Clinical Interventions Track: Drinking, Fluid Intake, and Dehydration in Older People

Saturday, November 21 8:00-9:30am

With Janet Mentes, James Powers, Diane Bunn, Florence Jimoh, and Lee Hooper

Clinical Interventions Track: The symposium, an Introduction

Janet Mentes, Chair
UCLA School of Nursing, jmentes@sonnet.ucla.edu

The symposium:

- **8:05 Janet Mentes: symposium chair, introduction**
- **8:10 Jim Powers: dehydration – why is it important and how do we diagnose it?**
- **8:20 Lee Hooper: how many & which older people are dehydrated?**
- **8:30 Florence Jimoh: the Drinks Diary – a tool to quantify drinking**
- **8:40 Lee Hooper: how can we tell whether older people are dehydrated?**
- **8:50 Diane Bunn: How can we help older people to drink well?**
- **9:10 Lee Hooper: take away messages and tools, evaluation forms**
- **9:15 Janet Mentes: question session**
- **9:30 end**

Complexities of Hydration in Older Adults

- Dehydration offers no opportunity for preventive intervention
- Research on dehydration has focused on attempting to detect IMPENDING dehydration
- Difficult to detect a “subclinical” condition and more difficult in frail older adults

What are the issues?

- Detection: which measure for impending dehydration---urine, saliva, serum, clinical signs? Single or serial measurements?
- Mechanism of dehydration
  - Active: vomiting diarrhea
  - Passive: not drinking enough

What are the issues?

- Age-related changes
  - Thirst mechanism, older adults drink less
  - Kidneys
  - Body composition
  - Changes in physical activity levels
- Health status
  - Chronic diseases
  - Multiple medications

- Our presentation will address these issues and identify important clinical implications and areas for future research
- Technology may help solve detection issues in so far as the use of serial measurements related to intake or evaluation of biomarkers. This can allow for personalized approach to hydration status in older adults.

Questions:

- We look forward to your thoughts and questions
- As we don't have audience microphones please write your question on the paper provided and pass up to the speakers
- We will work through the questions at the end of the presentations, during the last 15 minutes of the symposium

Clinical Interventions Track: Drinking, Fluid Intake, and Dehydration in Older People

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Clinical Interventions Track: Dehydration – what is it? Why is it important? How do we diagnose it?

James S. Powers, MD
Associate Professor of Medicine, Vanderbilt University School of Medicine
AD/Clinical, TVHS GRECC

Water in the body

Decrease in FF Mass with aging
Decreased TBW in elderly (10-30%) from predicted 70% in adults
Decreased reserves associated with aging
Maintaining intracellular fluid is needed for normal physiology
Maintaining extracellular fluid is needed for:

- Maintenance of circulation
- The lymphatic system
- Thermoregulation via sweating
- Excretion of waste products
- Tearing and secretion
- Enable eating & digestion (saliva, gastric juices, fluid in the intestines, faecal bulk)

Fluid is crucial to our health and wellbeing

Clinical Interventions Track

- HS chairs encourage involvement of clinicians
- 2015 GSA collaboration with Florida Geriatrics Society
- Topics:
  - Dehydration
  - Antibiotic Stewardship
  - Preservation of functional status
  - Sarcopenia
  - Oral health
  - Exercise
  - Prevention

What is dehydration?

- Dehydration is "loss or removal of fluid" from the body
- occurs when fluid intake fails to fully replace fluid losses in the body
- Dehydration Council*: dehydration … results in a reduction in total body water
  - water-loss dehydration (not drinking enough)
  - salt-loss dehydration (excessive losses)

*Thomas DR et al. J Am Med Dir Assoc 2008;9(5):292-301.

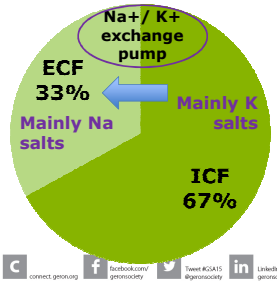
Water-loss dehydration

- due to fluid (water) deficit
- can be hypernatraemic or hyponatraemic w. hyperglycaemia
- Defined & diagnosed by serum osmolality:
  - 275 to <295mOsmol/kg is hydrated
  - 295-300 mOsmol/kg impending water-loss dehydration
  - >300 mOsmol/kg current water-loss dehydration

Appears very common in older people

What happens when we drink less?

Composition of TBW



1. **ECF Na concentration rises**
2. **Water moves from ICF to ECF to equalise osmolality**
3. **ICF osmolality rises**
4. **Cells shrink**
5. **Osmoreceptors increase thirst & water intake, stimulate vasopressin secretion & reduce water loss**

TBW: total body water, Na: sodium
ECF: extracellular fluid, ICF: intracellular fluid

Water-loss dehydration

- Water-loss dehydration is also called
  - dehydration, or
  - intra-cellular dehydration, or
  - hyperosmolar dehydration
- Diagnosed by raised serum or plasma osmolality with normal sodium, potassium, urea & glucose – the only useful measure in older adults
- (salt-loss dehydration is sometimes named hypovolemia, or extracellular dehydration)

Usual ways of diagnosing dehydration may be inaccurate in older adults:

- With renal function plasma urea/creatinine ratio (BUN/creatinine ratio) indexes hydration status relative to protein metabolism… but renal dysfunction is common
- Low fluid intake …. but individual needs variable
- Physical assessment …. Problematic as of people aged 65+ with diagnosis of dehydration 17% had serum osmolarity >295 mOsm, 11% had serum Na >145, relying on unhelpful clinical signs (i.e. skin turgor)? (Thomas DR et al, JAMDA 2003;4:251-4)
- Weight fluctuates dramatically in well hydrated older adults (Vivanti A et al, J Hum Nutr & Diet 2013;26:429-35)

How do we diagnose dehydration?

"The primary indicator of hydration status is plasma or serum osmolality"

National Academy of Sciences. Dietary Reference Intakes for water, potassium, sodium, chloride, and sulfate. Consensus Report 2004

What is the effect of dehydration on health?

- Associated with major causes of **mortality & morbidity** in older people
  - Falls, fractures, confusion & delirium
  - Pressure ulcers, poor wound healing
  - Constipation, urinary tract infections
  - Heat stress, infections, kidney stones
  - Renal failure, drug toxicity
  - Stroke, myocardial infarction

Chan J et al. *Am J Epi* 2002;155:827-33
Olde Rikkert MG et al. BMJ 2009;339(b2663)
Rolland Y et al. Am J Med 2006;119(12):1019-26
Thomas DR et al. *J Am Med Dir Assoc* 2008;9:292-301
Wakefield BJ et al. *Rehab Nurs* 2008;33:233-41

What is the effect of dehydration on health?

Prospective studies (well adjusted) suggest raised serum osmolality and tonicity are associated with

- increased risk of mortality in a general elderly US population, UK stroke patients and US older people with diabetes
- Increased the risk of disability at 4 years
  - RR 2.1, 95% CI 1.2 to 3.6
  - RR 1.8, 95% CI 0.8–3.9 in normoglycaemics

1999 US estimated avoidable cost to healthcare of older people admitted to hospital with 1° dehydration was $1.1 to $1.4 billion/yr (Xiao 2004)

Bhalla A et al. Stroke 2000;31:2043-8.
Stookey JD et al. J Am Geriatr Soc 2004;52:1313-20.
Wachtel TJ et al. J Gen Intern Med 1991;6:495-502
Xiao H et al. Am J Health Syst Pharm 2004;61:2534-40

Key points:

- Water-loss dehydration (dehydration) in older adults is the result of not drinking enough to cover normal fluid needs
- **Diagnosis** of not drinking enough fluid (water-loss dehydration) is via a blood test – **serum or plasma osmolality** (with normal sodium, potassium, urea & glucose)
- Dehydration has important consequences for health including **increased mortality and disability**

Clinical Questions:

- What are the signs and clinically available tests suggestive of potential or current Water Loss Dehydration?
- What single point index tests are useful for identification of Water Loss Dehydration?
- Can early identification of Water Loss Dehydration reduce excess hospitalization?

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Clinical Interventions Track:
How many older people are dehydrated and who are they?

Dr. Lee Hooper
Reader, Norwich Medical School, University of East Anglia l.hooper@uea.ac.uk

DRIE study - Dehydration Recognition In our Elders (1)

Primary aim

- to improve the health and wellbeing of older people by finding out how we can tell when they are drinking enough fluid, and understanding how to help them to drink more when they are not drinking enough

Methods

- Recruited 200 people living in UK residential care, aged 65+, without congestive cardiac failure or renal failure
- Blood samples:
  - serum osmolality (freezing point, for assessment of hydration)
  - Serum sodium, potassium, urea, creatinine, glucose
- Assessment of many potential "signs" of, and risk factors for, dehydration

DRIE study - Dehydration Recognition In our Elders (1)

Risk factors assessed

- Age, sex
- General health
- Suggested risk factors (eg body temperature, needs help drinking etc)
- Continence factors
- Cognitive status
- Nutritional status & risk
- Functional status
- Medications

Hydration assessed by

- serum osmolality (continuous),
- current dehydration (serum osmolality >300mOsm/kg)
- Impending/current dehydration (serum osmolality 295+mOsm/kg)

Analysis

- Univariate analyses, each factor
- Multivariate analyses, promising factors
- Linear and logistic regression

DRIE study - Dehydration Recognition In our Elders (1)

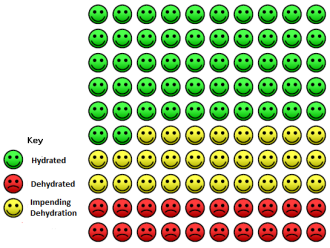
Characteristics of 188 older people included in DRIE:

- 66% women
- Mean age 86years (sd 7.8)
- 19% had diabetes
- Mean MMSE score 22 (range 0 to 30)
- Mean Barthel Index 67 (range 0 to 100)
- Mean eGFR 63 (sd 19)
- 39% took diuretics

DRIE study - Dehydration Recognition In our Elders (1)

How many older people living in UK long-term care are dehydrated?

- **20% are dehydrated**
- **1 in every 5 older people is dehydrated**
- A further 28% are at risk of dehydration (have impending dehydration)



Dehydrated: serum osmolality >300mOsm/kg
Impending dehydration: 295-300mOsm/kg
Hydrated: 275 to <295mOsm/kg

Dehydration in other older adults

Setting	Country (reference)	No.	N (%) with impending dehydration (295-300mOsm/kg)	N (%) with current dehydration (>300mOsm/kg)
Residential care	UK, DRIE	188	52 (28%)	38 (20%)
	US (2)	36	3 (8%)	0 (0%)
	US (3)	48	21 (44%)	9 (19%)
Older people living at home	US (4)	21	2 (10%)	2 (10%)
	US (5)	43	13 (30%)	2 (5%)
	Japan (6)	71	5 (7%)	2 (3%)
	US (7)	10	2 (20%)	0 (0%)
	Sweden (8)	13	7 (54%)	2 (15%)
Hospitalised groups	UK (9)	17	0 (0%)	4 (24%)
	UK (10)	31	5 (16%)	18 (58%)
	UK (11)	106	16 (15%)	4 (4%)
	Austria (12)	34	8 (24%)	18 (53%)

DRIE study - Dehydration Recognition In our Elders (1)

Factors associated with dehydration in univariate analyses:

- Sex
- eGFR (renal function)
- Number of health contacts
- Number of emergency hospital admissions
- Diabetic status
- Swollen ankles
- COPD (chronic obstructive pulmonary disease)
- Arthritis
- Continence problems
- Cognitive function by
  - MMSE (cognitive) score
  - MMSE drawing score
  - Ability to provide informed consent
  - Dementia level
- Diabetic medications
- Laxative use
- Loop or potassium sparing diuretic use

So which 3 factors do you think are most strongly associated with risk of dehydration in multifactorial (adjusted) analyses? Write these down!

DRIE study - Dehydration Recognition In our Elders (1)

Factors consistently associated with dehydration in multivariate (all 3 models) analyses:

- **Lower eGFR signifying worse renal function**
- **Lower MMSE score signifying poorer cognitive function**
- **Use of any diabetic medication**
- (in some analyses not taking potassium-sparing diuretics, being male and having more recent health care contacts also predicted dehydration)

Factors associated with dehydration in other studies

Small studies in older adults have identified the following as (sometimes) associated with dehydration:

- Greater age
- Being female
- Being non-Caucasian
- Dementia and poor cognition
- Urinary incontinence
- Fewer drinking sessions
- Diuretic use, obesity, diabetes, chronic disease
- Functional limitations
- In some but not all studies – functional limitations were protective in some studies

Key points:

- Dehydration (through not drinking enough fluid) is very common in older adults in long term care, living at home, and in hospital
- Older adults who appear to more at risk of dehydration:
  - With limited cognition
  - With limited renal function
  - With diabetes

References:

1. Which frail older people are dehydrated? The UK DRIE study. Hooper L, Bunn DK, Downing A, Jimoh FO et al. *J Geront Med Sci A*. Published online 9th Nov 2015. doi: 10.1093/gerona/glv205
2. Comparison of four… Gaspar PM. Res Theory Nurs Pract 2011;25(1):11-22.
3. Increased fluid intake…. Stotts NA et al. Wound Repair Regen 2009;17(6):780-8.
4. Water balance….. Bossingham MJ et al. Am J Clin Nutr 2005;81(6):1342-50.
5. Arginine vasopressin…. Johnson TM et al. J Urol 2003;170(2 Pt 1):480-4.
6. Dehydration and water intake.. Kajii F et al. Bull St Luke's Coll Nurs 2006;32:43-50.
7. Body fluid balance…. Mack GW et al. J Appl Physiol 1994;76(4):1615-23.
8. Mathematical Modelling….. Rodhe P. 2010. Karolinska Institutet.
9. Urine colour as an index…. Fletcher SJ et al. Anaesthesia 1999;54(2):189-92.
10. The diagnostic accuracy… Kafri MW et al. Med Sci Mon 2013;19:548-70.
11. Is whole-body hydration… Walsh NP et al. Invest Ophthalmol Vis 2014;53(10):6622-7.
12. Tonicity balance…. Lindner G et al. Am J Kidney Dis 2009;54(4):674-9.

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Clinical Interventions Track:

Drinks Diary: a tool to find out how much older people are drinking

Florence Jimoh

Researcher, Norwich Medical School, University of East Anglia, fjimoh2011@gmail.com

Background

- Not knowing how much people are drinking clouds the relationship between fluid intake and hydration

Fluid chart: inaccurate and incomplete

Weighed record: burdensome

Food frequency questionnaire: limited checklist

24 hr recalls: difficult to remember

The methods are either burdensome or not accurate

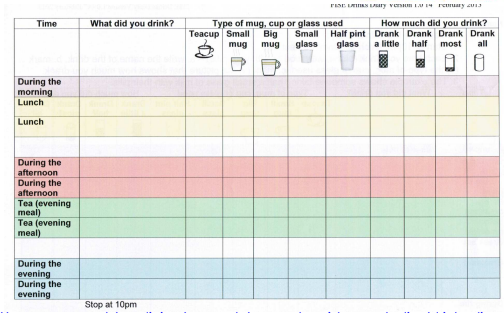
Development (1)

- Developed following several round of piloting.
- Piloted by researchers family members, free-living older people and care home residents.
- Developed for use by older people living in care homes.

Criteria for development

- User friendly
- Minimal writing
- No need for recall
- Pictorial examples of cup, mug, glass

The Drinks Diary (2)



Time	What did you drink?	Type of mug, cup or glass used					How much did you drink?			
		Teacup	Small mug	Big mug	Small glass	Half pint glass	Drank a little	Drank half	Drank most	Drank all
During the morning										
Lunch										
Lunch										
During the afternoon										
During the afternoon										
Tea (evening meal)										
Tea (evening meal)										
During the evening										
During the evening										

Stop at 10pm

https://www.uea.ac.uk/medicine/research/research-evidence-studies/drinks-diary

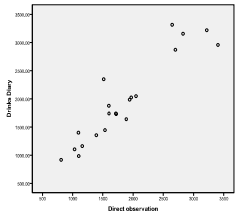
Purpose

- To find out how best to record how much older people drink
- To assist older people record drinks intake

adjunct to DRIE study (3)

How well it works (1)

22 residents aged 68 to 100 years, 20 with normal cognition (MMSE ≥27)



Scatter plot

R^2= 0.851, p=0.001

Some residents couldn't be involved in the study due to:

- Severe stroke
- Parkinson disease – (which made writing difficult)
- Literacy level
- Disability (blindness)
- Illness

Fluid intake recommendations (1)

- Assumes 80% of intake = water + other beverage; Food = ~ 20% (IOM 2004, EFSA 2010)
- Drinks intake = beverages (tea, juice, water etc)
- No agreement about what adequate water intake

Institute Of Medicine, US (4)
Men-3.7L/day total water (3.0L drinks only)
Women- 2.7L/day total water (2.2L/day drinks only)

European Food Safety Authority, Europe (5)
Men -2.5L/day total water (2.0L drinks only)
Women- 2.0L/day total water (1.6L/day drinks only)

Dept. of Health and Human services, US
Long-Term Care Facility Resident Assessment Instrument (RAI,) (6)
1.5 L/day (Oct 2015)

Fluid intake recommendations (2)

Institute of Medicine

- The Drinks Diary Classified correctly 19/22 participants as either drinking well or not

European Food Safety Authority

- The Drinks Diary Classified correctly 19/22 participants as either drinking well or not

How to download it

https://www.uea.ac.uk/medicine/research/research-evidence-studies/drinks-diary
or http://tiny.cc/w0m0mx or put "UEA drinks diary" into google!

What is required:

- Name
- Employer or institution
- Email address
- Your role
- Date form completed

Links to:
- The Drinks Diary.
- How to work out how much a person has drunk in 24hrs.

Usefulness in practice

- More accurate record of drinks intake
- Accurately completed records can improve hydration
- Draw attention of users to the amount that they drink
- Self completed record could increase user's involvement in their own care
- Can be used in care home settings, hospitals or own homes
- Researchers interested in measuring the drinks intake of elderly people

Feasibility

- **Care staff** can be trained to use it for residents
- **Nurses** can be trained to use it
- **Residents/patients** capable of recording could use it

*We however need to try this out first

Key points:

- Drinks Diary - a simple tool for assessing how much older adults are drinking
- Many older adults are able to complete the Drinks Diary themselves
- This is often more accurate than staff-completed drinks intake charts
- The Drinks Diary is FREE to download from https://www.uea.ac.uk/medicine/research/research-evidence-studies/drinks-diary or http://tiny.cc/w0m0mx or put "UEA drinks diary" into google!

References

1. Assessment of a self-reported Drinks Diary for the estimation of drinks intake by care home residents: Fluid Intake Study in the Elderly (FISE). Jimoh, Bunn D, Hooper L. (2015) J Nutr Health Aging 19(5): 491-496 http://link.springer.com/article/10.1007%2Fs12603-015-0458-3#/page-1
2. Drinks Diary: https://www.uea.ac.uk/medicine/research/research-evidence-studies/drinks-diary or http://tiny.cc/w0m0mx or put "UEA drinks diary" into google!
3. DRIE study website - http://driestudy.appspot.com
4. Institute of Medicine. Panel on Dietary Reference Intakes for Electrolytes and Water. 769 Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. Washington, DC, USA.; 2004
5. EFSA Panel on Dietetic Products N and A (NDA). Scientific Opinion on Dietary Reference Values for water. EFSA J 2010. 2010 Mar 25;8(3):1459.
6. CMS. Long-Term Care Facility Resident Assessment Instrument 3.0 User's Manual, Version 1.13, 2015.

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Clinical Interventions Track:

How can we tell whether an older person is drinking enough?

Lee Hooper

Reader, Norwich Medical School, University of East Anglia, l.hooper@uea.ac.uk

Possible signs of dehydration

We diagnose dehydration (due to insufficient fluid intake) using **serum osmolality**. Can we use **simple signs** to help us identify dehydration more readily?

- Reduction in cell volume:
  - confusion, headache, lethargy, dizziness
  - Dry wrinkled skin, reduced skin turgor
- Reduced fluid excretion:
  - Infrequent dark concentrated urine, dry lips, mouth, eyes, armpits, palms
- Low blood volume:
  - Slow capillary refill
  - Low BP, weak pulse, rapid heartbeat (1)

RAI* 2015 J1550C

Dehydrated: Check this item if the resident presents with two or more of the following potential indicators for dehydration:

1. Resident takes in less than the recommended 1,500 ml of fluids daily …
2. …one or more potential clinical signs of dehydration, **including but not limited to** dry mucous membranes, poor skin turgor, cracked lips, thirst, sunken eyes, dark urine, new onset or increased confusion, fever, or abnormal laboratory values (e.g., elevated hemoglobin and hematocrit, potassium chloride, sodium, albumin, blood urea nitrogen, or urine specific gravity).
3. Resident's fluid loss exceeds the amount of fluids he or she takes in (e.g., loss from vomiting, fever, diarrhea that exceeds fluid replacement). (J-26, ref 2)

*Long-Term Care Facility Resident Assessment Instrument 3.0

Problem… identifying dehydration:

- Systematically review diagnostic accuracy of simple physical signs vs. serum osmolality (3)
- Research with older adults living in long-term care (DRIE study – Dehydration Recognition In our Elders) (4,5)
  - Objective: To determine the diagnostic accuracy of signs to be used as screening tests for detecting water-loss dehydration in older people aged 65+ years
- Minimum criteria: sensitivity 60% and specificity 75%

Dry mucous membranes

None of these were diagnostically useful in the **systematic review** (3):

1. Dry oral mucosa (1 study)
2. Tongue furrows (1 study)
3. Dry tongue (1 study)
4. Dry mouth (2 studies)
5. Unable to spit (1 study)
6. Reports sticky mouth or sticky saliva (1 study)

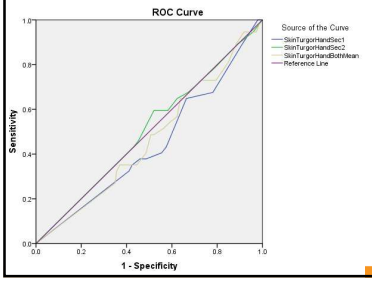
In the **DRIE study** (unpublished):

- Self-report by residents of tongue feeling dry
- Tongue visually dry, to touch of finger or depressor
- Inside cheek visually dry, to touch, or depressor
- Presence/ consistency of saliva under tongue

None were diagnostically useful (serum osmolality >300mOsm/kg)

Poor skin turgor

- 6 studies assessed skin turgor within the SR (3)
- None found useful diagnostic accuracy (using different sites including hand, chest and legs)



DRIE data (unpublished)

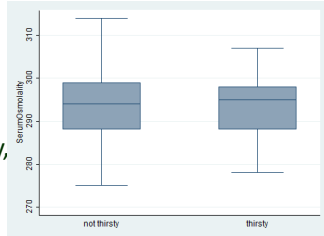
Cracked lips

1. Dry lips assessed in 1 study in the systematic review – not diagnostically useful (3)
2. In the DRIE study (unpublished) we assessed:
   a. Dry lips (visually, external)
   b. Dry inside lips (inside lip, assessed with paper for dampness)
   c. Cracked lips (visually, external)

   But none were diagnostically useful

Thirst

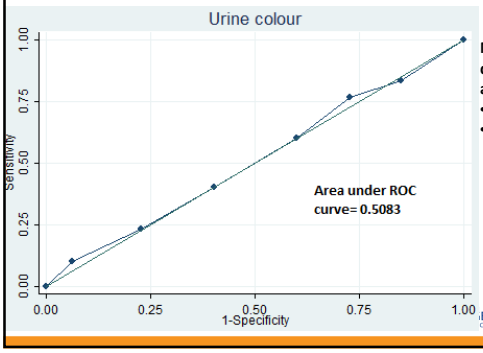
1. Thirst assessed in 6 studies included in the SR, none of which suggested useful diagnostic accuracy (3)
2. DRIE data suggested no difference in serum osmolality for those who felt thirsty, and those who did not (4)



Sunken eyes, fever, confusion

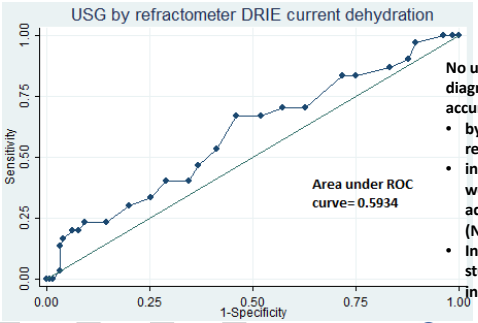
- No studies in the SR assessed sunken eyes (3)
- DRIE data similarly suggested no diagnostic utility (sensitivity 0.18, specificity 0.77) (4, unpublished)
- New onset or increased confusion not assessed in any SR studies or DRIE (3,4)
- No relationship between cognitive function and dehydration in SR or DRIE (3,4)
- Fever in last week not associated with dehydration in DRIE (4)

Dark urine



No useful diagnostic accuracy
- **in DRIE (5), or**
- **in 4 small studies included in the SR (3)**

Urine specific gravity



No useful diagnostic accuracy (3,5)
- **by dipstick or by refractometer**
- **in a cohort of well older adults aged 65+ (NU-AGE)**
- **In 3 small studies included in the SR**

Abnormal laboratory values

- Raised potassium (3%) or sodium (1%) miss most who are dehydrated (20%) (6,7)
- We CAN use an osmolarity equation to estimate serum osmolality (by freezing point depression) (6,7):
  - osmolarity=1.86×(Na^++ K^+) +1.15×glucose+urea+14 (all measured in mmol/L)
  - osmolarity= 4.28xNa^++ 7.25xK^+ +20.70×glucose + 6xurea+ 14 (all measured in mg/dl)
  - osmolarity >295mOsm/L suggests dehydration

Key points:

- Dehydration (due to not drinking enough) is diagnosed using serum osmolality (by freezing point depression)
- Excess fluid loss (diarrhoea, blood loss) ➡ hypovolemia
- There are no simple signs clearly diagnostic of dehydration in older adults
  - Urine tests do not signal dehydration in older adults
  - Other simple tests do not work to signal dehydration
- One osmolarity equation is useful

  Osmolarity=1.86×(Na^++ K^+) +1.15×glucose+urea+14 (all measured in mmol/L), osmolarity >295mOsm/L suggests dehydration

References:

1. Nursing Crib. "Dehydration in Children." (2009) Available: http://nursingcrib.com/nursing-notes-reviewer/maternal-child-health/dehydration-in-children/
2. CMS. Long-Term Care Facility Resident Assessment Instrument 3.0 User's Manual, Version 1.13, 2015. https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursinghomeQualityInits/MDS30RAIManual.html
3. Clinical symptoms, signs and tests for identification of impending and current water-loss dehydration in older people. Hooper L et al *Cochrane Database Syst Rev* 2015, Issue 4. Art. No.: CD009647. DOI: 10.1002/14651858.CD009647.pub2.
4. Which frail older people are dehydrated? The UK DRIE study. Hooper L, Bunn DK et al. *J Gerontol Med Sci A.* Published online 9th Nov 2015. doi: 10.1093/gerona/glv205
5. Can we use urine to tell if we are dehydrated? Diagnostic accuracy in older people. Hooper L, Bunn DK et al. Submitted 22July2015, resubmitted Sept 2015.
6. Diagnostic accuracy of calculated serum osmolarity to predict dehydration in older people: adding value to pathology lab reports. Hooper L et al. *BMJ Open* 2015;5:e008846. doi:10.1136/bmjopen-2015-008846
7. Accuracy of prediction equations for serum osmolarity in frail older people with and without diabetes. Siervo M, Bunn D et al. *Am J Clin Nutr* 2014;100(3): 867-876; doi:10.3945/ajcn.114.086769.

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GSA2015 Aging as a Lifelong Process

Clinical Interventions Track:
How can we help older people to drink well?

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How can we help older people living in long-term care facilities to drink well?

Systematic Reviews

Focus Groups

What helps or hinders drinking and/or prevents dehydration?

Effectiveness of factors to increase drinking and/or reduce dehydration risk in older people living in long-term care facilities[1,2]

- 5410 • 13 Database searches, n=5184 • Author searches, reference list searches, n=226
- 4328 • Duplicates removed, n=1082
- 325 • Screening of titles & abstracts, records removed, n=4003
- 33 • Records excluded after obtaining full-text papers, n=292
- 23 • Records combined into single studies, n=10

- Long-term care
- ≥65 years
- Drink orally

SR-1

Effectiveness of interventions to directly or indirectly support food and drink intake in people with dementia[3]

- Dementia/MCI; any age; any setting; able to eat & drink orally
- 81 interventions
- 12 examined dehydration and/or fluid intake
- 6 had been included in SR1

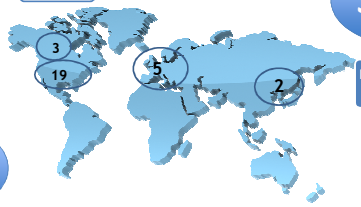
SR-2

Intervention Studies, n=19

- RCT's, n=4
- Non-randomised CCT's, n=3
- Crossover, n=4
- Pre-post, n=8

Observational Studies, n=4

- Retrospective cohort, n=1
- Cross-sectional, n=3



SR-1

SR-2

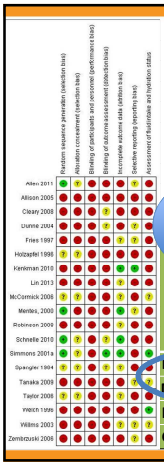
Interventions, n=6

- Pre-post, n=4
- RCT, n=2

Risk of Bias

Assessed by:

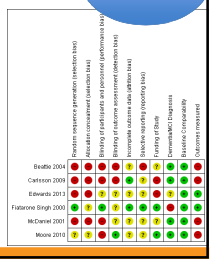
- Cochrane – intervention studies
- Newcastle-Ottawa – observational



SR-1

Study	Number of stars achieved (max=9)
Dyck, 2006	8
McGregor, 2006	8
Reed, 2005	6
Gaspar, 1999	4

SR-2



Outcome assessment

1. ***Fluid intake***
   - Was fluid intake assessed over 24 hours to evaluate effectiveness of the intervention on total fluid intake?
   - What is the definition of a fluid (beverages, liquids at room temperature, water-content of beverages and foods)?
   - What method of fluid intake ascertainment was used?
     - ➢Calibrated cups
     - ➢Weighing
     - ➢Visual estimation, % consumed of amount served*
     - ➢Fluid intake/output charts
     - ➢Photographic pre/post pictures
     - ➢Low fluid intake defined as <8oz of beverage at 1 lunchtime meal (method of assessment not reported)

**proportion served not always provided*

Outcome assessment

2. ***Hydration status***
   - Is there evidence that the assessment of dehydration status had been validated in this population?
   - Serum osmolality
   - ICD-9-CM diagnostic code 276.5
   - BUN:creatinine ratio
   - Clinical signs of dehydration (dry mucous membranes, furrowed tongue, sunken eyes)
   - Urinary signs (colour, specific gravity)
   - RAI-MDS, >2 criteria present from the following*:
     - ➢ Fluid intake <1.5l/day
     - ➢ Clinical signs of dehydration
     - ➢ Fluid loss >fluid intake

**not known what measurement methods were used*

Types of interventions

Coloured cups vs white

"We did start with one of these red cups […] they don't like it, it's so big to hold!
Aya, carer

Pre-thickened vs thickened by staff

Straw in carton vs glass

Dining area less institutionalized

Seating plan

Feeding assistant stands or sits

Multi-component

	Individual fluid goal monitoring	Increased choice	Personal likes /needs met	Social activities	Increased availability	Individual drinking aids	Identification of 'at risk' residents	Staff training	Advice for residents	Improved aesthetics	Increased staff help	Toileting assistance	Exercise
Care, toileting assistance not included													
Allison, 2005. B/A	Y						Y						
Kenkman, 2010. CCT		Y			Y					Y			
Mentes, 2000. RCT	Y	Y	Y	Y	Y	Y	Y	Y			Y		
Robinson, 2002. B/A		Y	Y		Y			Y		Y	Y		
Willms, 2003. B/A		Y	Y	Y	Y	Y		Y	Y	Y	Y		
Zembruski 2006. CCT		Y			Y		Y			Y	Y		
Care, toileting assistance included													
Schnelle, 2010. RCT		Y			Y						Y	Y	Y
Simmons, 2001. RCT		Y	Y		Y						Y	Y	Y
Spangler, 2001. RCT		Y			Y			Y		Y	Y	Y	
Tanaka, 2009. B/A	Y	Y		Y	Y			Y			Y	Y	

Macro Factors

Author, date, n Study design	Outcomes (dependant variable/s)	Exposure (independent variables)	Effect
1. Monitoring			
Fries, 1997. US. N=2128/2088 Pre-post	Dehydration prevalence (defined by RAI-MDS)	Implementation of RAI-MDS in US 1990-1. Dehydration at baseline significantly reduced post implementation (3% to 1%).	Y
2. Ownership, staffing & size			
*Dyck, 2006. US N=363,595 Cross sectional	Dehydration prevalence (RAI-MDS/ICD-9 coding)	Not-for-profit vs for-profit	N
		Chain facilities vs non-chain	Y
		Staffing (staff grades, staff hours)	N
*McGregor, 2006. Canada. N=43,065. Retrospective cohort	Risk of admission to acute unit with primary diagnosis of dehydration from LTCF	For-profit vs not-for-profit facilities	Y
		Large facilities (>71.5 beds) vs small	N

**studies at low risk of bias, but study by Dyck was X-sectional, so a less robust design*

Summary of SR evidence

- Interesting ideas for interventions
- Most studies at high risk of bias
- Any results interpreted with care
- Despite this, a trend can be seen for multi-component studies to show an effect, usually positive
- Particular components are:
  - ➢Increased availability
  - ➢Increased choice
  - ➢Increased staff assistance
  - ➢Toileting assistance

An exploratory study to identify drivers & barriers to maintaining hydration in older care home residents[4]

Thinking about Drinking

- **Purposive sampling** *(residents, families, front-line and senior care staff)*
- **7 Care Homes** *(residential, housing-with-care, dementia, nursing)*
- **8 Focus groups** *(n=29, 2-5 participants/group)*
- **Verbatim transcription**
- **Thematic analysis**

Themes

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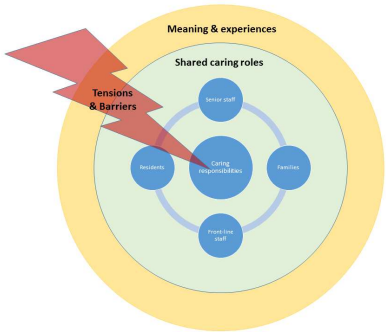

Reminiscing & Hospitality

GSA 2015 Aging as a Lifelong Process

"Whenever anyone came to the front door, 'Would you like a cup of tea?'"
Freda, resident, residential home

Co-F: *Do you make a drink if some-one visits?*
Ruby: *Oh yes, that's the first thing they do, put the kettle on!*
Resident, housing-with-care

"There's a few families that come in and have lunch […], or come in and have a cup of tea during the day, and that helps, yeah."
Tia, senior carer, dementia home

"We will offer families a drink as well, they will sit and drink."
Sophie, senior carer, dementia home

Changing habits

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"You were taught as a child to drink when you were thirsty. […] You drank a cup of water, tea, whatever, whereas they only have a small amount every time!"
Alan, resident, housing-with-care

"See, as a child I wasn't encouraged to drink […] you drank what you were given."
Cat, aged 58 years, carer, residential home

Water

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"Those that are able will have a jug of juice or water (whatever they prefer) in their room, so that they can help themselves as they need to."
Ada, carer, dementia-care home

"You get given a jug and that stands there about six months [laughter] and it's warm… & then they wonder why you don't drink it!"
Pearl, resident, housing-with-care

"The life seems to go out of it."
Freda, resident, residential care

Residents

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"When I first came here, they made awful tea, so I turned to coffee. But now its quite good!"
Betty, resident, residential home

'It's up to us to make sure we have enough water intake in a day.'
Zak, resident, residential

"I always try to help & not ask for too many bits & things."
Zak, resident, residential home

"But you see, we wait for them to bring it round, the cold water, because we can't get to a tap."
Betty, resident, residential home

"But they're very good, you know, if you ask for something they'll bring it."
Mavis, resident, NH

Families

"He's a very stoical man and he **does what he's told**, so if he got thirsty he would **wait** till the staff came, he wouldn't even try to tell them he was thirsty.
You know, they're a generation who did put up with things. [...] He **forgets to ask** and he **wouldn't ask**, [..] and if he's given orange juice, he **won't drink** that."
Fran, father resident in a nursing home

"Dee would have hardly any milk, [...] and **I've told them** so many times and they bring it up with milk in and they say, 'I've brought Dee a cup of tea,' and I say, 'She **won't drink** that.' And I know she won't."
Edgar, wife resident in a dementia home

Drinks service

"They're completely dependent on us on making sure that these drink rounds happen."
Olive, senior carer, dementia home

"If we have time in the morning [...] as we're getting them up we do like to offer them a drink, but that very often isn't the case, but we do try and do that."
Ada, night carer, dementia home

Managing choice

"That's just basically knowing their needs and what they like and what they don't really."
Cat, carer, residential home

"I mean it's supposed to be all about choice and making a choice, but if you asked every single one of the residents sometimes 'Would you like a drink?' they would probably say, 'No,' and you can't, you can't sort of go that route, really."
Gail, carer, dementia home

"Yeah, but everything's written down and times [...] when drinks [...] have been offered."
Tia, senior carer, dementia home

Type of cups & Aids

"Sometimes I do have a job to lift the cup up, but I'm sure if I did say they would do something, but I manage and that's me. [...] I like to be independent."
Betty, resident, residential care

"Because you can't hold 'em like normal people."
Alan, resident, housing-with-care

"We tend not to unless they need to. They're quite clinical, aren't they?"
Avril, manager, dementia home

Staff assisting

"That [providing drinks] does sort of fill our day in lots of ways!"
Gladys, carer, dementia home

"We have a few that go to bed quite late and we have like a little picnic and drinks in front of the telly."
Ada, night carer, dementia home

***Una**: Just perseverance.*
***Sue:** Persevere.*
***Una:** Trying different ways.*
***Sue:** Small and often*
***Una:** Different faces.*
Senior staff, dementia home

Frustrations.....

And sometimes you'll just wear a nice cup of tea-leaves!"
Sophie, senior carer, dementia home

"They're short-staffed at the moment"
Edgar, wife in dementia home

"And others I've seen just leave the drink."
Doris, sister in dementia home

"I think everybody could always say they could do with more staff, and realistically it's manageable. [...] I think you can always do with more training, but again, it's on the ball here."
Sophie, senior carer, dementia home

Sometimes I come in and there's a cold cup of tea. [...] And you know that she's not had anything to drink.
Doris, sister, dementia home

Key points

- Drinking is both a basic need and a social experience
- As a basic need, our impetus to drink is the thirst sensation, but we also drink as a habit and socially. If thirst deteriorates, then habits and social events should take priority
- Offering drinks is meeting the physiological need, but if we overlook the aesthetics, then we are not acknowledging the social experience of drinking
- Providing hydration care is an intrinsic part of carer's roles, and is acknowledged as such.
- Residents take an active role in their care and adapt to their changing abilities and circumstances

Dehydration prevention requires a multi-level approach: person-centred care, backed up by effective care home environments and national guidelines ('macro-level')

References

1. Bunn D, Hooper L. Effectiveness of external factors to reduce the risk of dehydration in older people living in residential care: a systematic review (protocol). Available from: http://www.crd.york.ac.uk/prospero/display_record.asp?ID=CRD42012003100#.VPy3UMtyavE
2. Bunn D, Jimoh F, Howard Wilsher S, Hooper L. Increasing fluid intake and reducing dehydration risk in older people living in long-term care: a systematic review. Journal of the American Medical Directors Association. 2015 Feb 1;16(2):101-113. Available from: http://dx.doi.org/10.1016/j.jamda.2014.10.016
3. Abdelhamid A, Bunn D, Dickinson A, Killett A, Poland F, Potter J *et al.*: Effectiveness of interventions to improve, maintain or facilitate oral food and/or drink intake in people with dementia. *PROSPERO* 2014, CRD42014007611: http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42014007611
4. Bunn DK, Hooper L, Poland, F. Thinking about Drinking: an exploratory study to identify drivers and barriers to maintaining hydration in older care home residents. 2015. British Society of Gerontology. http://conferences.ncl.ac.uk/bsg2015/

University of East Anglia

Clinical Interventions Track:
Take away messages & evaluation

Lee Hooper
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Take away messages – what is dehydration?

- Water-loss dehydration (dehydration) in older adults is the result of not drinking enough to cover normal fluid needs
- **Diagnosis** of not drinking enough fluid (water-loss dehydration) is via a blood test – **serum or plasma osmolality** (with normal sodium, potassium, urea & glucose)
- Dehydration has important consequences for health including **increased mortality and disability**

Take away messages –who is dehydrated?

- Dehydration (through not drinking enough fluid) is very common in older adults in long term care, living at home, and in hospital – think **1 in 5**
- Older adults who appear to more at risk of dehydration:
  - With **limited cognition**
  - With **limited renal function**
  - With **diabetes**

Tools – Drinks Diary

- Drinks Diary - a simple tool for assessing how much older adults are drinking
- Many older adults are able to complete the Drinks Diary themselves
- This is often more accurate than staff-completed drinks intake charts
- The **Drinks Diary is FREE to download** from https://www.uea.ac.uk/medicine/research/research-evidence-studies/drinks-diary or http://tiny.cc/w0m0mx or put "UEA drinks diary" into google!

Tools – what signs work?

- Dehydration (due to not drinking enough) is diagnosed using **serum osmolality (by freezing point depression)**
- Excess fluid loss (diarrhoea, blood loss) ➡ hypovolemia
- There are **no simple signs** clearly diagnostic of dehydration in older adults
  - Urine tests do not signal dehydration in older adults
  - Other simple tests do not work to signal dehydration
- One osmolarity equation is useful

  Osmolarity=1.86×(Na⁺+ K⁺) +1.15×glucose+urea+14 (all measured in mmol/L), osmolarity >295mOsm/L suggests dehydration

Helping older adults drink well

- Drinking is both a basic need and a social experience
- As a basic need, our impetus to drink is the thirst sensation, but we also drink as a habit and socially. If thirst deteriorates, then habits and social events should take priority
- Offering drinks is meeting the physiological need, but if we overlook the aesthetics, then we are not acknowledging the social experience of drinking
- Providing hydration care is an intrinsic part of carer's roles, and is acknowledged as such.
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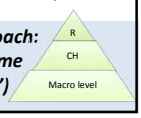
Dehydration prevention requires a multi-level approach: person-centred care, backed up by effective care home environments and national guidelines ('macro-level')



Evaluation sheet

- We would love to hear what you thought of our symposium, please complete the evaluation form
- We would also like to contact you again in 12 and 24 weeks to find out whether this symposium has had any effect on your understanding of dehydration and/or your practice – if you are happy for us to do this please let us have your email address.
- **Thank you for your attention and we look forward to your thoughts and questions!**

Thank you for your attention!

- We would also like to thank our funders:
  - National Institute for Health Research,
  - NHS England, and
  - CLAHRC East of England
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- DRIE steering group members
- Care home managers & staff
- Focus Group participants
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National Institute for Health Research