

# Thickened Liquids = Dehydration? Factors Influencing Fluid Intake in the Adult Neuro Patient



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# Thickened Liquids

## One treatment...so many issues

- Effects on swallow physiology
- Preference (taste/consistency)
  - Pelletier (1997): healthy volunteers
  - Horwarth, Ball and Smith (2005): healthy volunteers
  - Macqueen, Taubert & Cotter (2003): patients with varying diagnoses (primarily CVA), healthy volunteers



# Thickened Liquids

## One treatment...so many issues

- Variability
  - Viscosity: subjective vs. objective (Steele et al., 2003)
  - Viscosity: time, temperature, beverage type
    - Cichero et al. (2000)
    - Dewar & Joyce (2006)
    - Adeleye & Rachal (2007)
    - Matta et al. (2006)
- Efficacy??



# Bottom Line: TL Continue To Be Used

- Prevalence of use
  - Garcia, Chambers & Molander (2005)
  - Low, Wyles, Wilkinson, & Sainsbury (2001)
  - Castellanos, Butler, Gluch & Burke (2004)
- Why?
  - Ease of implementation
  - No additional physical and/or cognitive demands



# The Basics on Water Homeostasis

- What does it mean to be in fluid balance?
  - Water represents ~ 60-70% of body weight (dependent on body composition)
  - Daily turnover of water represent ~ 2400-3000ml/day in (Kleiner, 1999)
  - Losses offset by consumption of liquids and foods (and to small degree oxidation) for a net body water balance
  - Fluid balance is tightly regulated within +/- .22% of body weight (Porth & Erickson, 1992)



# How much is enough?

- What are the standards for fluid intake?
  - 8, 8 ounce glasses/day ~ 1900ml
  - General: Average sedentary male: 2900ml and average sedentary female: 2200ml (approximately 1500ml via beverages and 1000ml via food and oxidation) (Davidhizar, 2004; Kleiner, 1999)
  - Standards used for individual water needs:
    - 30ml/kg body weight
    - 1 ml fluid/kCal consumed
    - 100ml/kg for first 10kg, 50ml/kg for next 10 kg and 15ml/kg for the remainder of the weight
- **\*\*Dependent on illness, environment/temperature, exercise, age**



# What is dehydration?

- Dehydration: 1% or greater loss of body weight due to fluid loss
- Types of dehydration
  - Isotonic: balanced loss of solutes and water
  - Hypotonic: excess loss of sodium compared to water
  - \*\*Hypertonic: excess loss of water compared to sodium
  - Often the type is not delineated in the diagnosis



# What is Dehydration (cont)

- Common markers of hydration status
  - Biochemical: serum sodium (normal range: 137-145mmol), plasma osmolality (normal range: 285-295 mOsm), BUN/Creatinine ratio (normal: <20)
  - Clinical: dry mucous membranes, skin turgor, weight loss over short period of time 1-2% of total body weight, blood pressure, urine output/color

References: Hodgkinson et al., 2003; Sheehy et al. 1999 and Davidhizar, 2004



# Dehydration and Thirst

- Perception of thirst and drinking behavior
  - Central: osmoreceptors/hypothalamus (cellular dehydration) and baroreceptors/carotid & aortic arch (extracellular dehydration) (Kenney & Chiu, 2000)
    - Increase in osmolality in extracellular fluid and/or decrease in extracellular fluid stimulus for thirst
    - Healthy elderly perception of thirst and subsequent fluid intake significantly lower versus younger cohort in mild states of dehydration (hyperosmolar and hypovolemic)
- Is age a factor in achieving adequate fluid intake?



# Perception of Thirst and Drinking Behavior

- Peripheral: Sensory receptors in oropharyngeal mucosa
  - Ratings of mouth dryness and thirst strongly correlated (Figaro & Mack, 1997)
  - Most salient sensation reported following water deprivation dry/tacky mouth with marked attenuation in drinking after initial bout of drinking (Roll et al., 1980)
  - Role of oropharyngeal stimulation (oropharyngeal metering) in fluid intake and perception of thirst: control, infused and extracted groups
  - Elderly report fewer oropharyngeal symptoms (e.g. dry mouth) than healthy younger cohorts (Ship & Fischer, 1997)
    - Age factor related to achieving adequate hydration?



# Drinking Patterns Relative to Thirst

- Drinking attenuates prior to absorption of water (oropharyngeal metering and gastric distention)
- Thirst Quenching Properties
  - Temperature
  - Acidic content
  - \*Mouth wetting properties



# Drinking Patterns: Non-homeostatic Influences

- Fluid balance largely regulated by non-homeostatic influences
- Fluid ingestion and:
  - meal time
  - taste preference
  - availability
- Studies on Fluid Intake (healthy younger and older adults)
  - deCastro (1992)
  - Bossingham, Carnell & Campbell (2005)



# Frequently Cited Risk Factors of Dehydration

- Mobility
- Functional Ability (self-feeding)
- Mental Status
- Incontinence
- Age

\*Conflicting reports in the literature of the effects on fluid intake

Hodgkinson, Evans and Wood (2003).



# Additional Risk Factors

- Fever
- Diarrhea
- Vomitting
- Infection
- \*Language barriers
- \*Dementia
- \*Dysphagia



# Getting Back To Thickened Liquids....



# Evidence Supporting Assumption

## TL = Dehydration

- Known alteration in sensory characteristics
  - Matta, Garcia & Helverson (2006): suppression of main flavor with some imparting slight off-flavors, starch-based more 'grainy' whereas gum-based more 'slick'
- Patient Satisfaction
  - MacQueen et al. (2003): 75% did not like using a thickener
- Fluid Intake Studies
  - Finestone, Foley, Woodbury & Greene-Finestone (2001): Mean fluid intake 755ml
  - Whelan (2001): Mean fluid intake 455ml
  - Both studies found grossly inadequate fluid intake despite standard of fluid requirement used
  - Case closed? Why?



# Fluid Intake Studies: Long Term Care

- Long-Term Care
  - Kayser-Jones et al.(1999)
  - Armstrong-Esther et al. (1996)
  - Gasper (1999)
  - Simmons (2001)
  - Chidester & Spangler (1997)
- What are some common threads?



# Known versus Unknown Information: Important?

- Whelan (2001)
  - Known:
    - Hospitalized with CVA
    - Age
    - Barthel Index
    - Level of Viscosity
  - Unknown:
    - Severity of dysphagia
    - Cognition/communication status
    - Amount of fluids offered
    - \*Fluid intake of stroke patients on thin liquids
- Finestone et al. (2001)
  - Known:
    - Hospitalized with CVA
    - Age
    - Compared with non-oral dysphagic patients
  - Unknown:
    - Level of viscosity
    - Severity of dysphagia
    - Measures of functional independence
    - Amount of fluids offered
    - \*Fluid intake of stroke patients on thin liquid



# Thin versus Thickened Liquids

- McGrail Pilot Study (2007)
  - Control: 10 healthy community dwelling elderly
  - 10 Elderly CVA on Thin liquids and 10 Elderly CVA on Thickened Liquids (8 nectar-like, 2 honey-like)
  - Mean fluid intake
    - Control: 1960 ml
    - CVA thin: 1230 ml
    - CVA thickened: 950 ml
  - Significant difference between all 3 groups
  - Important: Stroke patients on both thin and thickened liquids fell below minimum standard of intake (1500ml) WHY?



## Is This Due to Age Related Factors?

- Recall the age related changes in thirst perception and subsequent fluid intake
- Additional age related changes:
  - Taste/smell
  - Somatosensory
  - Perception of viscosity (Smith, Logemann, Burghardt, Zecker and Rademaker, 2006)



## Other Factors To Consider

- Recall non-homeostatic influences on drinking
  - Availability of sufficient amounts of fluids that patients find palatable.
- Stroke Sequelae
  - Impaired mobility, impaired self-feeding, impaired communication, impaired cognition, impaired visual/perceptual skills



# Current Study

- Hospitalized Adult CVA (>18 yrs)
  - Prevalence of substandard fluid intake in hospitalized CVA (based on 1500ml); fluid intake for 72 hours
    - Do we see differences relative to age of patient, thickened liquids versus thin liquids
  - Amount of fluids offered
    - Are there differences in what is being offered?
    - Is interpretation of TL fluid intake relative to what is being offered?
    - Accessibility of beverages



## Current Study (cont.)

- Predictors of Fluid Intake
  - Does level of functional status predict intake (mobility, self-feeding, cognition, communication)
- Relationship of Status of Oral Mucosa (mouth dryness) and Fluid Intake
- Unannounced observations
  - Beverages within reach, containers opened, patients positioned properly, receiving assistance as recommended, thickened liquids matches recommended consistency
  - \*\*medications: known to alter taste perception



# Appreciating Factors That Influence Fluid Intake

- Amount of fluids available or being offered
  - Especially those on thickened liquids
  - Accessibility of fluids
- Preferences
  - Type of beverage
  - Temperature of beverage
- Communication and/or Cognition Issues
  - Awareness of deficits → compliance
  - Recognition of importance of adequate hydration
  - Ability to request



# Factors Influencing Fluid Intake

- Level of dependence for mobility & feeding
  - Horror stories are abundant!
- Prior fluid intake patterns
  - 63% of patients on thickened liquids stated their drinking habits had not changed since being prescribed thickened liquids (Macqueen et al, 2003)
- Thickened liquids: brand used, variability
- Fatigue
- Age related factors
- Out of daily routine (Holmes, 2006)



# What Can SLP's Do?

- Recognize there are several factors that contribute to fluid intake in the hospitalized neuro patient
  - Investigate!
- Work with dietician
- Document Intake
- Participate in ways to facilitate fluid intake in the hospitalized/LTC patient
  - Offer patients drinks during therapy
  - Beverage carts
  - Education