Artificial hydration in the terminally ill patient

Oral fluid intake is often reduced in dying patients. This article outlines the clinical assessment of the likely net benefit of artificial hydration, and the evidence relating to its use.

Best care for patients at the end of life is challenging, especially in the context of an ageing population with multiple medically managed comorbidities. The diagnosis of dying is complex, often accompanied by clinical uncertainty, and is made by the clinical team in an iterative manner over hours or even weeks according to a patient's response, or lack of response, to interventions, with continued deterioration (Taylor and Johnson, 2011).

Decisions regarding the use of artificial hydration fall broadly into two categories towards the end of life: first, given as an attempt to resuscitate and reverse a potentially reversible clinical insult, with or without other specific measures. An example of this would be a trial of intravenous fluids and antibiotics where sepsis is apparent or suspected. In this situation, there is an expectation of clinical improvement within a given timeframe. Other examples of potentially reversible conditions are given in *Table 1*. The second broad category is when it appears that the patient is dying with no reversible cause. In this situation, the aim of clinical care is to maximize the patient's comfort, part of which might include attention to his/her state of hydration. This article focuses on the second situation, as in the first, a trial of intravenous fluids attempting to correct the estimated fluid deficit should be given.

As people approach the end of their lives they often have a decreased fluid intake as a result of a variety of factors including sleepiness, cognitive impairment, anorexia, nausea and vomiting, decreased muscle strength and decreased ability to swallow (Chiu et al, 2002; Dev et al, 2012). The clinical decision regarding the net benefit of artificial hydration must be made for each individual, assessing whether fluid depletion is contributing to a patient's symptoms and clinical state. If a trial of fluids is deemed appropriate, daily assessment of the beneficial and detrimental effect of the fluids is important, along with clear treatment goals, which should be communicated clearly with the patient if possible, the family, other informal carers and the clinical team. A patient with mental capacity has the right to refuse hydration, or to ask for artificial hydration to be withdrawn (General Medical Council, 2010). However, if the patient lacks capacity and does not have an advance directive, the health-care professionals together with family and carers have to act in the best interests of the patient. Artificial hydration is regarded in law as medical treatment and should be considered as any other medical intervention (General Medical Council, 2010).

The main questions regarding the use of artificial hydration in the dying patient are:

1. Does it prolong survival?
2. Does it alleviate symptoms?
3. If artificial hydration is indicated, what is the best method of administration?

However, the first step must be a careful clinical assessment of the patient to examine whether reduced fluid intake has led to significant fluid depletion.

Table 1. Potentially reversible causes of dehydration

Hypercalcaemia
Hyperglycaemia
Diuretics
Diarrhoea
Vomiting
Sweating

Assessment of hydration in the terminally ill patient

A systematic review of 15 studies evaluated the evidence for methods of hydration assessment in patients with advanced cancer. The review concluded that there is a lack of evidence relating to clinical or laboratory assessment (Nwosu et al, 2012). Therefore, in the absence of any validated assessment tool, symptoms and signs of dehydration (*Table 2*) should be sought systematically along with an assessment of the pattern

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Table 2. Symptoms and signs of dehydration
Thirst
Fatigue or tiredness
Dizziness or light-headedness
Headache
Diminished skin turgor
Dry oral mucous membranes
Sedation
Agitation
Confusion
Delirium
Hallucinations
Myoclonus
Decreased urine output

and amount of the patient's oral intake over the past few days. It is important to also take into account the patient's medical history, drug history, individual views and expectations. Careful assessment for reversible factors is important. Even with the reduced conscious level and increased weakness commonly seen in the dying person, the possibility of a reversible factor must be considered taking the full clinical context into account (*Table 1*). For example, a cachectic patient with a World Health Organization performance status 4 as a result of extensive and metastatic oesophageal cancer, with severe dysphagia caused by malignant stricture, is unlikely to gain net benefit from an attempt at stent insertion. On the other hand, treatment of severe oesophageal candidiasis, if present, may well help the patient. Blood tests should only be performed at the end of life if the results would contribute to a change in management, e.g. clinical assessment suggests a reversible cause of deterioration such as hypercalcaemia or hyperglycaemia.

Bioelectrical impedance has been used to assess hydration, but in patients with advanced cancer (because they have reduced intracellular water) calculations may be inaccurate as they are based on equations from healthy people. Analysis of the raw bioelectrical impedance measurements using vector analysis may have a role as a hydration assessment tool in patients with advanced cancer, but currently this method is not common in daily clinical practice (Nwosu et al, 2012). Reassessment of the patient, including his/her comfort and the patient's and family's satisfaction, is central to the management of hydration in the terminally ill patient. Where a trial of artificial fluids is given, reassessment will also include monitoring for signs of fluid overload, including peripheral and pulmonary oedema, pleural effusion and ascites as well as any effect on bronchial secretions.

Evidence for hydration at the end of life

Will artificial hydration in the dying patient increase survival?

There are few data on the effect of artificial hydration on survival. In a randomized, placebo-controlled, double-blind trial of 129 terminally ill patients with advanced cancer (median survival 17 days), Bruera et al (2013) showed that 1 litre/4 hours normal saline subcutaneously per day had no benefit on survival in mildly to moderately dehydrated patients compared with placebo (100 ml of normal saline) over 4 hours every day. In another study of patients with terminal cancer admitted to a palliative care unit, the effect of artificial hydration and nutrition was investigated and did not have an effect on survival (Chiu et al, 2002). Studies in this area are difficult to design and conduct, and those that are available are mainly in people with cancer.

Will artificial hydration in the dying patient improve symptoms?

A systematic literature review of the practice and effects of artificial hydration in the last week of life in cancer patients showed that those who received artificial hydration in the last week of life varied from 12–88% (Raijmakers et al, 2011b). A Cochrane review of medically assisted hydration for adult palliative care patients in 2008 and updated in 2011 reported the results of five randomized controlled trials and prospective controlled studies which concluded that there is not sufficient evidence to make any recommendations for use of artificial hydration in palliative care patients (Good et al, 2011). These five trials together with more recent studies are described in *Table 3*.

The systematic review of 15 studies described above, which primarily evaluated the evidence for methods of assessment of hydration in patients with advanced cancer, also concluded that there is a lack of evidence relating to the symptom benefit from artificial hydration at the end of life (Nwosu et al, 2012). There is no consistent evidence to show the effects of artificial hydration on symptoms, quality of life and length of survival. Thus, the common practice of providing hydration during the terminal phase is not based on robust evidence of benefit (Raijmakers et al, 2011b).

Patient and family perspectives of fluid administration

Although health-care professionals might perceive parenteral fluids to be a burden for patients and their families, 17 patients with advanced diseases were interviewed using 37 statements about artificial hydration, and it was found that this view is not necessarily shared by patients; many reported wanting a trial of hydration if they could no longer drink (Malia and Bennett, 2011). Most patients based this decision on whether it would improve quality of life rather than increasing survival, although this was also important for some

patients. Patients viewed artificial hydration as an important issue and wished to be involved in decision making. Thus clear information is crucial for patients to make an informed choice (Malia and Bennett, 2011) and it is important to ascertain the views of patients and families about hydration, rather than withholding fluids at the end of life.

A systematic literature review of 11 studies reported that most patients believed that hydration could improve physical or psychological wellbeing and survival, while in contrast, most health-care professionals did not (Raijmakers et al, 2011a). In a study from the USA, patients and their family perceived hydration as potentially life prolonging and able to enhance quality of life, reducing fatigue, pain and increasing patients' alertness. Therefore an assessment of not only the likely net clinical benefit, but also of the expectations and beliefs held by the patients and their families about artificial hydration is an essential part of two-way communication. Explicit discussion of these may help tailor care plans to meet specific patient needs (Cohen et al, 2012). In Japan, cancer patients who received parenteral hydration therapy were highly satisfied with the therapy and felt that this had been of benefit to them, but this was not related to the volume of hydration or clinical outcomes (Yamaguchi et al, 2012). In view of potentially different cultural and societal views about hydration at the end of life, it is important to ensure these are understood during the assessment.

How should fluids be administered in the dying patient?

Depending on the degree of dehydration, clinical condition and symptoms, hydration can be achieved by encouraging oral intake, with small amounts of fluids being encouraged regularly or, if already in situ, via a nasogastric or percutaneous endoscopic gastrostomy tube, or parenterally. Parenteral fluids might be needed if the patient has emesis or bowel obstruction or if he/she is very sleepy with no nasogastric or percutaneous endoscopic gastrostomy access. In the absence of nasogastric or percutaneous endoscopic gastrostomy access, in the last days to weeks of life insertion of a tube is unlikely to be of benefit unless there is another indication such as faecal vomiting in obstruction, and parenteral administration is less invasive.

The two main routes of parenteral fluid administration are subcutaneous and intravenous. Subcutaneous fluids (hypodermoclysis) are relatively easy to administer, and can be given outside the hospital setting. There is some, albeit conflicting, evidence indicating some symptom benefit from 1 litre/24 hours subcutaneous fluids administered to dying patients with mild to moderate dehydration. The subcutaneous fluid forms an oedematous area around the site of insertion, from which absorption occurs. They are generally well tolerated and are unlikely to cause fluid overload. In view of the limited volume infused they will be unable to correct severe dehydration or make up for large enteric losses.

Table 3. Summary of main trials evaluating medically assisted hydration for adult palliative care patients

Reference	Population studied	Results and conclusions
Waller et al (1994)	68 hospice patients, serum sodium and urine osmolarity collected prospectively within 2 days of death. Treatment: intravenous fluids 1–2 litre/day (*n*=13); non-treatment: oral fluids	Treatment group was not better hydrated and no statistical differences in state of consciousness between groups. Non-randomized and poorly defined groups
Viola et al (1997)	66 advanced cancer patients recruited. One centre delivered subcutaneous fluids (median 1 litre/day), another centre delivered usual care	Groups were not matched and no statistical analysis performed between groups
Cerchietti et al (2000)	42 patients with terminal stage advanced cancer recruited and randomized. Treatment: 1 litre 5% dextrose/saline in 24 hours subcutaneously; non-treatment: usual treatment. All received haloperidol and/or metoclopramide	Sustained improvement in nausea at 48 hours in treatment group. Randomization and blinding methodology unclear
Bruera et al (2005)	51 terminally ill cancer patients recruited and randomized. Treatment: 1 litre normal saline as an infusion over 4 hours; placebo: 100 ml normal saline as an infusion over 4 hours	Significant improvement in myoclonus and sedation in the treatment group, hydration was well tolerated, placebo effect observed
Morita et al (2005)	226 patients with incurable malignancy of abdominal origin, life expectancy <3 months. Treatment: ≥1 litre fluids per day; non-treatment: oral fluids	Dehydration significantly improved in treatment group, but significantly higher rates of pleural effusion, ascites and peripheral oedema. No randomization, varying fluid regimens
Yamaguchi et al (2012)	Parenteral hydration in 161 patients with advanced abdominal cancer in a prospective, observational study. Large-volume hydration group (>1 litre/day), small-volume hydration (<1 litre/day)	No significant difference between the groups on changes in global quality of life, discomfort scale, and symptom intensities; fluid retention signs were generally stable in both groups. Large-volume hydration was significantly associated with a decreasing intensity of dry mouth whereas small-volume hydration was significantly associated with increased agitation and hyperactive delirium
Bruera et al (2013)	129 terminally ill patients with advanced cancer in a randomized, placebo-controlled, double-blind trial. Treatment: 1 litre of normal saline subcutaneously; placebo: 100 ml of normal saline over 4 hours every day	No differences between the two groups for change in total dehydration symptoms, delirium, serum urea and creatinine values and overall survival

Hypodermoclysis was first described in 1913 as a way of providing fluids to people who have an inadequate oral intake and has been described in several observational studies, although it has only relatively recently been tested in a controlled trial (Rochon et al, 1997; Good et al, 2011; Bruera et al, 2013). There is little evidence to guide the type of fluid to be used in this setting, but isotonic solutions are needed to minimize side effects. Many of the studies administered 1 litre of normal saline per day. A review of subcutaneous dextrose of different strengths mixed with normal saline for rehydration of elderly patients showed that these mixtures can be used for the treatment of dehydration, with similar rates of adverse effects to intravenous infusion (Rochon et al, 1997; Turner and Cassano, 2004). Studies in elderly patients either with acute stroke or cognitive impairment have shown that subcutaneous fluids are an effective alternative to intravenous fluids in those who are not severely dehydrated but need parenteral fluids (Challiner et al, 1994; O'Keeffe and Lavan, 1996). *Table 4* provides an overview of how to administer subcutaneous fluids.

Intravenous fluids can be delivered at a higher rate, but would be reserved for the inpatient setting and for people with significant dehydration or with major electrolyte imbalances. Frequent assessment is needed especially in people nearing the end of life as fluid overload can lead to increased discomfort (Raijmakers et al, 2011b). Normal saline is the usual fluid used, especially if only 1 litre per day is needed and electrolytes are normal. If more than 1 litre a day intravenously is required, then 5% dextrose should be given along with potassium supplementation.

Table 4. How to administer subcutaneous fluids

Explanation to patient and family, including goals of care
Insertion of a 21 or 23 gauge butterfly cannula under aseptic conditions into the abdominal, thigh or upper torso or arm subcutaneous tissue
Attach to a bag of isotonic parenteral fluids (usually 5% dextrose or 0.9% saline solutions) via a giving set, commonly infused at a rate of 1 litre over a 12–24 h period
Assess regularly for benefits or side effects of this treatment

From Sasson and Shvartzman (2001), Barton et al (2004)

KEY POINTS

- There is no standard assessment tool.
- A thorough clinical evaluation with regular review is needed. Assess the patient for reversible causes of dehydration and address if present.
- Discuss management options and expected net benefit with the patient, when possible, and the family.
- The oral route (small amounts often) should be used when possible, with encouragement and assistance where necessary.
- If the oral route is not possible and the patient is symptomatically dehydrated, a trial of an infusion of subcutaneous normal saline (1 litre every 12–24 hours) with monitoring of effects and side effects can be used.
- If appropriate, large volume fluid losses should be replaced intravenously.
- There is no consistent evidence for benefit for symptoms or survival of parenteral hydration at a rate of 1 litre every 12–24 hours for terminally ill cancer patients, nor is there any harm.

Conclusions

The evidence base informing clinical decision-making about artificial hydration in the dying patient is sparse. Currently there is no good quality evidence to suggest that low volume artificial hydration in the dying patient improves survival when the patient can no longer take oral fluids.

Future research is needed to examine the benefits and burdens of artificial hydration in the dying, in specific patient groups at the end of life such as for those with non-malignant conditions, and in those with specific symptoms such as delirium. The clinical information given to patients about hydration at the end of life needs careful consideration. A better understanding of the concerns and expectations of patients and carers in the context of artificial hydration at the very end of life, and the effects on their decision making is needed.

Therefore, as in all aspects of patient care, an approach tailored to the individual's values and context is needed. Careful clinical assessment (including looking for any reversible causes) and monitoring before and during fluid administration or withholding is mandatory. If the patient appears to have symptoms related to dehydration, which cannot be managed enterally, then discussion with the patient (where possible) and the family is needed. This should include explanation of the benefits, burdens and risks of fluid administration and, if in keeping with the goals of care, a monitored trial of fluids, keeping the patient and family informed, should be considered. **BJHM**

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