THE IMPORTANCE OF WATER: IN MODERN WOUND CARE

Water is a vital element, not only for life, but also for optimum wound healing. It has been demonstrated that poorly hydrated individuals are more likely to develop pressure ulcers because dehydration reduces the padding over bony points. Reduced hydration also denies wound tissues the necessary nutrients for healing. This article looks at how clinicians can ensure that they provide patients with adequate hydration.

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Table 1.

Tips for encouraging water consumption (adapted from the RCN, 2007)

Serve water fresh and chilled – not left in open jugs
Offer water at mealtimes and between meals as many people prefer to drink little and often aiming for 6–8 glasses of fluid per day
Patients tend to drink all the water in their glass when swallowing tablets so offer slightly larger volumes and they will tend to drink more
Serve water alongside coffee and tea and explain why it would be beneficial to drink more water
Patients often worry about increased toilet visits during the night so encourage water consumption in the mornings
As the weather gets warmer, increase the availability of drinking water and encourage patients to drink more. Older people perspire more in warmer weather and the warm hospital environment
Offer water and fluids at mealtimes. Make sure those that are less able are offered a drink
Identify those patients at risk of dehydration or those that require assistance with drinking and monitor and record their fluid intake
Serve water (hot or cold) with flavourings such as squash, or slices of citrus fruit to make it more interesting
Older people and those who are unwell can lose their thirst response and their taste sensation. Never take it for granted that they will know when they need to drink

Water is an often overlooked but very important nutrient. It is vital for maintaining the correct function of all the body's systems. It is needed to act as a solvent for ions and molecules, to act as a transport medium, as a lubricant and to regulate body temperature. The water in our bodies is in a constant state of flux; we eat, we drink, we pass urine and we sweat, yet despite all of this our bodies maintain a steady total volume of water. Any disruption in the quantity of water in our bodies can cause serious problems. This article will look at how much of our bodies is made up of water, how much we actually need and the function it plays in health and disease, with a particular focus on wounds and wound healing.

Body composition

In humans water comprises 50–70% of total body weight, the percentage varying according to age and gender. A 70kg man will have around 45 litres of fluid in his body; a woman would have slightly less due to females having a greater proportion of fat. Fluid is essential to life and although humans can survive for a period of weeks without food, they cannot withstand deprivation of fluid for more than a few days or even hours in some circumstances. Normally, the total fluid volume fluctuates by less than 1% per day despite variations in fluid intake; changes in body fluid volume of as little as 1–2% can lead to illness and sometimes death.

Failure to maintain the right volume of body water leads to impaired blood circulation, which then rapidly leads to tissue death due to lack of oxygen and nutrients and failure to remove waste products. Water in the body is primarily divided into two compartments; the intracellular and extracellular compartments, the later being composed of the interstitial fluid and the plasma. These compartments are separated by semi-permeable barriers which permit the free passage of salt and water but only limited movement of other dissolved substances such as proteins. Both compartments are interdependent and movement of

fluid between them is regulated by pressure gradients and osmosis.

Hydration control

The amount of water in the body is regulated to maintain an osmotic pressure in body fluids of 285mosm/kg. In normal circumstances an increase in osmolality will be corrected by an increased water intake in response to thirst, together with decreased water excretion via urine. If osmolality decreases, water excretion via the kidneys increases. The hormone control of this function is complex and if there is any disruption and these adjustments cannot be made, due to environmental circumstances or body dysfunction, dehydration or overhydration can occur.

Renal function is therefore an important factor in the regulation of fluid balance and any impairment is often characterised by oedema. 'Pitting oedema' is the most common clinical symptom of an expanded interstitial volume. Pitting oedema' is the swelling of body tissues due to the accumulation of fluid and can be shown pressing the swollen area with a finger — if there is an indentation that persists after the release of the pressure, this is known as pitting oedema. It is important to remember that in practice the location of pitting oedema is affected by gravity and that a bedridden patient may show signs of sacral oedema in the absence of ankle oedema and therefore is at greater risk of pressure damage.

Fluid balance

The body can maintain fluid balance despite variations in intake and losses under normal circumstances. Fluid intake is normally controlled by the sensation of thirst, which is regulated by the hypothalamus. However, a significant proportion of fluid is also derived from food as well as drink — around 20% from food compared with 80% from drink (Water UK, 2010). The body also obtains around 300ml per day from metabolism (Thomas and Bishop, 2007).

Fluid output is primarily controlled by the kidneys, but losses also occur via the skin, lungs and gastrointestinal tract. Typical losses per 24 hours are approximately (Thomas and Bishop, 2007):

- 1500ml from urine
- 150ml from faeces
- 400ml from the lungs
- 750ml from the skin.

These volumes are variable and depend on factors such as body surface area, climate, activity, state of health and dietary intake. Pyrexia (fever) increases fluid requirements by about 500ml/day per 1°C rise in temperature. When considering fluid balance, all losses of fluid should be taken into account, e.g. vomiting, diarrhoea, ileostomy output, drains and wound exudates, some of which may be difficult to quantify (Thomas and Bishop, 2007).

The kidneys play a vital role in regulating the amount of fluid in the body, but their function deteriorates with age. Age-related changes such as alterations in hormone levels also mean that water balance takes longer to be restored even after a drink has been consumed. Although fluid balance can usually be maintained under normal circumstances, dehydration can occur as a result of cognitive impairment, changes in functional ability, medication such as laxatives, diuretics or hypnotics, illness or stress on the body arising from other factors. In addition, thirst, the body's natural response to dehydration, has been shown to be impaired in older people. Patients with stroke or those with Alzheimer's disease may be particularly insensitive to thirst (Water UK, 2010). These are the types of patients nurses should be concerned about and take extra care to monitor their fluid intake.

Provided that renal function is adequate, patients can normally excrete excess fluid. However, in the acute phase of recovery post trauma (illness or surgery) individuals should not be given excess fluid as this can increase their risk of complications. Overloading patients with fluid is a particular problem in surgical patients as excess fluid and sodium is a common cause of oedema, prolonged ileus (disruption of the normal propulsive gastrointestinal motor activity) and other post surgical complications (NICE, 2006).

Fluid requirements

Individual fluid requirements vary considerably — the minimum intake should be sufficient to replace losses from all sources and provide adequate dilution for the excretion of solutes via the kidney. The maximum intake of fluids should be that which the kidney can excrete. Fluid requirements are usually based on body weight since this or body surface area determines the

extent of water loss via the skin and lungs. In normal adults fluid requirements are approximately 30–35ml per kg of body weight (Parenteral and Enteral Nutrition Group [PENG] of the British Dietetic Association, 2007) — this equates to between 1.5–3 litres per day. Infants and young children require considerably more as a proportion of body weight; between 120–150ml/kg up to the age of one year (Great Ormond Street Hospital, 2000). Nurses can judge whether someone is consuming enough fluid by the colour of his or her urine – if it is a pale straw colour the fluid intake is probably sufficient; if it is dark yellow he or she may need to drink more.

Fluid imbalance and wounds

Acute dehydration usually results from pathological conditions resulting in increased fluid losses rather than reduced fluid intake (i.e. gastroenteritis) and can be life-threatening. Chronic dehydration is usually caused by low fluid intake, and can result in constipation, headaches, lethargy and mental confusion and increases the risk of urinary tract infections.

Severe fluid imbalance is usually only a risk in people who are critically ill or given inappropriate nutritional or hydration support. However, mild-moderate fluid depletion is a high risk in many clinical circumstances and hydration status is an important consideration in the management of all patients in hospital.

Fluid retention can occur after serious injury. Aldosterone (a hormone that increases blood volume and therefore blood pressure) and antidiuretic hormone secretion rises and urine output falls. There is an increase in capillary permeability to water and to the smaller plasma proteins such as albumin and a resulting loss of intravascular fluid into the extravascular space. Intravenous fluids given for resuscitation also pass into the interstitial space and are retained for the duration of the acute phase of the illness. Even in the absence of fluid being put into the body these compartmental shifts in fluid distribution occur. Fluid retention following elective surgery can amount to up to 5 litres, delaying recovery and wound healing and increasing the risk of pressure damage.

Oedema or increased weight increases the risk of pressure ulceration through greater skin compression and reduced mobility. Coexisting dehydration and vascular disease compromise the filling of local tissue with fluid, nutrients and immune agents. Adequate perfusion of the wound tissue is essential to supply fluid and nutrients and maintain immune defences (Thomas and Bishop, 2007).

The National Institute for Health and Clinical Excellence (NICE) (2001) has identified that inadequate fluid intake leading to dehydration is an independent major risk factor for the development of pressure sores. Skin becomes inelastic and fragile and more susceptible to breakdown. Older debilitated patients are particularly vulnerable to dehydration and may voluntarily decrease fluid intake to control urinary incontinence, thus increasing their risk of pressure sore formation. Many patients also have a decreased thirst response as they get older and do not voluntarily take drinks without prompting.

Poorly hydrated individuals are twice as likely to develop pressure ulcers because dehydration reduces the padding over bony points. It has been shown that some nursing home residents with pressure ulcers had low subcutaneous oxygen, which could impair ulcer healing. In further work it was found that fluid administration to correct impaired hydration increased levels of tissue oxygen and enhanced ulcer healing (Stotts and Hopf, 2003).

Conclusion

A moist environment allows the optimum environment for healing. Epithelial cells will migrate over living tissue and this process can be delayed by dehydration. A wound surface that has been exposed to air for a lengthy period suffers cellular dehydration, tissue necrosis and increase in wound depth.

When a wound has to be exposed for examination by medical staff cling film can be used to prevent dehydration and help protect and maintain temperature. Most modern dressings have been designed to allow moist healing.

The use of the most appropriate dressing will maintain a moist environment at the wound surface without causing maceration of the surrounding skin. WE

Recommendations tips for encouraging water consumption on the wards are shown in *Table 1* (RCN, 2007).

Great Ormond Street Hospital (2000) *Nutritional Requirements for Children in Health and Disease*. Dietetic Department, Great Ormond Street Hospital, London

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Stotts NA, Hopf HW (2003) The link between tissue oxygen and hydration in nursing home residents with pressure ulcers; preliminary data. *J Wound Ostomy Continence Nurs* **30:**184–90

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Water UK (2010) Wise Up on Water. Hydration and Healthy Ageing. Available at: http://www.water.org.uk/home/water-for-health/resources/wise-up---older-web.pdf (acessed 19 May, 2010)

Key points

- **Water is vital for maintaining correct function of all body systems.**
- **Lack of water leads to impaired blood circulation.**
- **Impaired blood circulation rapidly leads to tissue death due to lack of oxygen and nutrients and failure to remove waste products.**
- **The average adult requires 1.5–3 litres of fluid per day (6–8 cups).**
- **Monitor patients fluid balance closely and take action for those who are not able to meet their fluid requirements independently.**