**

These skills may be difficult for a plus-size person so their postural balance needs to be assessed before transferring to ensure they have sufficient balance. The use of a transfer board can help with this transfer; however, it is important that the person feels safe and the movement is comfortable.

Other points to consider are:

- **The position of the two seating surfaces. When positioned side by side, the wheelchair armrests, for example, will need to be removed to do the transfer and the weight will need to be shifted forward to lift and slide to the side.** This can give an unsafe feeling as there is nothing to hold on to in the front, therefore, some people prefer both seating surfaces facing towards each other, so they can hold on to the other seat whilst transferring. Both positions require enough space for the person to shift their weight to the front. This will have implications, for example, on the space in the bathroom or the room around the toilet.
- **As for every transfer with a plus-size person, extra care is needed to ensure the pressure on the knees is not too high, the blood circulation is secure and damage to the skin is limited during transfer.** This type of transfer may also require caregivers to intervene if needed, however, this depends on the individual situation.



f

Independent sitting transfers

The suitability of a bed with electrical functions will depend on the capabilities of the individual: sitting balance, upper body strength, head and neck control and the ability to flex the body when going from sit to lay. Choosing the correct bed is important and the bed dimensions itself should also accommodate repositioning. The mattress used on the bed will influence the movement of the individual or their ability to move.

The backrest can help in certain cases to lift or hold the weight of the individual during a transfer. The bed height, if the transfer is done independently, should be on a height that the persons feet are on the floor when seated. To stimulate the independence of the individual, a leg riser can be helpful.

The ability to get in and out of the bed independently depends on the body shape, weight distribution and the capabilities of the individual. Some people use their lower body weight as a pendulum to swing to a seated position from a lying position. It is important to assess the individual situation and, above all, make sure the environment is safe. This means that the brakes of the bed must be working and the individual must be able to put their feet flat on the ground when sitting on the edge of the bed. Also, the distance to the chair should be minimal.

i

Changes in blood pressure and respiratory function that should be considered are as follows (Checky, 2005):

- Plus-size people often have chronic back pain from increased load pressure and foot pain from flattening feet
- Potential transient paraesthesia (brief electric shocks – numb feeling) of the arms can result from impaired circulation in the axillae (area of the armpits)
- Stress fractures may be present, as well as degenerative joint disease, which potentially makes the transfer difficult and painful
- The gait is typically wide based for balance, with a rolling motion
- The arms are often held out from the body due to a wide shape, with the back arched to counterbalance the weight of the abdomen
- Stress incontinence is a potential problem due to increased intra-abdominal pressure - transferring in and out of bed can exacerbate this situation
- Respiratory systems may be compromised

g Hygiene chair as transfer to the bathroom

The shower or bathroom environment is a potentially slippery and dangerous place. A hygiene chair will offer a safe platform to provide the individual with hygiene care, along with a good solution for their safe transport to the bathroom. Depending on the individual situation and the level of independence of the person, there are fixed height or a variable height versions, tilt and/or recline versions and electrical or manual versions available.

h Other transfer methods

There are many other transfer options and techniques that can be applied, depending on the individual situation. There is a walking stick, crutches, a walking frame etc. However, it is always important to consider the shape of the body, the person's weight and anthropometrics.

The choice of aid is based on an individual risk assessment and can depend on:

- **The standing balance**
- **Walking gait**
- **Foot movement**
- **Weight distribution**
- **Upper body strength**
- **The reach of the arms**
- **Personal comfort**
- **The environment**

Conclusion

- Hopefully, this booklet has been a useful tool to explain what plus-size is and highlight the causes and risks that come with it.

The overlay aim of the booklet was to make people aware of the effects of obesity as many people do not realise how damaging it can be to the body and a person's overall health. Obesity is something that is increasingly on the rise today and will continue to rise unless something is done about it. Awareness is key, not only for the plus-size person themselves, but also for their family, friends, carer etc.

It is very important for any plus-size person to stay mobile and independent or regain mobility and independence after a period of immobilisation, and there are a number of aids available to support this, which have been highlighted in this booklet. It is vital that the individual and their caregiver are aware and educated about obesity and individual care pathways are set up to support them.

Obesity is something that is increasingly on the rise today and will continue to rise unless something is done about it.

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Glossary

µm (as a unit of measure) – "Micrometre" = 10-6 (0.000001), in other words 1 millionth of a metre or 1 thousandth of a millimetre

Abdomen– That portion of the body that lies between the thorax (chest) and pelvis

Abdominal – Related to the region of the abdomen

Adrenal gland – Small gland located on top of the kidney

Adrenal medulla – The inner portion of the adrenal gland

Adrenaline – A hormone secreted by the adrenal glands, especially in conditions of stress

Adrenocorticotropic Hormone (ACTH) – A hormone produced by the anterior lobe of the pituitary gland

Aldosterone – Hormone which helps to maintain sodium balance in the body and the maintenance of blood volume and blood pressure

Alimentary canal – The whole passage along which food passes through the body from mouth to anus

Alpha synuclein – A protein abundant in the human brain

Alveoli – Tiny air-filled sacs arranged in clusters in the lungs, in which the exchange of oxygen and carbon dioxide takes place

Amino acid – An organic compound. It serves as a building block for proteins

Amyotrophy – Reduction in muscle mass due to shrinkage or loss of muscle fibres

Anal sphincter – The muscle around the anus

Anosognosia – A deficit of self-awareness, a condition in which a person who suffers some disability, seems unaware of the existence of his or her disability

Anoxia – Oxygen deprivation

Anterior – Indication of position and direction in anatomy, in this case: situated before or toward the front of the body or its parts, also situated near or toward the head, respectively directed to the head

Anterior lobe – Upper part of the cerebellum (little brain)

Antidiuretic hormone (ADH) – Hormone which controls water excretion by the kidneys

Anus – The external outlet of the gastrointestinal tract

Aorta – The main artery of the body, supplying oxygenated blood to the circulatory system

Apathy – Lack of emotion or emotional expression; a disorder of motivation that persists over time

Aphasia – Aphasia is an acquired speech defect as a result of a lesion (damage) in the dominant hemisphere of the brain (usually the left hemisphere)

Appendages – A body part (such as an arm or a leg) connected to the main part of the body

Appendicular bones – The bones that support the appendages

Arteries – Muscular-walled tubes forming part of the circulation system by which blood is transported from the heart to all parts of the body

Assimilation – The movement of digested food molecules into the cells of the body where they are used

Assistive technology – Umbrella term that includes assistive, adaptive and rehabilitative devices for people with disabilities and also includes the process used in selecting, locating and using them. Assistive technology promotes greater independence, by enabling people to perform tasks that they were formerly unable to accomplish, or had great difficulty accomplishing, by providing enhancements to, or changing methods of interacting with, the technology needed to accomplish such tasks

Ataxia – Loss/ deterioration of muscle coordination

Atrium – Each of the two upper cavities of the heart

Atrophy – Gradual loss of muscle or other tissue, usually because of disease or lack of use

Autonomic nervous system – The part of the nervous system responsible for control of the bodily functions not consciously directed, such as breathing, the heartbeat, and digestive processes

Axial bones – The part of the skeleton that consists of the bones of the head and trunk

Axillae - Area of the armpits

Axon – Long, slender projection of a nerve cell, or neurone that typically conducts electrical impulses away from the neurone's cell body

Bariatric - The branch of medicine that deals with the study and treatment of obesity

Baroreceptors – Sensors in the vascular system that respond to changes in pressure within blood vessels

Basal ganglia – A group of structures linked to the thalamus in the base of the brain and involved in coordination of movement

Benign – Not causing death or serious injury, not cancerous

Bicuspid valve – Valve of the heart which prevents blood from flowing back into the atrium

Bile – Greenish-brown alkaline fluid that aids digestion is secreted by the liver and stored in the gallbladder

Bladder – Muscular and membranous sac, in which the urine is retained until it is discharged from the body

Blanching - Whiteness under the skin

Blood pressure – The pressure exerted against the walls of the arteries (usually measured in mmHg)

Blood vessel – A tubular structure carrying blood through the tissues and organs

Body Mass Index (BMI) – An approximate measure of whether someone is over or underweight, calculated by dividing their weight in kilograms by the square of their height in metres

Bolus – Chewed food at the moment of swallowing

Bone marrow – A soft fatty substance in the cavities of bones, in which blood cells are produced

Bone suture – A connective tissue-like joint between two cranial bones of the skull. These are so-called fused joints which allow just a tiny amount of movement between the bones

Bowel – The long tube in the body that helps digest food and carries solid waste out of the body

Bowel incontinence – The inability to control bowel movements, causing faeces to leak unexpectedly from the rectum

Bradykinesia – Slowness of movement

Brain – The organ of the body in the head that controls functions, movements, sensations and thoughts, being part of the central nervous system (CNS)

Brain stem – Part of the brain, connecting the spinal cord with the forebrain and cerebrum (large part of the brain with the cerebral cortex). Though small in size, this is an extremely important part of the brain, as the nerve connections of the motor and sensory systems from the main part of the brain to the rest of the body pass through the brain stem

Bronchi – The two main branches of the trachea

Bronchioles – The tiny branch of air tubes within the lungs

Bulbar region – Relating to the region of the medulla oblongata

Calcitonin – Works alongside parathyroid hormone in the maintenance of calcium levels in the blood

Calcium – A chemical element that is present in teeth & bones

Calories – Units used as a measure of the energy released by food as it is digested

Candida - A yeast-like parasitic fungus that can sometimes cause thrush

Cancer – Disease caused by an uncontrolled division of abnormal cells in a part of the body

Capillary – Capillaries are the smallest blood vessels in a human's body, about 0.5 mm long and with a diameter of 5 to 10 µm

Capsid – The protein shell of a virus particle. It encloses the genetic material of the virus

Carbohydrates – Any one of various substances found in certain foods (such as bread, rice and potatoes) that provide the body with heat and energy and are made of carbon, hydrogen and oxygen

Carbon dioxide – A colourless, odourless gas produced by respiration

Cardiac muscle – Muscle of the heart

Cardiac sphincter – A muscle that regulates the flow of food from the oesophagus into the stomach

Cardiovascular – Circulatory system, also called the cardiovascular system or the vascular system, is an organ system that permits blood to circulate and transport nutrients (such as amino acids and electrolytes), oxygen, carbon dioxide, hormones and blood cells to and from the cells in the body to provide nourishment and help in fighting diseases, and stabilise temperature

Cartilage – Firm, whitish, flexible connective tissue

Cavity – Anatomical structures are often described in terms of the cavity in which they reside. The body maintains its internal organisation by means of membranes, sheaths, and other structures that separate compartments. Some cavities allow for significant change in the size and shape of the organs as they perform their functions

Central nervous system (CNS) – The complex nerve tissues (brain and spinal cord) that controls all activities of the body

Cerebellum – The part of the brain at the back of the skull

Cerebral – Of, or relating to, the brain

Cerebral cortex – The outer layer of the cerebrum

Cerebral haemorrhage – Sudden and abrupt bleeding within the brain tissue, caused by the bursting of a blood vessel

Cerebrospinal fluid (CSF) – A clear, colourless body fluid found in the brain and spine. It is produced in the ventricles of the brain. It acts as a cushion or buffer for the brain's cortex, providing basic mechanical and immunological protection to the brain inside the skull

Cerebrum – The front part of the brain that is believed to be where thoughts occur

Cervical area (cervical vertebrae) – The upper seven vertebrae of the spinal column (C1 to C7)

Chemical digestion – Involves breaking down the food into simpler nutrients that can be used by the cells

Chronic – Persisting for a long time or constantly recurring

Chronic disorder – An illness that persists over a long period

Chyle – A milky fluid containing emulsified fat and other products of digestion

Circulatory system – The system that circulates blood and lymph through the body

Cirrhosis - A chronic disease of the liver marked by degeneration of cells, inflammation, and fibrous thickening of tissue. It is typically a result of alcoholism or hepatitis

Clavicle – Collarbone

Clotting proteins – Found in the blood and work to form a clot

Cognitive – Of, relating to, being, or involving conscious intellectual activity (such as thinking, reasoning or remembering)

Cognitive disturbances – Also known as cognitive disorders, defined as any disorder that significantly impairs the cognitive function of an individual, to the point where normal functioning in society is impossible without treatment

Cogwheel rigidity – Is a combination of lead-pipe rigidity and tremor which presents as a jerky resistance to passive movement as muscles tense and relax.

Collagen – The fibrous protein constituent of bone, cartilage, tendon, and other connective tissue

Colon – The large intestine

Comorbidity - The presence of one or more additional diseases or disorders co-occurring with a primary disease or disorder

Conception – The fertilisation of an egg by a sperm

Congenital defect – State that already exists at birth due to damage to the foetus during its development. Such damage occurs if the mother suffered an infection or injury during pregnancy or was poisoned through the ingestion of a toxic substance, or if normal development is impaired by a genetic defect

Constipation – A condition in which there is difficulty in emptying the bowels, usually associated with hardened faeces

Contracture – Permanent shortening of a muscle or fibrous tissue, leading to distortion and deformities

Coronary artery – An artery supplying blood to the heart

Corpus striatum – Part of the basal ganglia of the brain containing the caudate and lentiform nuclei

Corset – A close-fitting, reinforced item of clothing or anatomically shaped composite material shell. Used to impose or support a particular posture

Cortex – The outer layer of an organ in the body and especially of the brain

Corticosteroid hormones – Natural steroid hormones secreted by the cortex of the adrenal glands

Corticosterone – Hormone which helps to control the immune system's inflammatory response

Cortisol – A steroid hormone. The main stress-buster of the body and controls the body's use of fats, proteins and carbohydrates

Cranial bones – Bones of the skull, housing the brain

Cranial nerves – Any of the nerves that arise in pairs from the lower surface of the brain, one on each side and pass through openings in the skull to the periphery of the body and that comprise 12 pairs in humans

Cyst – A cyst is a cavity in tissue that is separated by a capsule. It can consist of one or more chambers and contain a thin or thick fluid

Cytokine - Any of a number of substances, such as interferon, interleukin, and growth factors, which are secreted by certain cells of the immune system and influence other cells

Cytoplasm – A jelly-like substance present in the cell membrane of all cell types. It mainly consists of water, salt and protein and is responsible for breaking down waste and aiding metabolic activity. Cystoplasm is responsible for giving a cell its shape; without cytoplasm a cell would deflate and movement of cellular materials between different parts of a cell (organelles) would not be possible

Debridement - The removal of damaged tissue or foreign objects from a wound

Deep tendon reflexes – A muscle contraction in response to stretching within the muscle, providing automatic regulation of skeletal muscle length

Defaecation – The discharge of faeces from the body

Deficit ocular pursuit – Inability of the eyes to smoothly and closely follow a moving object

Glossary

Degeneration – The deterioration and decay, mainly of whole tissues or organs

Delusions – A belief that is not true: a false idea: a false idea or belief that is caused by mental illness

Dermis – Inner layer of skin beneath the epidermis

Delusions – A belief that is not true: a false idea: a false idea or belief that is caused by mental illness

Dermis – Inner layer of skin beneath the epidermis

Dermis – Inner layer of skin beneath the epidermis

Diaphragm – The large muscle that separates the chest cavity from the abdominal cavity

Diastole – The phase of the heartbeat when the heart muscle relaxes and allows the chambers to fill with blood

Digestion – The breakdown of large, insoluble food molecules into small, water-soluble molecules, using mechanical and chemical processes

Digestive enzymes – Substances produced by our bodies that help us to digest the foods we eat

Digestive system – The system of organs responsible for getting food into and out of the body

Digestive tract – The series of organs in the digestive system through which food passes, nutrients are absorbed and waste is eliminated

Distal – Indication of position and direction in anatomy, in this case: situated away from the point of attachment, origin or a central point

DNA or Desoxyribonucleic acid – A very long macro molecule that contains genetic information in humans and most other organisms. Most DNA is found in the core or the nucleus of every cell of an organism and is built up of nucliotides (formed out of a chemical base, sugar and phosphate). The nucliotides pair up and form two strands that then form a spiral, the so called double helix. The order and sequence of the bases of the nucliotides form a code that gives information about the building and maintenance of the organism

Dopamine – A neurotransmitter - a chemical released by neurones to send signals to other nerve cells

Dysphagia – Swallowing difficulties

Elastin – An elastic, fibrous glycoprotein found in connective tissue

Electrolytes – Salts and minerals that can conduct electrical impulses in the body

Elephantiasis - A condition in which a limb or other part of the body becomes grossly enlarged due to obstruction of the lymphatic vessels, typically by the nematode parasites which cause filariasis

Emotional lability – Type of effect characterised by involuntary crying or uncontrollable episodes of crying and/or laughing, or other emotional displays. Occurs secondary to a neurologic disorder or brain injury. E.g. individuals may find themselves crying uncontrollably at something that is only moderately sad, not able to stop themselves for several minutes

Encephalitis – An inflammation of the brain that can lead to damage of the central nervous system or even to death

Endemic – Restricted or typical/peculiar to a locality or region

Endocrine system – The collection of glands that produce hormones

Enteric nervous system – Controls the function of the gastrointestinal system

Enterovirus – A genus of viruses that multiply especially in the gastrointestinal tract but may infect other tissues (as nerve and muscle)

Enzymes – Any of numerous complex proteins that are produced by living cells and catalyse specific biochemical reactions at body temperatures

Epidermis – Outer layer of the skin

Epiglottis – A flap of cartilage at the root of the tongue

Epilepsy – A brain disorder due to abnormal electric activity in the brain, leading to seizures (epileptic attacks) with convulsions. In so-called "Grand mal" episodes it is typical for individuals to bite their tongue during an attack

Epithelium – The thin tissue forming the outer layer of a body's surface and lining the alimentary canal

Ergonomics – Scientific discipline that considers how human energy can be used most efficiently

Erythropoietin – A hormone that aids the formation of red blood cells

Oesophagus – Often called food pipe. A muscular tube organ that in adult humans is about 23 centimetres long, through which the food passes from the mouth into the stomach

Executive dysfunction – A term for the range of cognitive, emotional and behavioural difficulties which often occur after injury to the frontal lobes of the brain. Impairment of executive functions is common after acquired brain injury and has a profound effect on many aspects of everyday life

Facial expression – The visible movements of the surface of the face. In most cases an overall impression is derived from various mimetic facets, as individual movements of the facial muscles take only fractions of a second. Facial expressions, together with gesture, are an important part of non-verbal communication

Faeces – Semi-solid waste material expelled from the body via the rectum

Fallopian tubes – Attached to the upper part of the uterus. Serve as tunnels for the ova (egg cells) to travel from the ovaries to the uterus

Fertilisation – Also known as conception, is the fusion of gametes to initiate the development of a new individual organism

Fibrillin – A glycoprotein, which is essential for the formation of elastic fibres found in connective tissue

Flatulence – The accumulation of gas in the alimentary canal

Foetus (also: Fetes) – A prenatal human between its embryonic state and its birth

Follicles – A vesicle in the mammalian ovary that contains a developing egg surrounded by a covering of cells

Follicle-stimulating hormone (FSH) – Secreted by the pituitary gland. Regulates the reproductive processes of the body

Fontanelle – The area of the skull of newborns and babies that has not yet been covered by bony or cartilaginous structures. Necessary, as the brain expands faster than the surrounding bone can grow

Gallbladder – The small sac-shaped organ beneath the liver, in which bile is stored

Gametes – The cells that join together to begin developing a new individual of the same species

Gastric dysmotility – Is a condition in which muscles of the digestive system become impaired and changes in the speed, strength or coordination in the digestive organs occurs

Gastrointestinal tract – A series of organs in the digestive system through which food passes, nutrients are absorbed and waste is eliminated. It consists of the oesophagus, stomach, small and large intestines, rectum and anus

Genetic – The term for the inheritance of features and characteristics/ relationship between organisms

Genetic mutation – A permanent alteration in the DNA sequence that makes up a gene, such that the sequence differs from that which is found in most people

Gland – An organ or group of specialised cells in the body that produce and secretes a specific substance, such as a hormone

Glucose – A simple sugar that is an important energy source in living organisms

Glycogen – A substance deposited in bodily tissues as a store of carbohydrates

Glycoprotein – Glycoproteins are proteins which have sugars attached to them. They are involved in nearly every process in a cell and assist with the immune, digestive and reproductive systems

Gonadocorticoids – Sex hormones

Gout – A disorder of the metabolism that occurs in phases and leads to cartilaginous changes, due to deposits of uric acid crystals in various joints and tissues. Long-term damage to the kidneys as excretory organs can cause renal failure

Haemaglobin – A red protein responsible for transporting oxygen in the blood of vertebrates

Haemorrhage – Bleeding or sudden loss of blood. This can involve internal or external bleeding or tissue bleeding

Haemorrhoids – Swollen vein or group of veins in the region of the anus

Hallucinations – An experience involving the apparent perception of something not present

Heart disease – Any condition of the heart that impairs its functioning

Heart murmur – Sounds during your heartbeat cycle — such as whooshing or swishing

Heartburn – A form of indigestion felt as a burning sensation in the chest, caused by acid regurgitation into the oesophagus

Hemopoiesis – Biological process in which new blood cells are formed

Hereditary – A descriptive term for conditions capable of being transmitted from parent to offspring through genes

Hernia - A condition in which part of an organ is displaced and protrudes through the wall of the cavity containing it (often involving the intestine at a weak point in the abdominal wall

Hindbrain – The lowest part of the brain stem, comprising the cerebellum, pons, medulla and oblongata

Hippocampus – A small region of the brain that forms part of the limbic system. It is responsible for memory and spatial navigation

Homeostasis – The ability to maintain a constant internal environment in response to environmental changes

Hormones – A regulatory substance produced in an organism and transported in blood to stimulate specific cells or tissues into action

Hyaline – Glass-like or translucent substance

Hydrocephalus – An usually large accumulation of cerebral fluid (liquor cerebrospinalis) within the skull. The liquor increases the pressure on the brain, often causing damage

Hydrochloric acid – An aqueous solution of hydrogen chloride, present in dilute form in gastric juice (stomach acid)

Hyperhidrosis - Excessive sweating usually affecting the palms, soles and armpits

Hyperlordosis – Excessive lumbar curvature of the spinal column

Hyperinsulinemia - A condition in which there are excess levels of insulin circulating in the blood relative to the level of glucose

Hypertrophy - The enlargement of an organ or tissue from the increase in size of its cells

Hypersexuality – Extremely frequent or suddenly increased sexual urges or sexual activity

Hyposmia – A reduced ability to smell and detect odours

Hypothalamus – Area of the brain, involved in controlling temperature, thirst, hunger, sleep and emotional activity. It also secretes substances that influence pituitary and other gland function

Idiopathic – The term idiopathy is used in connection with illnesses that occur without an identifiable cause

Ilium bones – The largest of the three bones that join to form the pelvis. The other two bones are the pubis and ischium

Immobility - The result of any disease or disability that requires complete bed rest or causes extreme limitations of activities

Immune disorder – A dysfunction of the immune system

Immune system – The body's defence against infectious organisms and other invaders

Implant – An artificial material, for example a hip joint, implanted in the body that is to remain there either permanently or for a long period of time

Incontinence – Inability to voluntarily control the discharge of urine and/or faeces

Indigestion – Pain or discomfort in the stomach associated with difficulty in digesting food

Infantile – The state of remaining in a childlike state. Can refer to both physical and mental development

Infection – Penetration and reproduction of microorganisms in the body's tissues, leading to cellular damage

Inflammation – A localised physical condition in which part of the body becomes reddened, swollen, hot and often painful, especially as a reaction to injury or infection

Ingestion – The consumption of a substance by an organism

Insomnia – Inability to sleep

Insulin – A hormone produced by the pancreas which prevents blood sugar levels becoming too high or too low

Insulin resistance – A state or condition in which a person's body tissues have a lowered level of response to insulin

Integumentary system – Consists of the skin, hair, nails, glands and nerves

Intercostal – Groups of muscles that run between the ribs and help form and move the chest wall. They help expand and shrink the size of the chest cavity to assist breathing

Intercostal muscles – Muscle groups that are situated in between the ribs that create and move the chest wall

Interstitial fluid – A solution that bathes and surrounds the tissue cells

Intervertebral disc – Spinal cord disc, a disc like piece of fibrous cartilage that separates two vertebrae

Intestines – A long continuous tube running from the stomach to the anus, which absorbs most of the nutrients from what we eat and drink. The intestines include the small intestine, large intestine and rectum

Joint capsule – A connective tissue-like covering around joints. It encloses the joint cavity, which is filled with synovial fluid

Kidney – Two organs situated in the abdominal cavity that remove waste products from the blood and produce urine

Kyphosis – Outward curvature of the thoracic vertebrae

Labour – Also known as childbirth, is the process whereby a baby leaves the uterus

Larynx – The hollow muscular organ forming an air passage to the lungs

Lateral – Indication of position and direction in anatomy, in this case: turned away from the middle of the body, positioned to the side

Lead pipe rigidity – An increase in muscle tone, causing a sustained resistance to passive movement throughout the whole range of motion, with no fluctuations

Glossary

Lesion – Damage, injury or impairment of an anatomical structure or physiological function

Leukaemia – Cancer of the blood cells

Levodopa – Also known as Ldopa, it is a synthetic substance that is converted in the brain to dopamine

Lewy bodies – Abnormal aggregates of protein, that develop inside nerve cells in Parkinson's Disease

Ligament – A permanent band of connective tissue that joins different structures, such as two bones

Limbic cortex – Also known as the limbic system, it is a set of brain structures located on both sides of the thalamus immediately beneath the cerebrum

Limbic system – A set of brain structures located on top of the brain stem

Lipid – A fat like molecule which together with carbohydrates and proteins are the main constitute of plant and animal cells

Lipidoses genetic – disorders passed from parents to their children, characterised by defects of the digestive system that impair the way the body uses dietary fat. When the body is unable to properly digest fats, lipids accumulate in body tissues in abnormal amounts

Lipofuscin – Lipid pigment found particularly in muscle, heart, liver and nerve cells

Liver – A large lobed glandular organ in the abdomen

Locomotor – Relating to movement processes or - particularly in relation to nerves - the control of movement. In the wider sense, the term also describes the structures that are required for a movement, such as the musculature

Locomotor impulses – Each excitation of a muscle fibre is preceded by a pulse excitation in the associated motor nerve fibres

Lumbar region – Part of the spinal column consisting of five vertebrae (L1 to L5), which are located between the thoracic vertebrae and the sacral vertebrae

Lumen – Is the inside space of a tubular structure, such as an artery or intestine

Lungs – The pair of organs situated within the rib cage, consisting of elastic sacs with branching passages into which air is drawn

Luteinising hormone – A hormone secreted by the anterior pituitary gland that stimulates ovulation in females

Luxation – Complete dislocation/displacement of a joint

Lymph – A colourless fluid containing white blood cells that bathes the tissues and drains through the lymphatic system into the bloodstream

Lymph nodes – A number of small swellings in the lymphatic system where lymph is filtered

Lymphatic gland – One of many small organs in the body that produce the white blood cells

Lymphatic system – The network of vessels through which lymph drains from the tissues into the blood

Lymphatic vessel – Thin walled, valve structures that carry lymph

Lymphoedema - Also known as lymphoedema and lymphatic oedema, is a condition of localised fluid retention and tissue swelling caused by a compromised lymphatic system, which normally returns interstitial fluid to the bloodstream

Lymphoma – A form of cancer that affects the immune system

Malaise – A general feeling of discomfort, illness or unease which can occur with almost any health condition

Macula retinae – The retina is a thin layer of tissue at the back of the eye located near the optic nerve. The retina converts light, captured by the lens, into neural signals and sends these signals to the brain for visual recognition. The macula is the small area at the centre of the retina responsible for what we see straight in front of us. Macular degeneration (deterioration of the macula) is the leading cause of severe vision loss in people over the age of 60

Mania – The stimulus and mood are far above the normal level in a mania. Sleep is reduced during a manic episode and areas of the brain become overexerted. High levels of excitation, inner agitation, intensive but ungrounded high spirits, restless activity and restiveness

Mechanical digestion – Breaking down food in the mouth as it is chewed

Medulla – The inner region of an organ or tissue

Medulla oblongata – Lower part of the brain stem, it is essential for life as it controls all involuntary functions such as breathing and regulating blood pressure. As part of the brain stem it also conveys messages from the brain to the spinal cord

Melanocyte-stimulating hormone (MSH) – A hormone secreted by the pituitary gland that regulates skin colour

Melatonin – A hormone produced by the pineal gland, a small gland in the brain which controls the sleep and wake cycles

Meninges – Membranous coverings of the brain, the meninges are made up of three layers known as the dura mater, arachnoid mater and pia mater

Meningitis – Bacterial inflammation or viral infection of the meninges that will quickly lead to death if not treated

Menopause – The ceasing of menstruation

Menstruate – The monthly shedding of the uterine lining

Metabolism – The chemical processes that occur within a living organism in order to maintain life

Micturition – The act of passing urine; urination

Mid brain – A small central part of the brain stem

Mineralocorticoids – Class of steroid hormones involved with maintaining the salt balance in the body

Monotone – A continuing sound, especially of a person's voice, that is unchanging in pitch and without intonation

Motor cortex – The region of the cerebral cortex involved in the planning, control and execution of voluntary movement

Motor neurone ganglia – A cluster of motor nerve cells that is connected to a muscle and conducts an impulse that causes movement

Movement disorder – Neurological condition that affects the speed, fluency, quality and ease of movement

Mucous – A slimy substance secreted by mucous membranes and glands for lubrication

Mucous membranes – The thin skin that lines the inside surface of parts of the body, such as the nose and mouth and produces mucous to protect them

Muscular system – An organ system consisting of skeletal, smooth and cardiac muscles

Myelin sheath – A fatty white substance, surrounding the axon of nerve cells as a protective and electrically insulating cover/envelope

Nasal passage – A channel for airflow through the nose

Necrosis – Death of a cell due to damage to the cell structure. Membrane defects occur in necrosis whereby the contents of the cell escape into the area surrounding the cell in an uncontrolled way. The consequence is an inflammatory reaction

Necrotising infections - Severe bacterial infection of the fascia, the tissues that line and separate muscles, that causes extensive tissue death - also known as flesh-eating bacteria

Nephrons – A system of tubules in the kidney, in which waste products are filtered from the blood and urine is produced

Nerve cell – Also known as a neurone (see Neurones)

Nervous system – The network of nerve cells and fibres that establishes the connection between changes and reactions in an organism, together with the endocrine system (hormones) and internal and external environmental conditions. The brain and spinal cord, as well as nerves that form part of the nervous system, together represent the body's communication and coordination system, supplying information to the brain and returning instructions from the brain

Neurodegeneration – The umbrella term for the progressive loss of structure or function of neurones, including death of neurones

Neurology – The study of disorders of the nervous system

Neuronal ceroid-lipofuscinosis (NCL) – Refers to a group of rare disorders of the nerve cells passed down through families (inherited). There are three types of NCL, Adult (Kufs or Parry disease); Juvenille (Batten disease); Late infantile (Jansky-Bielschowsky disease). NCL involves the build-up of abnormal material called liofusan in the brain. NCl is thought to be caused by problems with the brain's ability to remove and recycle proteins

Neurones – A specialised cell transmitting nerve impulses, also known as nerve cell

Neuropsychiatric – Psychiatric symptoms or syndromes which are caused by organic cerebral disorders

Neuropsychological – The relationship between the nervous system and mental functions such as language, memory and emotions

Neurotransmitters – A chemical messenger that carries, boosts and modulates signals between neurones and other cells in the body

Noradrenaline – A hormone secreted by the adrenal medulla, increasing blood pressure and heart rate

Norepinephrine – A substance that acts as both a neurotransmitter and hormone in the central nervous system

Obesity – An abnormal accumulation of body fat, usually 20% or more over an individual's ideal body weight

Oblongata – The part of the vertebrate brain that is continuous posteriorly with the spinal cord and that contains the centres controlling involuntary vital functions

Occipital foramen – The largest opening in the base of the skull and the aperture through which the central nervous system (CNS) passes: This is where the spinal cord and brain meet

Occupational therapist – A recognised healthcare worker who specialises in those with impaired movement, who can assess the influence of the disorder on everyday life and who develops and prescribes aids to enhance everyday quality of life

Oedema – An anomalous swelling of the connective tissues and/or cavities due to the storing of watery fluid from the body

Oesophageal reflux – A condition where stomach contents regurgitate or back up into the oesophagus

Oesophagus – A muscular passage connecting the mouth or pharynx with the stomach

Olfactory bulb – A brain structure responsible for our sense of smell

Olfactory pathway – Set of nerve fibres conducting impulses from olfactory receptors to the cerebral cortex. It includes the olfactory nerve, olfactory bulb, olfactory tract, olfactory tubercle, anterior perforated substance, and olfactory cortex

Orthopaedics – The specialist area of medicine that deals with the surgical or mechanical treatment of deformities, disorders and injuries to the skeletal system (bones and joints)

Orthostatic hypotension – A condition in which the blood pressure falls when a person goes from lying or sitting to standing

Orthotics (orthoprostheses) – Orthopaedic aids with a corrective support function for weakened muscles or joints

Osteoporosis - A medical condition in which the bones become brittle and fragile from loss of tissue, typically as a result of hormonal changes, or deficiency of calcium or vitamin D

Ova – Plural for ovum

Ovaries – Small, oval-shaped glands that are located on either side of the uterus, which produce ova (eggs) and hormones

Ovulation – When a mature egg is released from the ovary, pushed down the fallopian tube, and is made available to fertilise

Ovum – A mature female reproductive cell (egg)

Oxygen – A colourless, odourless reactive gas and the life-supporting component of the breathing air

Oxytocin – A hormone which causes the womb to contract during labour and plays a role in the production of breast milk

Pancreas – A large gland behind the stomach that secretes digestive enzymes

Paralysis – Loss or disruption of locomotor functions

Parasympathetic nervous system – The part of the involuntary nervous system that slows the heart rate, increases intestinal and glandular activity and relaxes the sphincter muscles

Parathyroid gland – A gland located behind the thyroid gland in the neck

Paresis – Incomplete paralysis

Paresthesia – A sensation of tingling, tickling, pricking or burning of a person's skin, with no apparent cause

Pathogens – A bacterium, virus or other microorganism that can cause disease

Pathology – The totality of symptoms resulting from a disease process yields the clinical picture, known as the pathology

Pelvic girdle – Basin-shaped complex of bones that connects the trunk and the legs

Pelvis – The large bony frame near the base of the spine to which the legs are attached

Penis – The male genital organ

Peripheral – In general usage this means "surroundings" or "environment" and in the medical sector it also means "surrounding", "proximate to" and "influenced by"

Peripheral nervous system – The nervous system outside the brain and spinal cord

Peristalsis – The involuntary constriction and relaxation of the muscles of the intestine

Persistent vegetative state – A cerebral degeneration that affects both halves of the brain, caused by head injury, anoxia or encephalitis, a permanent state of unresponsiveness

PH – The measure of acidity or alkalinity

Phagocytose – The process by which a cell, such as a white blood cell, ingests microorganisms, other cells and foreign particles

Pharynx – The membrane-lined cavity behind the nose and mouth

Pheromones – Chemical signals that influence the behaviour of another

Phlegm – A thick yellowish liquid that is produced in the nose and throat especially when someone has a cold

Phosphorous – A chemical element essential in the diet

Phrenic nerve – A nerve that originates in the neck (C3-C5) and passes down between the lungs and the heart to reach the diaphragm. It is important for breathing as it passes motor information to the diaphragm and receives sensory information from it

Glossary

Physiology – Scientific discipline that focuses on the functions of the living organism

Pill-rolling – Rest tremor in which the fingers and wrist move in a manner reminiscent of a rhythmic voluntary manipulation of small objects or pills in the hand

Pineal gland – Pea-sized gland near the centre of the brain which produces melatonin

Pituitary gland – Pea-sized gland attached to the base of the brain

Plagues – Abnormal clusters of protein fragments which build up between nerve cells

Plaques – Deposits in the brain and/or in the spinal cord

Plasma – The fluid portion of the blood - a straw-coloured liquid composed primarily of water

Platelets – Small cells that help blood to clot

Pons – A broad mass of chiefly transverse nerve fibres in the brain stem lying central to the cerebellum at the anterior end of the medulla oblongata

Popliteal fossa - A shallow depression located at the back of the knee joint

Posterior – Indication of position and direction in anatomy, in this case: near or toward the back of the body or its parts. Directed towards the rear

Postural hypertension – A sudden increase in blood pressure when a person stands up

Postural instability – A tendency to fall or the inability to stop oneself from falling - imbalance

Progressive – A deteriorating progression of a disease

Prolactin (PRL) – A protein best known for its role in enabling females to produce milk

Prone position - Lying horizontally with the face and torso facing down

Prophylaxis – Measure to prevent illness

Prostate gland – A gland surrounding the neck of the bladder in males

Prosthesis – The replacement of limbs, organs or parts of organs with artificial products with a similar function. If the prosthesis is located outside of the body, it is referred to as an exoprosthesis (for example, artificial limbs, arm, leg or hand prostheses), otherwise it is known as an endoprosthesis or implant

Protein – Is found throughout the body, in bones, skin, hair and muscles. It makes up the enzymes that power many powerful chemical reactions and the haemoglobin that carries oxygen in the blood

Proximal – Indication of position and direction in anatomy, in this case: situated close to, next to or near the point of attachment i.e. a joint. Located towards the centre of the body

Pulmonary oedema – A condition caused by excess fluid in the lungs, this fluid collects in numerous air sacs in the lungs, making it difficult to breathe

Pulmonary vein – Vein carrying oxygenated blood from the lungs to the left atrium of the heart

Pupil – The opening in the centre of the eye through which light enters

Receptors – An organ or cell able to respond to light, heat or other external stimulus and transmit a signal to a sensory nerve

Rectum – The final section of the bowel, terminating at the anus

Regurgitation – Voluntary or involuntary return of partly digested food from the stomach to the mouth

REM sleep – A kind of sleep that occurs at intervals during the night and is characterised by rapid eye movements, more dreaming and bodily movement, and faster pulse and breathing

Renal – Relating to or involving the kidneys

Reproductive system – The organs and glands in the body that aid in the production of new individuals

Resorption – The absorption of material in biological systems

Respiratory system – The set of organs that allows a person to breathe and exchange oxygen and carbon dioxide throughout the body

Rheumatoid – Symptoms relating to rheumatism, or the experience of pain as a result of the symptoms of rheumatism

Rigidity – Inability of a muscle to relax

RNA – Ribonucleic acid, RNA and DNA, along with proteins and carbohydrates constitute the four main macromolecules essential for all known forms of life

Saccadic movement – Movements of the eyes that abruptly change the point of fixation

Sacral – Relating to the sacrum

Sacro-iliac joint – The joint between the sacrum and the ilium bones of the pelvis

Sacrum – A triangular bone in the lower back formed from fused vertebrae and situated between the two hipbones of the pelvis

Saliva – A watery liquid secreted into the mouth by glands, providing lubrication for chewing and swallowing, and aiding digestion

Salivary glands – Glands that discharge a fluid secretion, called saliva, into the mouth

Scapula – Shoulder blade

Sclerosis – A hardening of organs or tissues through an increase in connective tissues. Sclerosis is not a disorder in itself, but rather the consequence of another underlying disorder

Scrotum – External pouch or sac located behind the penis containing the testes

Sebaceous gland – A small gland in the skin which secretes a lubricating oily matter (sebum) into the hair follicles to lubricate the skin and hair

Self-reflection – Contemplation and awareness of oneself. Self-criticism, questioning and evaluation of one's own personality

Semen – The male reproductive fluid (sperm)

Semi-Fowler position – Lying upright with the back at a tilted angle

Semilunar valve – Each of a pair of valves in the heart (aortic and pulmonary valves)

Sensory – Perception through the senses

Skeletal muscle – A muscle that is connected to the skeleton

Skeletal system – The parts of the body, consisting of bones and cartilage that form the supporting structure of the whole organism

Skull – The skeleton of the head forming a bony case that encloses and protects the brain

Small intestine – The part of the intestine that runs between the stomach and the large intestine

Smooth muscle – Muscle tissue in the walls of blood vessels and internal organs

Spasm – A sudden, short, uncontrolled and jerky contraction of the muscles, muscle tissues or a hollow organ that disrupts function; accompanied by pain and leading to involuntary movements and deformities

Spasticity – A muscle control disorder that is characterised by tight or stiff muscles and an inability to control those muscles

Sphincter muscles – A ring of muscles that contracts to close an opening

Spinal column – The bony column consisting of separate vertebrae that surrounds and protects the spinal cord

Spinal cord – The bundle of nerve fibres that is enclosed in the spine and connects nearly all parts of the body to the brain

Spleen – An abdominal organ involved in the production and removal of blood cells and forming part of the immune system

Sporadic – Occurring rarely and without regularity

Stem cells – A simple cell in the body that is able to develop into any one of various kinds of cells

Sternum – The long flat bone in the upper middle of the front of the chest

Steroid hormone – Molecule that acts as a chemical messenger in the body

Stump – The remaining part of an amputated limb of the human body

Subclinical – No recognisable clinical findings or signs and symptoms that can be recognised

Subcutaneous – Situated or lying under the skin

Sundown syndrome – A term that describes the onset of confusion and agitation

Supine position - Lying horizontally with the face and torso facing up

Sweat gland – A small gland that secretes sweat, situated in the dermis of the skin

Sympathetic nervous system – A part of the nervous system that serves to accelerate the heart rate, constrict blood vessels and raise blood pressure

Symptom – In relation to pathologies: a visible or tangible sign, indicating a disorder or illness

Synovial – Pertaining to the most common and most movable type of joint in the body

Systole – The time period when the heart is contracting

Tendinitis – An inflammatory disorder of the tendons as part of other disorders

Tendons – A cord or band of dense, tough, inelastic, white, fibrous tissue, serving to connect a muscle with a bone

Testes – Primary male reproductive organ, in which sperm and sex hormones are produced

Testicles – The two oval organs that produce sperm in men, enclosed in the scrotum

Thalamus – A structure in the brain that is involved in sensory perception and relaying sensory information to the cerebral cortex

Thoracic – Of, or relating to, the thorax

Thoracic cavity – The cavity in the vertebrate body enclosed by the ribs between the diaphragm and the neck

Thoracic vertebrae – The 12 thoracic vertebrae (T1 to T12) are located between the cervical vertebrae (neck vertebrae) and the lumbar vertebrae

Thorax – The part of the trunk between the neck and the abdomen, containing the cavity enclosed by the ribs

Thymus – A butterfly-shaped lymphoid gland situated behind the sternum, above the heart

Thyroid Stimulating Hormone – (TSH) – A hormone produced by the pituitary gland at the base of the brain

Thyroxine (T4) – The thyroid gland hormone that regulates the metabolic rate of the body

Tissue – A group or layer of specialist cells that perform a similar function together. The four main types of tissue are muscle, nerves, skin and connective tissue

Tone – The resistance of the muscle to partial stretching or elongation

Toxins – An organic poison made by plants or animals

Trachea – Another name for windpipe, which is the tube that connects the larynx to your primary bronchi, just before the lungs

Tracheotomy – Surgical procedure in which a cut or opening is made in the windpipe (trachea)

Transient paraesthesia - Brief electric shocks – numb feeling

Trauma – A physical or emotional injury or shock

Tremor – Involuntary quivering movement

Tricuspid valve – Valve on the right side of the heart which prevents back flow of blood into the right atrium

Triiodothyronine – A thyroid hormone

Trunk – The main part of the human body not including the head, arms and legs

Tumour – An anomalous swelling of a part of the body, generally without inflammation, caused by an abnormal growth of tissue, can be either benign or cancerous

Urea – A nitrogen-containing substance normally cleared from the blood by the kidney into the urine

Ureter – The duct by which urine passes from the kidney to the bladder

Urethra – The duct by which urine is conveyed out of the body from the bladder, and which in the case of males also conveys the semen

Urinary incontinence – The inability to hold urine in the bladder because voluntary control over the urinary sphincter is either lost or weakened

Urinary retention – The inability to empty the bladder completely

Urinary system – The bodily system consisting of the organs that produce, collect and eliminate urine

Urine – Watery, typically yellowish fluid stored in the bladder and discharged through the urethra

Uterine lining – The inner layer of the uterus (womb); the cells that line the womb.

Uterus – (see also Womb) The organ in the lower body of a woman or female mammal where offspring are conceived and in which they gestate before birth

Vascular system – Also called the circulatory system, is made up of the vessels that carry blood and lymph through the body

Vegetative nervous system – Autonomous nervous system. "Autonomy" in this case means: largely beyond the voluntary control of the brain

Veins – The system of branching vessels or tubes conveying blood from various parts of the body to the heart

Vena cava – A large vein carrying deoxygenated blood into the heart

Ventral – Indication of position and direction in anatomy, in this case: of, or relating to, the belly

Ventricle – In the heart, a ventricle is one of two large chambers that collect and expel blood received from an atrium. In the brain, the ventricular system is a set of four interconnected cavities (ventricles), where the cerebrospinal fluid is produced

Vertebrae – Each of the series of small bones that make up the spinal column and that protect the spinal cord

Villi – Intestinal villi (singular: villus) are small, finger-like minute elongated projections that extend into the lumen of the small intestine

Viral – Of the nature of, caused by, or relating to, a virus or viruses

Visuospatial – Refers to our ability to process and interpret visual information about where objects are in space

Womb – The organ in the body of a female in which a baby develops before birth

Wound dehiscence - A surgical complication in which a wound ruptures along a surgical incision

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Plus-size: An introduction EU - 05/2018

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