Detection and management of malnutrition post stroke

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Malnutrition

• A state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients causes measurable adverse effects on tissue and/or body function and clinical outcome (Elia, 2005)

• **Starvation-related malnutrition** e.g. resulting from social and/or psychological or environmental issues

• **Disease-related malnutrition**
  – Chronic e.g. associated with cancer, emphysema (COPD) or chronic kidney disease
  – Acute e.g. associated with severe illness or injury (Jensen et al., 2010)
WHY DOES IT MATTER?
**Impact on the individual**

- Widespread adverse effects on physical, social and psychological function
  - ↓ muscle strength
  - ↓ mood
  - ↓ ability to perform everyday tasks
  - ↓ quality of life

- In the presence of illness malnutrition results in delayed recovery, increased complications and increased mortality (*NICE, 2006*)
  - ↑ length of hospital stay
  - ↑ hospital admissions
  - ↑ GP visits
  - ↑ care needs
Impact on the family and carers

- 74% prepare all the meals for the person they care for
- 60% worry about the nutrition of the person they care for
- 55% of the people being cared for use nutritional supplements
- 25% care for someone who is underweight
- 16% care for someone who is underweight and with a small appetite and were worried about their diet yet were not having any nutritional support of any kind (Carers UK, 2012)
Impact on society

• Malnourished individuals cost twice as much to manage as the well nourished (Guest et al., 2011)

• Malnutrition costs at least as much to the health and social care services as obesity, estimated to be up to £ 13 billion per year (Elia & Stratton, 2009)

• NICE identifies better nutritional care as the fourth largest potential source of cost savings to the NHS
PREVALENCE OF MALNUTRITION
Prevalence

• 3 million malnourished or at risk of malnutrition at any time

• 1 million aged over 65 years old
  – 93% in the community
  – 5% in care homes
  – 2% in hospital

• People from the most deprived areas are more likely to be at risk of malnutrition than those in more affluent areas (*Stratton & Elia, 2006*)
## Prevalence studies - Stroke

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axelsson et al., <em>Acta Med Scand.</em> (1988)</td>
<td>100</td>
<td>16 (16 %)</td>
</tr>
<tr>
<td>Unosson et al., <em>Stroke</em> (1994)</td>
<td>60</td>
<td>5 (8 %)</td>
</tr>
<tr>
<td>Finestone et al., <em>Arch Phys Med Rehabil.</em> (1995)</td>
<td>53</td>
<td>26 (49 %)</td>
</tr>
<tr>
<td>Davalos et al., <em>Stroke</em> (1996)</td>
<td>104</td>
<td>17 (16 %)</td>
</tr>
<tr>
<td>FOOD Trial, <em>Stroke</em> (2003)</td>
<td>3012</td>
<td>275 (9 %)</td>
</tr>
<tr>
<td>Davis et al., <em>Stroke</em> (2004)</td>
<td>185</td>
<td>30 (16 %)</td>
</tr>
<tr>
<td>Martineau et al., <em>Clin Nutr.</em> (2005)</td>
<td>73</td>
<td>14 (19 %)</td>
</tr>
<tr>
<td>Vajpayee et al., e-SPEN (2008)</td>
<td>95</td>
<td>43 (45 %)</td>
</tr>
<tr>
<td>Yoo et al., <em>Arch Neurol.</em> (2008)</td>
<td>131</td>
<td>16 (12 %)</td>
</tr>
</tbody>
</table>
Prevalence of malnutrition

- Reported prevalence rates vary from 8% to 49%.
- Apart from the FOOD Trial (2003) all studies had small sample sizes.
- Heterogeneous populations e.g. age range, included both ischaemic and haemorrhagic strokes, different countries (Davalos et al 1996; Davis et al 2004, Vajpayee et al 2008, Yoo et al 2008).
- Care setting and timing after stroke e.g. acute hospital versus rehabilitation unit (FOOD Trial 2003, Finestone et al 1995).
- In 25% patients weight loss persists for up to 12 months post stroke (Perry & Maclaren, 2003; Jonsson et al., 2008).
- Prevalence increases and patients become more malnourished during hospital stay (Mosselman et al 2013).
Prevalence of malnutrition

- Different methods used to define malnutrition
  - Anthropometry and laboratory data *(Unosson et al 1994; Finestone et al 1995; Davalos et al 1996)*
  - Clinical judgement *(FOOD Trial, 2003)*
  - PG-SGA *(Martineau et al 2005)*
  - Recent weight loss and laboratory data *(Yoo et al 2008)*
- Validated nutrition screening tool
Duration?

- Westergren et al., *Issues Innov Nurs Pract.* (2001)
  - 24 stroke survivors reviewed at 3 months
  - 9 (37.5 %) unable to complete meals despite assisted feeding
  - Increased incidence of respiratory infections

  - 206 stroke survivors interviewed at home 6 months post stroke
  - 12 % malnourished
  - Poor appetite and decreased intake linked to depression
  - Malnourished had poorer quality of life scores

  - 18/36 stroke patients reviewed at 6 months
  - 10 had lost weight (mean 3.9 kg ± 8.1)
  - 6/10 had lost weight since discharge
  - 7 could eat independently
  - Only 3 could prepare hot drink or snack
Consequences of malnutrition

Malnourished stroke patients:

- More likely to develop complications in hospital i.e. gastro-intestinal bleeds, pneumonia and other infections (FOOD Trial, 2003; Martineau et al., 2005; Yoo et al., 2008)
- Stay in hospital longer (Davalos et al., 1996; Martineau et al. 2005)
- Suffer poorer functional outcomes (Yoo et al., 2008)
- Less likely to be discharged home (Axelsson et al. 1988)
- More likely to die in hospital or soon after discharge (Davalos et al., 1996; Davis et al., 2004; Yoo et al., 2008)

Malnutrition is an independent predictor of poor outcome (FOOD Trial, 2003)
DETECTION OF MALNUTRITION
Detection of malnutrition

- Malnourished patients or at risk patients are most likely to benefit from nutritional intervention (Stratton, Green & Elia, 2003; NICE 2006)

- FOOD trial suggested oral nutritional supplements (sip feeds) only likely to be of benefit in malnourished (thin) patients (Dennis et al., 2005)

- Emphasis therefore on detection of those most likely to benefit from nutritional intervention
Which of these patients is at risk of malnutrition?
Nutrition screening and assessment

Screening
– Identifies patients with actual (or potential) nutritional problems i.e. nutrition risk status
– Non-specialists

Assessment
– Establishes nutritional status
– Explores causes and duration of nutritional problems
– Forms the basis for nutrition action plan
– Nutrition specialists
Nutrition Screening Tools (NST)

- Highlight nutrition as an issue
- Provide a baseline for assessment
- Monitor changes over time
- Aid transfer of care

Screening tools support, but do not replace, clinical judgement
Nutrition screening tools


'**MUST**' Tool

**Step 1**
- BMI kg/m²
  - >20 (>30 Obese) = 0
  - 13.5–20 = 1
  - <13.5 = 2

**Step 2**
- Unplanned weight loss in past 3–6 months
  - %
    - <5 = 0
    - 5–10 = 1

**Step 3**
- If patient is acutely ill and there has been or is likely to be no nutritional intake for >5 days
  - Score 2

**Step 4**
- Overall risk of malnutrition
  - Add scores together to calculate overall risk of malnutrition
  - Score 0: Low Risk
  - Score 1: Medium Risk
  - Score 2 or more: High Risk

**Low Risk**
- Routine clinical care
- Ensure appropriate food and drink choices
- Repeat screening every 3–6 months, unless there is clinical concerns
- Document action taken

**Medium Risk**
- Observe
- Follow 'MUST' 1 care pathway on page 10 of Guidelines Booklet

**High Risk**
- Treat
- Follow action plan for medium risk
- Refer to Dietitian
- Re-weigh weekly
- Document action taken, unless detrimental or no benefit is expected from nutritional support e.g. end of life care pathway

This tool is to assist your assessment. If in doubt, use your professional judgement.

Stratton et al. (2004)
Nutrition risk status predicts outcome (GSTT or MUST)

N = 543 (51% male; 87% ischaemic stroke)
Mean age 74.7 years (range 22–99)
(Gomes, Emery & Weekes, 2014)
Aims of nutritional assessment

- Determine baseline nutritional status and body composition
- Establish possible causes of malnutrition
- Help determine goals of nutritional intervention and form the basis of the nutrition action plan
- Monitor response to nutrition intervention
Weight loss predicts poor outcome

Recent weight loss (independent of BMI)

- < 5 %: Not significant (unless likely to be ongoing)
- 5 – 9 %: Not serious (unless rapid/already malnourished)
- > 10 %: Clinically significant
Weight loss prior to stroke predicts poor outcome at 6 months

<table>
<thead>
<tr>
<th>Weight loss</th>
<th>N = 553</th>
<th>Mortality</th>
<th>$X^2$ test</th>
<th>Hazard ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>110</td>
<td>30 %</td>
<td>P &lt; 0.001</td>
<td>1.87 (1.21 – 2.91)</td>
</tr>
<tr>
<td>No</td>
<td>443</td>
<td>14 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight loss</th>
<th>N = 448</th>
<th>Length of stay</th>
<th>Univariate ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>77</td>
<td>37 (2 – 119)</td>
<td>P = 0.002</td>
</tr>
<tr>
<td>No</td>
<td>371</td>
<td>17 (2 – 194)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight loss</th>
<th>N = 446</th>
<th>Costs (£)</th>
<th>Univariate ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>77</td>
<td>8416 (552 – 21,230)</td>
<td>P = 0.017</td>
</tr>
<tr>
<td>No</td>
<td>369</td>
<td>5506 (437 – 38,245)</td>
<td></td>
</tr>
</tbody>
</table>

Weight loss assessed using the GSTT Nutrition Screening tool
Cox proportional hazards model and univariate analysis adjusted for age, gender, ethnicity, type and severity of stroke (Gomes et al., 2014)
MANAGEMENT OF MALNUTRITION
Systematic reviews

Randomised controlled trials (RCTs)

Non-randomised trials (cohort, case-controlled studies)

Non-experimental studies (>1 centre)

Expert opinion
## Factors affecting food intake

<table>
<thead>
<tr>
<th>Physical</th>
<th>Psychological</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altered consciousness</td>
<td>Depression</td>
<td>Financial issues</td>
</tr>
<tr>
<td>Dementia</td>
<td>Bereavement</td>
<td>Social isolation</td>
</tr>
<tr>
<td>Gastro-intestinal symptoms</td>
<td>Mental illness</td>
<td>Access to shops</td>
</tr>
<tr>
<td>Pain</td>
<td>Anxiety</td>
<td>Cooking and food storage facilities</td>
</tr>
<tr>
<td>Co-morbidities e.g. diabetes</td>
<td>Apathy</td>
<td>Religion</td>
</tr>
<tr>
<td>Poor dentition</td>
<td>Poor motivation</td>
<td>Cultural meanings of illness and food</td>
</tr>
<tr>
<td>Chewing difficulties</td>
<td>Loneliness</td>
<td>Family and informal carers</td>
</tr>
<tr>
<td><strong>Dysphagia</strong></td>
<td>Self-esteem</td>
<td>Social networks</td>
</tr>
<tr>
<td>Changes in senses of taste and smell</td>
<td>Substance abuse</td>
<td>Access to formal social care services</td>
</tr>
<tr>
<td>Pharmaceutical and other</td>
<td></td>
<td>Access to health services e.g. for recent immigrants</td>
</tr>
<tr>
<td>treatments e.g. home O₂ therapy</td>
<td></td>
<td>Homelessness</td>
</tr>
<tr>
<td>Impaired mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor eyesight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restricted limb movement</td>
<td></td>
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</tr>
</tbody>
</table>
## Results – Nutritional support

<table>
<thead>
<tr>
<th>Question</th>
<th>Titles identified</th>
<th>Papers reviewed</th>
<th>Papers included</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1  Benefits of oral nutritional support</td>
<td>2084</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>A2  Benefits of tube feeding vs. MTD</td>
<td>500</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>A3  NG vs. PEG feeding</td>
<td>756</td>
<td>2</td>
<td>(1)</td>
</tr>
<tr>
<td>A4  Bridles and restraining devices</td>
<td>34</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>A5  Small bowel vs. intra-gastric feeding</td>
<td>570</td>
<td>2</td>
<td>1 (1)</td>
</tr>
<tr>
<td>A6  Tube feeding + MTD vs. MTD alone</td>
<td>235</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>A7  ONS + MTD vs. MTD alone</td>
<td>25</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

Systematic reviews conducted for RCP/ISWP Guidelines 2011
Numbers in brackets indicate systematic reviews
Management of malnutrition – oral diet

The FOOD Trial (2003)

- 125 hospitals in 15 countries
- 4023 randomised (2007 hospital diet; 2016 diet + ONS)
- 4004 followed-up
- Routine supplementation did not result in any benefits to stroke patients
- Open to several criticisms (Prosser-Loose & Paterson, 2006)
  - Definition of malnutrition and small proportion identified as malnourished (8%)
  - Supplemented all rather than those who were already malnourished
  - Compliance probably over-estimated
  - No measurements of change in nutritional status over time
Tailored nutritional support

Ha et al., 2010

- N = 124 acute stroke (> 65 years old)

- Randomised to individualised nutrition treatment plan devised and monitored by MDT (intervention) or ONS/tube feeding at physicians’ discretion (control)

- Significant differences between groups in % who lost > 5 % body weight, handgrip strength, body composition and energy intake (kcal/day and kcal/kg body weight)

- No between group differences in quality of life (sample size) or protein intake (g/day or g/kg body weight)
What is the evidence?

- Supplementation vs no supplementation in non-dysphagic patients (Geeganage et al 2012)
- Recruited up to 6 months post stroke
- 8 RCTs (including one assessing antioxidant and ω-3 fatty acids and one that included some tube fed patients)
- 4391 participants
- Nutritional supplementation had no effect on case fatality, death or dependency
- Supplementation was associated with reduced pressure sores, and increased energy and protein intake
- What was the effect on patient-centred outcomes and healthcare utilisation?
Effect on pressure sores

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Treatment</th>
<th>Control</th>
<th>Odds Ratio</th>
<th>Weight</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n/N</td>
<td>n/N</td>
<td>M-H, Random, 95% CI</td>
<td></td>
<td>M-H, Random, 95% CI</td>
</tr>
<tr>
<td>Sip feeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOOD 1 2005</td>
<td>15/2016</td>
<td>26/2007</td>
<td>-</td>
<td>72.1%</td>
<td>0.57 [0.30, 1.08]</td>
</tr>
<tr>
<td>Rabadi 2008</td>
<td>7/51</td>
<td>12/51</td>
<td>-</td>
<td>27.9%</td>
<td>0.52 [0.19, 1.44]</td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td><strong>2067</strong></td>
<td><strong>2058</strong></td>
<td><strong>-</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>0.56 [0.32, 0.96]</strong></td>
</tr>
</tbody>
</table>

Total events: 22 (Treatment), 38 (Control)
Heterogeneity: Tau² = 0.0; Chi² = 0.03, df = 1 (P = 0.87); I² = 0.0%
Test for overall effect: Z = 2.12 (P = 0.034)
Test for subgroup differences: Not applicable
Effects on energy and protein intake

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Treatment</th>
<th>Control</th>
<th>Mean Difference</th>
<th>Weight</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean(SD)</td>
<td>Mean(SD)</td>
<td></td>
<td>IV/Random,95% CI</td>
<td>IV/Random,95% CI</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------</td>
<td>---------</td>
<td>----------------</td>
<td>--------</td>
<td>----------------</td>
</tr>
<tr>
<td>Sip feeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquilani 2008</td>
<td>24</td>
<td>24</td>
<td>1548 (212)</td>
<td>34.7 %</td>
<td>439.00 [320.74, 557.26]</td>
</tr>
<tr>
<td>Gariballa 1998</td>
<td>21</td>
<td>21</td>
<td>1807 (318)</td>
<td>31.3 %</td>
<td>723.00 [522.95, 923.05]</td>
</tr>
<tr>
<td>Ha 2010</td>
<td>46</td>
<td>38</td>
<td>1197.42 (328.87)</td>
<td>34.1 %</td>
<td>152.25 [16.91, 287.59]</td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td><strong>91</strong></td>
<td><strong>83</strong></td>
<td><strong>100.0 %</strong></td>
<td><strong>430.18 [141.61, 718.75]</strong></td>
<td><strong>100.0 %</strong></td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 58886.43; Chi² = 23.12, df = 2 (P<0.00001); I² = 91%
Test for overall effect: Z = 2.92 (P = 0.0035)
Test for subgroup differences: Not applicable
Outcome measures

Patient-centred

• Nutritional e.g. nutritional intake and weight change

• Functional e.g. Barthel score, activities of daily living

• Quality of life e.g. generic or disease-specific

• Psychological e.g. depression, cognitive function, mood

• Post-discharge destination

Healthcare utilisation

• Complications e.g. infections, aspiration episodes, GI bleeds

• Hospital admissions, length of stay

• Drugs and therapeutic interventions

• Post-discharge destination

• Costs of health and social care
Oral diet research questions

- Is there a role for nutritional intervention (oral nutritional supplements, dietary counselling and/or food fortification) in malnourished patients who have had a stroke?

- What is the best strategy for achieving weight gain and measurable benefits?

- How long should intervention last to achieve benefits?

- Who should provide nutritional intervention and in what care setting?

- Can nutritional support alone achieve measurable benefits or is this only possible as part of a multi-disciplinary intervention?
NUTRITIONAL MANAGEMENT OF DYSPHAGIA
Nutritional considerations

- People who are nil by mouth for more than 5 days are nutritionally at risk (NICE 2006)

- Texture modified diets are often nutritionally inadequate (Nowson et al 2003, Wright et al 2005) and patients may require supplementary tube feeding or oral nutritional supplements (NICE 2006)

- Patients requiring thickened fluids are less likely to meet fluid requirements (Finestone et al 2001, Vivanti et al 2009)

- Nutritional requirements and texture requirements change over time therefore monitoring is crucial
Aims of dysphagia management

• Minimise risk of undernutrition *(Finestone et al 2001)*

• Minimise risk of dehydration *(Finestone et al 2001)*

• Minimise risk of aspiration pneumonia *(Perry & Love 2001)*

• Maintain oral intake *(Burton et al 2011)*
Challenges of modified texture diets

- Texture descriptors – objective and rheological?
- Variety (snacks)?
- Preparation
- Stability
- Require fortification
Route of feeding - Nasogastric versus PEG feeding

Geeganage et al (2012)

- 5 RCTs; 455 participants (n = 19 to n = 321)
- Fewer treatment failures (t = 3; n = 72; OR 0.09; 95% CI 0.01 to 0.51; P = 0.007; I² = 0%)
- Fewer gastrointestinal bleeds (t = 1; n = 321; OR 0.25; 95% CI 0.09 to 0.69; P = 0.007)
- Higher feed delivery (t = 1; n = 30; MD 22.00; 95% CI 16.15 to 27.85; P < 0.0001)
- No differences in mortality rate or pneumonia
Nasal loops

Beavan et al., (2010)

- N = 104 randomised to nasal loop or adhesive dressing

- Bridle/nasal loop significantly ↑ the amount of feed and fluid delivered, ameliorated electrolyte disturbances and ↓ NGT failure

- ↑ nasal traumas and ↑ costs (£ 88 over two weeks) in nasal loop group

- No differences between groups in mortality, morbidity, PEG placement, functional outcomes or LOS at three months
What is the spontaneous recovery rate?


- 91 acute stroke patients
- 48 (53%) clinical evidence of swallowing abnormality
  - 42% tube fed and 58% orally fed
- 13/48 (27%) eating regular diet by day 21
- 36/48 (75%) eating regular diet by day 90
- No assessment of dietary intake or nutritional status at follow-up
Research questions – dysphagia (NICE 2006)

- Do patients with dysphagia who are given thickened fluids (pureed food) compared with standard/unthickened fluids (soft food) benefit in terms of improved mood, increased nutritional intake, reduced dehydration, fewer aspiration incidents, avoidance of the need for enteral feeding or mortality?

- What are the benefits of enteral tube feeding compared with no tube feeding in people with dysphagia in terms of reduced complications associated with swallowing, nutritional status, hospital admissions, cost effectiveness and survival?
What are the energy requirements of patients who have had a stroke?
Measured Energy Expenditure

- BMR
- DIT
- Activity
- REE
- TEE
- Health
- Disease
- BMR + Stress
- Activity
- DIT
## Energy expenditure studies in stroke

<table>
<thead>
<tr>
<th>Study</th>
<th>Type</th>
<th>N</th>
<th>MEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekes &amp; Elia (1992)</td>
<td>Ischaemic</td>
<td>15</td>
<td>1317 (+ 221) kcal/day (95 – 107 % predicted)</td>
</tr>
<tr>
<td>Finestone et al (2003)</td>
<td>Ischaemic</td>
<td>65</td>
<td>1521 (+ 290) kcal/day (107 – 114 % predicted)</td>
</tr>
<tr>
<td>Weekes et al 2011</td>
<td>Ischaemic</td>
<td>11</td>
<td>1663 (+ 303) kcal/day</td>
</tr>
</tbody>
</table>
Energy requirements research questions

- What are the optimal levels of energy and nitrogen provision for patients who have had a stroke using clinical endpoints such as infection and mortality rates rather than changes in anthropometry and estimated nutrient balance (NICE, 2006)

- How do energy requirements change with changes in clinical condition, physical activity level and nutritional status?

- What are the requirements of stroke patients receiving long term home enteral tube feeding?
Conclusions

• Research required to evaluate the impact of nutritional support in at risk and malnourished patients who have had a stroke

• Research required to evaluate the impact of supplementary tube feeding and/or oral nutritional supplements in dysphagic patients on texture modified diets

• Research required to evaluate the impact of tube feeding on patient-centred outcomes and healthcare costs after stroke
ANY QUESTIONS?