

Challenges of wound management in bariatric patients

Wound healing in bariatric patients may be impaired by obesity-related underlying medical conditions, including poor tissue perfusion as a result of reduced chest wall expansion during respiration, diabetes, and an increased risk of postoperative thrombophlebitis and pulmonary embolism (Troia, 2002; Baugh et al, 2007). Hospital systems should be in place to meet these challenges and to ensure that the patient is appropriately managed, both in relation to their wound and bariatric body dynamics. Although equipment provision is paramount as an extrinsic factor towards wound healing, it will not be a focus of this article, but mentioned in the case report.

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KEY WORDS

Bariatric patients
Body mass index (BMI)
Multidisciplinary teamworking
Patient dignity

In adults, body mass index (BMI) is frequently used as a measure of overweight and obesity, with overweight being defined as a BMI of 25–29.9 kg/m² and obesity as a BMI of more than 30 kg/m². In children, overweight is defined as a BMI between the 85th and 95th centiles, and obesity as a BMI above the 95th centile (National Institute for Health and Clinical Excellence [NICE], 2006).

Bushard (2002) defines a bariatric person as anyone who has limitations in health due to physical size and lack of mobility. Bariatric patients can have

a wide range of comorbidities and professional judgement is paramount. In addition, organisations need to take a holistic view when dealing with extremely heavy trauma victims, which includes impact on mobility, space requirements and staffing levels.

It should be noted that differences exist between Caucasian, Afro-Caribbean and Asian populations. The 1999 Health Survey for all England data on minority ethnic groups revealed that although people of Asian descent are usually lighter than the general population, they are particularly prone to abdominal obesity and the associated metabolic consequences (Department of Health [DH], 1999).

Prevalence

In the UK, obesity levels have risen threefold between 1980 and 2001. Levels of extreme obesity nearly doubled among women in the 1990s and trebled in men. By 2007, 56% of women and 65% of men were overweight or obese (NHS Information Centre for Health and Social Care, 2009).

The NHS information Centre for Health and Social Care (2009) found that in 2008 24% of adults (aged 16 or over) in England were classified as obese, representing an overall increase of 15% since 1993.

Their main finding suggests that:
 ▶▶ Men and women were equally likely to be obese; however, women were more likely to be morbidly obese (3% compared to 1%). Although several classifications and definitions for degrees of obesity are accepted, the most widely used are the World Health Organization (WHO) criteria based on BMI. Under this convention for adults, grade 1 overweight (commonly and simply called overweight) is a BMI of 25–29.9kg/m². Grade 2 overweight (commonly called obesity) is a BMI of 30–39.9kg/m². Grade 3 overweight (commonly called severe or morbid obesity) is a BMI greater than or equal to 40kg/m². Surgical literature often

Table 1

Risk factors for tissue damage

Patient

- ▶▶ Patient's underlying medical conditions
- ▶▶ Patient's immobility

Extrinsic factors

- ▶▶ Inappropriate equipment
- ▶▶ Inadequate staffing levels
- ▶▶ Environmental constraints

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uses a different classification to recognise particularly severe obesity. In this setting, a BMI greater than 40kg/m² is described as severe obesity, a BMI of 40–50kg/m² is termed morbid obesity, and a BMI greater than 50kg/m² is termed super obese

- ▶ Thirty-seven percent of adults had an increase in their waist circumference in 2006, compared to 23% in 1993, and this was more common in women than men (41% and 32% respectively).

This rise in obesity levels challenges the patient, caregivers and clinicians when an episode of intervention is required. For example, the risk of tissue damage increases due to a number of factors (*Table 1*).

Mathison (2003) suggests that the hospitalisation of the morbidly obese patient is a challenging experience for both the patient and his or her caregivers. The risk of skin breakdown is increased due to immobility caused by underlying disease processes, sedation, improperly sized rooms and equipment, and inadequate staff numbers, or staff who lack training in bariatrics.

Bariatric body dynamics

To enhance patient dignity and wound healing, it is important that practitioners are aware of the different body shapes that relate to bariatric management, how the different body shapes interact with care, equipment provision, and the inherent risks involved.

Anasarca

This presents as severe generalised oedema in which a large amount of body fluid (commonly lymphatic) has leaked into soft tissues and is obstructed from returning to central circulation via the lymphatic vessels.

The impact that this has on the individual includes:

- ▶ Severe loss of range of motion resulting in an inability to flex limbs or whole body segments
- ▶ Centre of gravity shifting towards the knees (in seated position)



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- ▶ Diminished ability to flex at the waist, combined with a difficulty in breathing when reclined
- ▶ Decreased heat dissipation resulting in profuse sweating
- ▶ Increased susceptibility to skin shear and tears
- ▶ Extreme waste elimination difficulties
- ▶ Frequent need for mechanical ventilation assistance.

Apple or apple ascites distribution

Apple ascites bariatric patients demonstrate a high waist to hip ratio, the belly button does not wander, abdomen may be rigid as a result of ascites (fluid collection), the leg size may be relatively normal and there is limited drifting of abdomen below the beltline. Dionne (2002) classified apple ascites to enable a clinical description of patients who, like those dominated by right-sided heart failure, often demonstrate a rigid abdominal wall.

The impact that this has on the individual includes:

- ▶ Limited trunk flexion
- ▶ Frequently intact hip and knee flexion
- ▶ Shortness of breath on exertion
- ▶ Pillow required when reclined for head support
- ▶ Poor supine or prone position tolerance
- ▶ Poor ambulation.

Apple pannus distribution

Here, weight is carried high but the abdomen is quite mobile, 'belly button' wanders, and the abdomen hangs toward the floor (apron), while leg size may be relatively normal.

The impact that this has on the individual includes:

- ▶ Better ambulation with intact hip and knee flexion
- ▶ Better supine and prone position tolerance
- ▶ Pannus fills entire lap and may hang between the thighs obstructing lymphatic flow.

Pear abducted distribution

Weight is carried predominantly below the waist, with significant tissue

between the knees preventing them from touching or thighs becoming parallel.

The impact that this has on the individual includes:

- ▶ Lack of supine position tolerance
- ▶ Difficulty rolling
- ▶ Hip and knee flexion limitations, often sitting with legs fully extended and spread
- ▶ Groin moisture and urine elimination problems
- ▶ Centre of gravity is toward the knees.

Pear adducted distribution

Weight is carried predominantly below the waist, with tissue bulk on the outside of the thighs allowing legs to close and knees to contact.

The impact that this has on the individual includes:

- ▶ Better waste elimination and hygiene
- ▶ Better rolling ability, supine and prone tolerance
- ▶ Hip and knee flexion limitations, often sitting with the knees extended (not spread)
- ▶ Clear access between legs for leg support placement
- ▶ Centre of gravity is toward the knees.

Bulbous gluteal region

With this body shape, excessive buttock tissue creates a posterior protruding shelf that significantly alters seating and supine posture.

The impact that this has on the individual includes:

- ▶ Gluteal shelf causes forward seating alteration
- ▶ Pillows may be required behind shoulders for reclined, supine or even upright lifting.

Wound healing physiology

Armstrong (1998) suggests that obesity can be viewed as having both intrinsic and extrinsic factors that impact on wound healing. Intrinsic factors include diabetes, rheumatoid disease, immunosuppressant disorders, and the obesity itself. While extrinsic

factors relate to dressings, equipment provision and care environments. Further extrinsic factors are the individual's body image (for instance, hospital gowns not fitting), society's prejudice and caregivers' reluctance to provide care due to fear of physical injury (Gallagher, 2005).

Respiration

Tissues need adequate oxygen supply for wound healing to take place. Armstrong (1998) states that oxygen pressures are not constant but depend on several factors including presence of other gases, local blood flow, oxygen saturation and haemoglobin concentration. Gallagher (2005) highlights that the heavier the BMI, the more likely it is that problems with excessive abdominal adiposity will mechanically interfere with lung function. Visceral adiposity is a common occurrence in people who are morbidly obese, resulting in breathing difficulties and obstructive sleep apnoea which can result in hypoxia and leg oedema (Troia, 2002). These episodes of de-oxygenation will impede pulmonary and arterial circulation, leading to leg oedema, periods of fatigue, increased weight gain and poor sleeping patterns (Troia, 2002).

A further physiological change that impacts on oxygen supply and the healing process is the presence of increased fat in the thorax, which limits respiration, therefore reducing gaseous exchange (Troia, 2002). Hyperventilation is more likely to take place as the diaphragm is unable to descend due to the abdominal girth which will affect gaseous exchanges.

Wilson and Clark (2004) maintain that for wound healing to take place, the circulatory system has to be able to deliver oxygen and nutrients to the tissue. In patients who are obese, the heart has to work harder to supply blood to the tissues. Adipose tissue is poorly vascularised and is less tolerant of ischaemia and hypoxia than the epidermis (Wilson and Clark, 2004).

Armstrong (1998) suggested that there may be several factors that reduce tissue pO_2 in people who are obese. Poor blood vessel networking through adipose tissue (known as dead space) can develop, which turns into layers of injured tissue and thereby reduces oxygen efficiency.

Nutrition

Nutrients need to be present for wound healing to take place, including protein, carbohydrate, vitamins A and C and minerals such as zinc (Wilson and Clark, 2003). Wilson and Clark, (2003) state that a wound which produces exudate can lose protein, resulting in a lowering of albumin. Protein stores can also be depleted due to the increased demand of the wound healing process. Collins (2003) argues that many bariatric patients with wounds are hyper-metabolic due to the body working harder and faster to regain haemostasis. Collins (2003) also suggests that the body may then break down lean tissue to quickly release fuel and keep up with demand. Therefore, a patient may have depleted protein stores and yet have a high BMI as fat stores remain.

Each patient should be treated as an individual, and be provided with nutritional advice that meets their needs and promotes wound healing. If the patient's diet lacks vitamins and nutrients, wound healing could be delayed (Collins, 2003).

It is paramount that dietician intervention is implemented immediately to re-establish or continue appropriate nutrition that enables wound healing. Monitoring of food and fluid intake is a vital role for nurses involved in patient care.

Skin

Skin changes as a result of obesity increase vulnerability to tissue damage and impaired healing (Pokorny, 2008). Pokorny (2008) suggests that there can be a change in skin barrier function due to an increase in transepidermal water loss (TEWL), which may explain why patients who are obese often have dry skin and an



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impaired skin barrier function. Obesity also causes changes in sebaceous glands and sebum production, lymphatics, collagen structure and function, micro and macrocirculation and subcutaneous fat (Yosipovitch et al, 2007).

In addition, bariatric patients are unable to control their body temperature, causing increased sweat gland activity. Larger skin folds become overheated because of the thick layers of subcutaneous fat, increasing friction and moisture components (Pokorny, 2008). Retained moisture in skin folds encourages the growth of bacteria and fungi, which can lead to rashes and infection such as intertrigo.

Wound classification

Wounds can be classified as chronic or acute (Wilson and Clark, 2004). Acute wounds are usually those caused by trauma or surgery, i.e. skin grafts. Chronic wounds are those with delayed healing, caused by underlying conditions such as pressure and venous ulcers (Wilson and Clark, 2004).

Krasner and Kennedy-Evans (2001) identified five wound types associated with bariatric patients, namely:



Figure 1. Healing fungal infection.

- ▶▶ Non-healing surgical wounds
- ▶▶ Venous ulcers
- ▶▶ Pressure ulcers
- ▶▶ Diabetic foot wounds
- ▶▶ Recurrent intertrigal ulcerations.

Surgery

Wound healing may be slower in bariatric patients following surgery, as their wounds are at increased risk of dehiscence and infection, especially at the stitching line due to increased pressure from adipose tissue and reduced oxygen perfusion (Pokorny, 2008). If the wound is within heavy skin folds, this is further compounded by the build up of excess moisture leading to the formation of bacteria (Mathison, 2003).

Infection

Bariatric patients are at an increased risk of post-surgical and chronic infections. Wilson and Clark (2004) state that the literature is replete with references that suggest that there are higher incidences of infection among bariatric patients. Avascularity effectively decreases the ability to combat infection, as insufficient oxygen impedes neutrophils from phagocytising bacteria.

One of the first signs of an infected wound could be the seepage of serous drainage between the sutures. Wilson and Clark (2004) suggest that due to the dead space of fatty tissue which is poorly perfused, seromas and haematomas develop easily. Further indications include pain, erythema oedema, heat, odour, discolouration of the granulation tissue and wound breakdown. Cutting and White (2004) suggest that accurate identification of wound infection is a challenge for any clinician involved in this area of care, and can have a significant impact on patient morbidity.

Baugh (2007) reported that there is an increased risk of surgical site infections (SSIs) following abdominal surgery, if the procedure lasts more than two hours, if three or more comorbidities are present at the time of surgery, or if the wound is contaminated.

For bariatric patients with excess skin folds, particular attention should be given to personal hygiene to eliminate the risk of fungal infections (Figure 1). These will thrive in skin folds, especially when combined with warm, dark moisture areas, i.e. in the perineal and pannus area. This area is particularly difficult for bariatric patients to clean properly and also for the practitioner to manage, due to the heavy weight of the adipose tissue.

Pressure ulcers

Immobility is a contributory factor to pressure ulcer development (Lindgren et al, 2004). Bariatric patients are also at risk of pressure ulcers developing within the skin folds due to pressure or poor blood supply.

Extrinsic factors can also contribute, especially equipment provision that is not fit for purpose, for example:

- ▶▶ Beds which are too small where bedrails rub on the external surface of the skin causing pressure injury
- ▶▶ Armrests and inappropriate pressure cushions in chairs can compound the risk of pressure damage
- ▶▶ Poor vascularisation associated with adipose tissue increases the risk of atypical or unusual pressure ulcers. When tubes or catheters are involved they can burrow down into the skin folds, remaining undetected until it is too late.

Deep tissue injury (chronic wounds) can occur from immobility, with pressure appearing in the first instance as bruising or a reddened area. Baugh (2007) suggests that tissue destruction is a result not only of ischaemia, but also the ensuing tissue reperfusion once pressure is relieved.

Deep tissue injury differs from typical pressure ulcers, as the damage starts within the muscle rather than the epidermis. Hampton (2004) writes that little is written on pressure damage and overweight adults,

which may be due to the erroneous belief that the fat 'padding' provides cushioning against pressure. This is not the case and bariatric patients will sustain pressure ulcers due to dry skin and decreased mobility, which can result in their not participating in their own personal skin care, especially if they have heavy skin folds to lift and wash (Gallagher, 2005).

Pressure ulcers can be a common complication of lymphoedema, especially when the patient is also suffering from obesity. Ulcers can start as red patches on the skin that slowly break down into an open wound, or blister that breaks open.

Bariatric patients are further at risk if their body dynamic is that of an apple ascites or apple pannus, where the weight of the abdomen resting on their legs impedes lymphatic flow (Figure 2).

Risk factors of hospitalisation

Hospitalisation is a worrying experience for most patients, but for bariatric patients it is even more challenging. The risk of skin breakdown increases as the majority of environments are not suitable to manage bariatric patients, due to lack of staff education, inadequate staffing levels, combined with the bariatric patient's underlying condition (Gallagher, 2005).

The health or social care environment may be the pivotal point of the bariatric patient's lifestyle transformation. The environment should be holistic, evidence-based and client-centred. Kirkpatrick (2009) discusses an optimal caring = healing environment for obese clients. Figure 3 identifies the five components of this environment which can be transferred into any health or social care setting to promote healing, namely:

- ▶▶ An attitude and consistent behaviour of caring
- ▶▶ A client-centred and culturally competent health, social care provider
- ▶▶ Safety
- ▶▶ Cleanliness, and integration of the ARTS (A = aesthetics, R



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Figure 2. Typical lymphoedematous leg.

= recreational movement, T = therapeutic, and S = spiritual).

To maintain quality of care and bariatric patient dignity, equipment should be provided that is fit for purpose within environments

designed to accommodate the patient. This, together with increased staff numbers, will not only ensure quality bariatric wound management in a dignified manner, but also bariatric enablement rather than disablement.

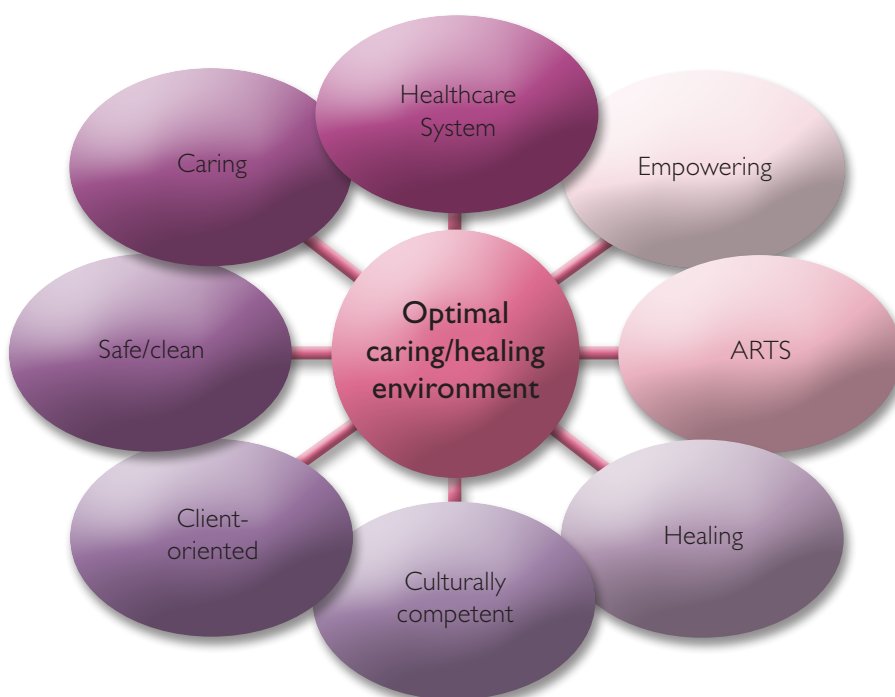


Figure 3. Optimal caring/healing environment (Kirkpatrick, 2009).

The plan of care must not stop at discharge. Discharge should be planned from the day of admission, as it is an important factor of hospitalisation and a continuum of care that prevents re-admission.

Case report

This case report is predominately based on the intervention required to heal a chronic wound (grade 4 sacral pressure ulcer). The ulcer was classified using the European Pressure Ulcer advisory Panel/National Pressure Ulcer Advisory Panel grading system (NPUAP/EPUAP, 2009).

Pressure ulcer grading:

- ▶▶ Grade 1: Intact skin with non-blanching erythema, usually over a bony prominence
- ▶▶ Grade 2: Partial-thickness loss of skin which involves the epidermis and possibly the dermis, which presents as an abrasion, blister or superficial ulcer
- ▶▶ Grade 3: Full-thickness loss of skin with extension into subcutaneous tissue, but not through the underlying fascia
- ▶▶ Grade 4: Full-thickness loss of skin and subcutaneous tissue extending into muscle, bone, tendon or joint capsule, with or without sinus tracts or undermining.

This bariatric patient was being cared for in the community in a two-storey house. She had been known to the community nursing team for many years for management of lymphoedematous legs. Lymphoedema is a chronic condition which can become progressive if not treated appropriately and usually presents as the swelling of one or more limbs (Lymphoedema Framework, 2006). The patient had been referred to a specialist for advice before developing a pressure ulcer and had undergone a Charles procedure in the past. This involves debulking fluid-filled tissue from the affected limb.

Lymphatic vessels can become damaged as a result of morbid obesity (Gallagher, 2005). In this case, the patient was unable to climb the stairs

so remained in a riser/recliner chair bought by a charity. This resulted in the legs becoming more oedematous, probably due to her heavy pannus. Wilson and Clark (2004) suggest that the abdominal girth of morbidly obese patients contributes to the resistance of return of venous blood flow.

The patient had previously suffered episodes of cellulitis which were usually managed at home with appropriate antibiotic therapy. However, during an episode of cellulitis she became particularly unwell and her mobility decreased. This resulted in longer periods sitting in the riser recliner chair. With appropriate equipment installed and regular visits from the district nursing service, the patient was able to remain at home. Unfortunately however, the patient had a fall and being unable to get up, remained on the floor for three hours.

Although appropriate equipment had been put in place, the patient was no longer able to stay at home and admission to a community hospital inpatient unit was arranged. On admission, a chronic wound, approximately 20cm in diameter was identified (grade 4 pressure ulcer to the sacrum).

The depth was difficult to assess due to the presence of necrotic tissue. The wound bed had thick, black necrotic tissue which had started to separate, exposing a deep cavity with some red granulating tissue. As a result of the depth and necrotic tissue, it was difficult to visualise the base. The main problem at this stage in the management of the wound was the risk of infection impeding the healing process. The other significant problem was profuse exudate (Figure 4), with the surrounding skin becoming red and macerated.

Exudate contains proteins which are essential to wound healing. Serum protein can quickly become depleted and should be monitored (Eagle, 2009). Eagle (2009) suggests that healing will be slower if the

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Figure 4. Grade 4 pressure ulcer to the sacrum with profuse exudate.

surrounding skin is soggy, as epithelial tissue is unable to migrate across the new granulation tissue. In this case, excess moisture was aggravated by lymphorrhoea, which can cause an increased risk of infection and maceration (Wingfield, 2009).

Initially, the wound was dressed using a Hydrofiber® as a primary dressing and a foam as a secondary dressing. Hydrofiber dressings are absorbent, containing hydrocolloid fibres which draw and retain exudate on contact with the wound (Ousey, 2005). A foam dressing was used to promote a warm, healing environment and to hold moisture away from the skin to prevent maceration.

However, the dressings selected for this patient were unable to contain the exudate and frequent dressing changes were being performed, sometimes more than twice a day. This had several implications, including the risk of further damage caused by moisture, and from shear and friction during movement of the patient.

As exudate management remained a problem, the decision was made by the multidisciplinary team to use topical negative pressure (TNP) once the wound bed was prepared. The patient was referred to the surgical team who surgically debrided the

wound, revealing a clean wound bed suitable for the application of TNP.

TNP promotes wound healing by improving blood flow, increasing granulation, removing microorganisms, reducing oedema and controlling exudate (Banwell and Teot, 2006). TNP was used for four weeks and during this time photographs and wound measurements were taken weekly to determine the extent of granulation tissue. The wound dimensions decreased significantly, with both granulation and epithelial tissue developing. As the wound was a deep cavity, there was the possibility of tracts and sinuses developing which can prolong healing and lead to infection (Eagle, 2009). Thus, the wound was probed gently with a gloved finger.

Moving the patient appropriately to perform dressing changes while maintaining dignity and pain relief posed a challenge both to the healthcare professionals and patient. Gallagher et al (2007) argued that patients and caregivers have a fear of injury. The importance of communication and team work is paramount to prevent injury and, indeed, to prevent deterioration of a pressure ulcer from shear and friction due to poor technique. It is also vital to know how to use the equipment appropriately (Rose et al, 2009). As part of the patient's care plan, it was agreed by the multidisciplinary team in discussion with the patient that dressing changes should take place during the crossover shift time, so that optimum staff were present on the unit. This reduced the risk of harm to both the patient and the other patients on the unit, as more staff were present.

While in hospital, different members of the multidisciplinary team were involved in this patient's care, including a GP, physiotherapist, tissue viability nurse and clinical nurse specialist for equipment. The senior back care advisor also educated the staff on the use of specialist equipment and safe handling

Key points

- ▶▶ It is essential to understand bariatric patient body dynamics to enhance patient quality of life.
- ▶▶ Bariatric patients' skin is vulnerable so daily skin checks are essential.
- ▶▶ Working as a multidisciplinary team enables positive patient outcomes.
- ▶▶ Maintaining appropriate pain relief is challenging for healthcare professionals.

techniques, while the pharmacist, being aware of the difficulties around the management of the wound, ensured that adequate supplies of dressings were available. Ousey (2005) maintains that it is 'imperative' that healthcare professionals work together across primary, secondary and tertiary boundaries to prevent and treat pressure ulcers. This is supported by the NICE Guidelines (NICE, 2005), which recommend seeking specialist advice for the selection of appropriate equipment and aids, a dietician for nutritional advice and surgical referral if appropriate.

Discharge planning was discussed throughout the patient's admission. As said above, this should be ongoing with assessment of the home and communication with the community team (Baugh et al, 2007) to ensure that the management of the patient continues at home to promote healing. Equipment needs and alterations should also be made before discharge.

Summary

Working as a multidisciplinary team enabled positive clinical outcomes for this patient. On reflection, the team

were able to look at the positive and negative aspects of the patient's journey through the healthcare system. The weaknesses were:

- ▶▶ Unplanned admission
- ▶▶ Having to wait for equipment appropriate for weight
- ▶▶ Indignity of being moved as the patient was rendered immobile by her condition, i.e. she was unable to get herself up when she fell at home resulting in a long time on the floor while help was found
- ▶▶ Patient's low self-esteem.

While the strengths included:

- ▶▶ Equipment obtained within four hours despite the weather
- ▶▶ Improved learning for team regarding management of bariatric patients
- ▶▶ Working together as a team and planning ahead
- ▶▶ Improved self-esteem of the patient.

This case enhanced the team's knowledge of caring for bariatric patients, not only with regard to wound management, but also the holistic aspect that considered the patient's dignity, the empathy from caregivers, and, most importantly, the ability to be creative in integrating the essence of care into day-to-day management tasks.

Conclusion

The complexity of this case report has highlighted some lessons that should be considered for future clinical risk management of these foreseeable situations, particularly as there is an upward trend of the obesity data, with almost one-third of the population likely to be obese (BMI greater than 30). The management of this patient was both a challenge and learning experience. A recent survey of organisational policies found that 42% of acute and primary care trusts had a policy for bariatric management (Hignett et al, 2007). Bariatric patient management is complex and multi-factorial, as shown in this case report. From the outset of the patient's journey (planned pre-assessment clinics or emergency admission), a safe

system of work should be provided to integrate the clinical treatment. **WUK**

References

- Armstrong M (1998) Obesity as an intrinsic factor affecting wound healing. *J Wound Care* 7(5): 220–1
- Banwell P, Teot L (2006) Topical negative pressure (TNP): the evolution of a novel wound therapy. *J Tissue Viability* 16(1): 16–24
- Baugh N, Zuelzer H, Meador J, Blankeship J (2007) Wound wise: wounds in surgical patients who are obese. *Am J Nurs* 107(6): 40–50
- Bushard S (2002) Trauma in patients who are morbidly obese. *AORN J* 76(4): 585–9
- Collins N (2003) Obesity and wound healing. *Adv Skin Wound Care* 16(1): 45–7
- Department of Health (1999) Health Survey for All England: The Health of Minority Ethnic Groups. London: Department of Health
- Dionne M (2002) One size does not fit all. *Rehab Management* 15(8): 28
- European Pressure Ulcer Advisory Panel/ National Pressure Ulcer Advisory Panel (2009) *Prevention and treatment of pressure ulcers: quick reference guide*. European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel, Washington DC
- Hampton S (2004) Pressure ulcer prevention for the morbidly obese patient. *Nurse 2 Nurse* 4(6): 1473–2114
- Eagle M (2009) Wound assessment: the patient and the wound. *Wound Essentials* 4: 14–24
- Gallagher S (2005) The challengers of Caring for the Obese Person Matrix. Medical Communications Chapter 11 page 96
- Gallagher D, Heymsfield SB, Heo M, et al (2000) Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index. *Am J Clin Nutr* 72(3): 694–701
- Hignett S, Griffiths P, Chipchase S, Tetley A (2007) *Risk assessment and process planning for bariatric patient handling pathways*. Health and Safety Executive Research, Loughborough University
- Kirkpatrick MK, Esterhuizen P, Drake D (2009) An optimal caring = healing environment for obese clients. *Bariatric Nurs Surg Patient Care* 4(2): 123–32
- Krasner D.L, Kennedy-Evans KL (2001) *Chronic Wound Care: A Clinical Source Book for healthcare Professionals*. 3rd edn. Wayne, Pa: HMP Communications
- Lindgren M, Unosson M, Fredrikson M, Ek AC (2004) Immobility — a major risk factor for development of pressure ulcers among adult hospitalized patients: a prospective study. *Scand J Caring Sci* 18(1): 57–64
- Lymphoedema Framework (2006) *Best Practice for The Management of Lymphoedema*. International consensus. MEP Ltd, London
- Mathison CJ (2003) Skin and wound care challenges in the hospitalised morbidly obese patient. *J Wound, Ostomy Continence Nurs* 30(2): 78–83
- National Institute for Health and Clinical Excellence (2005) *The Prevention and Treatment of Pressure Ulcers. Clinical Guidelines*. NICE, London
- National Institute for Health and Clinical Excellence (2006) Obesity: guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children. NICE, London. Available online at: www.nice.org.uk/nicemedia/pdf/CG43NICEGuideline.pdf
- NHS Information Centre for Health and Social Care (2009) Statistics on Obesity, Physical Activity and Diet, England, February 2009. Available online at: www.ic.nhs.uk/webfiles/publications/opan09/OPAD%20Feb%202009%20final.pdf
- Porkorny ME (2008) Lead in: skin physiology and disease in the obese patient. *Bariatric Nurs Surg Patient Care* 2(2): 125–8
- Rose MA, Pokorny M, Drake DJ (2009) Preventing pressure ulcers in the morbidly obese: In search of an evidence base. *Bariatric Nurs Surg Patient Care* 4(3): 221–6
- Ousey K (2005) *Essential Skills for Nurses: Pressure Area Care*. Blackwell publishing, Oxford
- Troia C (2002) Promoting positive outcomes in obese patients. *Plast Surg Nurs* 22(1): 10–17, 28
- Wilson JA, Clark JJ (2004) Bariatric skin and wound care. Obesity: impediment to postsurgical wound healing. *Adv Skin Wound Care* 17(8): 426–35
- Wingfield C (2009) Chronic oedema: the importance of skin care. *Wound Essentials* 4: 26–34
- World Health Organization (2000) *Obesity: Preventing and Managing the Global Epidemic*. WHO, Geneva
- Yosipovitch G, DeVore A, Dawn A (2007) Obesity and the skin: skin physiology and skin manifestations of obesity. *J Am Acad Dermatol* 56(9): 901–16