Pennington Lecture

You can do it

Jeremy Nightingale
Gastroenterologist
Chairman of British Intestinal Failure Alliance (BIFA)
Professor Christopher R Pennington
1946-2002

THERAPEUTIC NUTRITION
A PRACTICAL GUIDE
C.R. PENNINGTON

CHAPMAN AND HALL MEDICAL

1988
Aims as BAPEN Chairman 2000-2002
To expand and apply the knowledge of nutritional care.
Outline of Lecture

My early career in nutritional support

Hospital Nutrition Support Teams
  - set up, working, studies

Intestinal failure and fluid management

Where we are now in nutritional care (BIFA)
Common sense and can do attitude.

Find a clinical problem, ask a question, investigate and publish.

1987 taken on a ward round, asked what I would be interested to research.

Many short bowel patients having PN.
1992 Difficult to get Senior Registrar job as a Gastroenterologist with an interest in nutritional support.

Told after one interview

“We don’t have patients with nutritional problems”
Leicester (1992)

**Food**

- Walkers snack packs
- Various cheeses

**Holidays**

- Thomas Cook airplane

**Hosiery**

- Stockings

**Richard III**

- Statue

**Sport**

- Football statue
Nutrition Support Team (NST)

Kings Fund 1992
A Positive Approach to Nutrition as Treatment

• Team which controls and supervises enteral tube and parenteral feeds.
• 4 members, dietitian, nurse, clinician, and pharmacist.
• Report to nutrition steering group/committee
Setting up a Nutrition Support Team (NST)

Where are we now?

How do we get there?

Where do we want to be?
Starting a NST (in 1993)

Main aim:
Appoint a nutrition nurse specialist to ensure parenteral nutrition was given effectively and safely.

1. Find interested people – *where we want to be*
   - Dietitian and Pharmacist

2. Get senior management support – *how do we get there*
   - Establish Nutrition Steering Group

3. Collect local data – *where we are now*
   - Prevalence of undernutrition (malnutrition)
   - Knowledge (undernutrition and its treatment)
   - Complications of parenteral nutrition
Prevalence of Undernutrition 1993
One Day Survey

- All medical in-patients (84 beds) (care of elderly excluded)
- Ask usual weight in health (%WL)
- Measure weight and height (BMI)
- Do TSF and MAC (calculate MAMC)

- Aim to publish
McWhirter JP, Pennington CR
Incidence and recognition of malnutrition in hospital.

*BMJ 1994; 308: 945-8*

<table>
<thead>
<tr>
<th>Ward type</th>
<th>n</th>
<th>Undernourished (BMI&lt;20kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General medicine</td>
<td>100</td>
<td>46</td>
</tr>
<tr>
<td>Respiratory medicine</td>
<td>100</td>
<td>45</td>
</tr>
<tr>
<td>Care of the elderly</td>
<td>100</td>
<td>43</td>
</tr>
<tr>
<td>General surgery</td>
<td>100</td>
<td>27</td>
</tr>
<tr>
<td>Orthopaedics</td>
<td>100</td>
<td>39</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>500</td>
<td>200 (40%)</td>
</tr>
</tbody>
</table>

Overall 34% were overweight
200 undernourished patients

- 9 (18%) were referred for nutritional support (70% of these gained weight on treatment).
- 96 (48%) had some nutritional information documented in hospital notes.

In-patient progress

- 67% of all patients lost weight during admission.
- 112 reassessed on discharge had mean weight loss of 5.4%
How to publish after that?

My mentors

“You can get anything published”

Eye catching title

- Fungal feeding-line infections: beware the eyes and teeth. *J Nightingale 1995*
- Our Granny starved to death in hospital. *Daily Express 1997*
- Thousands of patients are annually starved in the midst of plenty. *F Nightingale 1859*

Change the focus of the paper

Keep trying, don’t give up
### Prevalence of Undernutrition in 84 Medical Inpatients

Three simple methods of detecting malnutrition on medical wards

*Nightingale JMD, Walsh N, Bullock ME, Wicks AC. J R Soc Med 1996; 89: 144-148*

<table>
<thead>
<tr>
<th>Method</th>
<th>Assessed n (%)</th>
<th>Undernourished n (%)</th>
<th>Seen by dietitian n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>%WL &gt; 10%</td>
<td>65 (77)</td>
<td>17 (26)</td>
<td>4 (24)</td>
</tr>
<tr>
<td>BMI &lt; 19 kg/m²</td>
<td>69 (82)</td>
<td>13 (19)</td>
<td>6 (38)</td>
</tr>
<tr>
<td>MAMC &lt; 5&lt;sup&gt;th&lt;/sup&gt; percentile</td>
<td>83 (99)</td>
<td>16 (19)</td>
<td>6 (38)</td>
</tr>
</tbody>
</table>

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All methods: 84 (100)  29 (35)  8 (28)

39% BMI > 25
17% BMI > 30 kg/m²
Comparison of 3 Methods to Detect Undernutrition (n=64)

Three simple methods of detecting malnutrition on medical wards

#: 4 had BMI >25 kg/m²
*: 2 oedematous
Knowledge about the Assessment and Management of Undernutrition


20 multiple choice questions.
I stem and only one of 5 possible answers was considered correct.

12 - adult nutritional assessment and requirements
   Energy in CHO, lipid, protein, 5% dextrose. % weight loss calculation, albumin

5 - oral/enteral nutrition
   NG position, diarrhoea, high output stoma

3 - parenteral nutrition
   Abnormal LFT, sepsis, collapse
Knowledge about the Assessment and Management of Undernutrition


<table>
<thead>
<tr>
<th>Profession</th>
<th>n</th>
<th>Median score of 20 (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors</td>
<td>29</td>
<td>7 (2-12)</td>
</tr>
<tr>
<td>Medical Students</td>
<td>65</td>
<td>8 (3-12)</td>
</tr>
<tr>
<td>Nurses</td>
<td>45</td>
<td>7 (2-9)</td>
</tr>
<tr>
<td>Dietitians</td>
<td>11</td>
<td>16 (12-18)*</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>11</td>
<td>9 (5-11)</td>
</tr>
</tbody>
</table>

*: p< 0.0001 compared with the other 4 groups
Complications of PN
Chris Pennington (excludes insertion related)

Catheter-related
  Sepsis (CRBSI)
  Thrombosis
  Occlusion/damage

Nutritional and metabolic
  Trace element/vitamin

Effect on end organ
  Liver / gallbladder
  Kidney
  Bone
Catheter–related Sepsis (CRS) and the Effect of a Nutrition Nurse Specialist


<table>
<thead>
<tr>
<th></th>
<th>Before nurse</th>
<th>After nurse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>CRS (%)</td>
</tr>
<tr>
<td>Tunnelled</td>
<td>26</td>
<td>6 (23)</td>
</tr>
<tr>
<td>Untunnelled</td>
<td>25</td>
<td>11 (44)</td>
</tr>
</tbody>
</table>
Care of Catheter Hub

NO

YES
What information did we have?

**General nutrition**
- Unrecognised undernutrition
- Poor knowledge
- No / Few policies or guidelines

**Parenteral nutrition (PN)**
- High infection rate (71%, 70 per 1000 days)
- Inappropriate
- Wasted PN bags

**Enteral nutrition**
- No PEG screening
- Long waiting time for access (NJ or PEG)
Funding for a Nutrition Nurse Specialist for 1 year

- Embryo NST
- Clinician, nutrition nurse specialist and occasionally a senior dietitian from the surgical wards.
- Ward rounds mainly on surgical wards
- Focused on PN and NJ feeding
- Needed early good outcomes – luck!
Lucius Annaeus Seneca
Roman Philosopher (4 BC – AD 65)

“Luck is what happens when preparation meets opportunity”
How did we Justify the Continuation of a NST?
One year after Nutrition Nurse Specialist Appointment

Activity/outcome data
Quality benefits
Cost savings
  - avoided PN
  - avoided CRS
Avoided PN Episodes in the NST First Year

133 referrals for PN
78 PN episodes (75 patients)
59% of referrals given PN
<table>
<thead>
<tr>
<th></th>
<th>Pre-nurse year</th>
<th>NST year</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN episodes</td>
<td>82 (54 patients)</td>
<td>78 (75 patients)</td>
</tr>
<tr>
<td>PN days</td>
<td>665</td>
<td>752</td>
</tr>
<tr>
<td>Mean duration of PN (days)</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Catheter-related sepsis (CRS)</td>
<td>71%</td>
<td>29%* (<em>&lt;7%#</em>)</td>
</tr>
<tr>
<td>CRS / 1000 days PN</td>
<td>70</td>
<td>30* (6#)</td>
</tr>
<tr>
<td>Mortality</td>
<td>43</td>
<td>24*</td>
</tr>
</tbody>
</table>

*: P<0.05

# = last 3 months
To Determine the Tangible Cost - savings of a NST


**Tangible cost - savings**

**Includes:**  
- all equipment, investigations and medication costs

**Excludes:**  
- nursing, medical and laboratory time
- bed occupancy costs
Tangible Cost - Savings in NST Year


£

55 avoided PN episodes

42,741

35 avoided CRS episodes

7,974

Total

50,715

Intangible costs

250,337
The salaries of a Nutrition Nurse Specialist and a Senior Dietitian were justified.
Patients seen by NST

• **Oral failure** (neurological or muscular disease, or cancer)

• **Intestinal failure** (dysmotility, short gut, leak, obstruction, mucosal disease)
Intestinal Failure

Reduced intestinal absorption causing malnutrition and/or dehydration

Nightingale JMD 2001:
ISBN 1 900 151 936
Fasting Citrulline and Small Bowel Length

Abada F, MD Thesis 2016

Citrulline μmol / l

Small bowel length cm

R² Linear = 0.499
Severity of Intestinal Failure

Severe

Moderate*

Mild*

* : Intestinal Insufficiency

nutrition

water / electrolyte

Severe

Moderate*

Mild*

parenteral

parenteral

parenteral

oral supplements

oral glucose / saline

dietary adjustments

sodium chloride

* : Intestinal Insufficiency
INTESTINAL FAILURE
Severe Intestinal Failure service specification NHS England

ACUTE
- Dysfunction
  - Ileus
  - Enteritis
  - Fistula
  - Obstruction

CHRONIC
- Short bowel
- Gut bypass
- Dysfunction

Type 1
Short-term

Type 2
Medium-term

Type 3
Long-term
Severe Intestinal Failure in 117 In-patients

*Kennedy JF et al. Clin Nutr 2002; 21 (suppl 1): 35*

\[
n \ (\%)
\]

### Short term - Type 1
- Ileus: 17 (15)
- Chemotherapy / GVHD: 12 (10)
- HIV: 4 (3)

### Medium term - Type 2
- Fistula / anastomotic leak: 35 (30)
- Small bowel obstruction: 28 (24)

### Long term - Type 3
- High output stoma / short bowel: 18 (15)
- Other: 3 (3)
Intestinal Failure

What to do?
Intestinal Failure Management- Enterocutaneous Fistula(s)

• **Immediate**
  ─ Water / electrolytes (Na⁺, Mg++)
  ─ Sepsis
  ─ Wound management
  ─ Pain control

• **Early**
  ─ Nutrition (refeeding risks)
  ─ Reduce stoma / fistula output
  ─ Psychosocial
  ─ Mobility

• **Late**
  ─ Anatomy - mapping
  ─ Procedure – Not days 10 – 100
  ─ Disease treatment
4 months PN
Fluid Management
Is a NST a fluid management team?

Overhydration (saline overload)

High Output Stoma (dehydration, >1.5L/24 hrs)
Nightingale JMD, Woodward J and Small bowel/Nutrition Committee of BSG. Guidelines for the management of patients with a short bowel. Gut 2006; 55 (suppl IV)
How Common is a High Output Stoma?

2002-2006 within 3 weeks of formation


Stomas
717

Small bowel
456
  ↓
High output
75 (16%)
  ↓
Resolved
55 (73%)
  ↓
Oral treatment
15 (20%)
  ↓
Colostomy
231
  ↓
High output
0
  ↓
Parenteral support
5 (7%)
Has anything changed?

- Malnutrition incidence
- Nutrition Support teams
- Knowledge
- Quality of PN care
- IF/HPN services
### Malnutrition* According to Type of Ward

**Table 48. BAPEN Screening Surveys in Hospitals in England 2007-2011**

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2010</th>
<th>2011</th>
<th>N</th>
<th>Total %</th>
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</thead>
<tbody>
<tr>
<td>Care of the elderly</td>
<td>34</td>
<td>39</td>
<td>43</td>
<td>37</td>
<td>2371</td>
<td>38</td>
</tr>
<tr>
<td>Oncology</td>
<td>41</td>
<td>39</td>
<td>37</td>
<td>33</td>
<td>1070</td>
<td>38</td>
</tr>
<tr>
<td>Medical</td>
<td>32</td>
<td>33</td>
<td>40</td>
<td>29</td>
<td>7899</td>
<td>34</td>
</tr>
<tr>
<td>Surgical</td>
<td>28</td>
<td>23</td>
<td>32</td>
<td>24</td>
<td>6390</td>
<td>27</td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>15</td>
<td>20</td>
<td>22</td>
<td>17</td>
<td>2840</td>
<td>18</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>26</td>
<td>33</td>
<td>23</td>
<td>1869</td>
<td>28</td>
</tr>
<tr>
<td>&gt;1 ward type</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>33</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>DK/NA</td>
<td>24</td>
<td>-</td>
<td>28</td>
<td>25</td>
<td>1165</td>
<td>25</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>7131</td>
<td>4056</td>
<td>7227</td>
<td>5217</td>
<td>23631</td>
<td></td>
</tr>
<tr>
<td><strong>P value†</strong></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*: MUST medium + high risk
Screening for Undernutrition

• Not always done and often not acted upon

Not currently a NHS health priority

“Prevention is better than cure”
# Hospital Nutrition Support Teams

**NICE 2006**  *Guidelines on Nutrition Support in Adults (CG32)*

**NCEPOD 2010**  *Parenteral Nutrition: A Mixed Bag*

**BAPEN**  *Freedom of information 2017*

<table>
<thead>
<tr>
<th>Trust</th>
<th>Hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>NST</td>
<td>80</td>
</tr>
<tr>
<td>Nutrition Steering Committee</td>
<td>90</td>
</tr>
</tbody>
</table>

But 33% did not reply
Malnutrition and Fluid Balance Knowledge of Doctors

**Undergraduate training**
Association for Nutrition (Undergraduate priority) - GMC backed

**Postgraduate training**
- Core Medical Training (weight loss)
- Speciality Gastroenterology Training
  - Advanced Nutrition

**To be resolved**
Malnutrition affects all specialities
How will non-gastroenterology specialities be covered?
Who will do the teaching?
Quality of Parenteral Support Care

British Intestinal Failure Alliance (BIFA) Documents

www.bapen.org.uk/about-bapen/bapen-special-interest-groups/bifa

HPN
HPN in advanced malignancy
High dose loperamide
Peptide growth factors
CRBSI – diagnosis
   – treatment
Standardised Parenteral Support Catheter Guidelines 2018


- Connecting
- Disconnecting
- Changing Dressing

Cathy Cawley & Mia Small
Simon Lal and Jeremy Nightingale
NHS England Consultation guide: Proposed Changes to Severe Intestinal Failure Services for Adults

<table>
<thead>
<tr>
<th>Region</th>
<th>Current IF/HPN unit</th>
<th>Proposed Integrated IF centre</th>
<th>Proposed HPN centre only</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>11</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Midlands/East</td>
<td>12</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>London</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>South</td>
<td>14</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>11</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

“Contract award estimated for October 2019”
Key Messages

1. Undernutrition remains common in hospitals. Not always detected and acted upon.

2. Undergraduate and post graduate medical training in nutrition and fluid balance is about to improve.

3. Nutrition Support Team must continue to be formed and they must keep data (publish).

4. Intestinal Failure/HPS services are finally being reconfigured.
- We must keep the profile of malnutrition high (prevention, detection and treatment).
- We must keep performing and publishing studies so expanding the knowledge of nutritional care.
Chris Pennington
1946-2002

You can do it
1. How many kcal are there in one gram of protein, fat and carbohydrate?
   a) 5, 9, 7  
   b) 9, 4, 4  
   c) 7, 9, 5  
   d) 4, 9, 4  
   e) 5, 7, 9

2. Approximately how many kcal a day would a well 70 kg man in hospital need?
   a) 500  
   b) 10,000  
   c) 2,000  
   d) 5,000  
   e) 10

3. Approximately how many kcal a day would a febrile post-operative 70 kg man need?
   a) 2,000  
   b) 500  
   c) 10,000  
   d) 5,000  
   e) 10

4. Approximately how many grams a day of nitrogen would a well 70 kg man in hospital need?
   a) 120  
   b) 52  
   c) 12  
   d) 520  
   e) 1,200

5. How many grams of protein are equivalent to a gram of nitrogen?
   a) 1.75  
   b) 15.50  
   c) 32.75  
   d) 90.65  
   e) 6.25

6. How many kcal are there in 1 litre of 5% dextrose?
   a) 2,000  
   b) 6,000  
   c) 600  
   d) 200  
   e) 20
7. In what units is body mass index (BMI) measured?
   a) kg/m
   b) m/kg²
   c) m/kg
   d) kg/m²
   e) kg

8. What is the normal/acceptable range of BMI?
   a) 4-10
   b) 19-25
   c) 24-30
   d) 29-35
   e) 9-15

9. The prevalence of malnutrition in most UK hospitals is?
   a) 2%
   b) 60%
   c) 8%
   d) 15%
   e) 30%

10. What % weight loss (in last 3 months) is suggestive of malnutrition?
    a) 2
    b) 10
    c) 20
    d) 40
    e) 60

11. How is % weight loss calculated?
    a) (usual wt - current wt) / usual wt x 100
    b) (current wt - usual wt) / usual wt x 100
    c) (usual wt - current wt) / current wt x 100
    d) (current wt - usual wt) / current wt x 100
    e) (usual wt - 100) / current wt

12. A poor measure of nutritional status is?
    a) BMI
    b) % weight loss
    c) grip strength
    d) albumin
    e) weight
13. A 40 year old obese man is admitted with pneumonia, he has lost 30% of his body weight in the 3 months prior to admission and now weighs 100 kg, should he initially receive?

a) parenteral nutrition  
b) oral nutritional supplements  
c) weight reducing diet  
d) nocturnal nasogastric feeding  
e) high fibre diet

14. The recommended method to confirm the correct position of a fine bore nasogastric tube is?

a) abdominal x-ray  
b) hear bubbles in stomach  
c) chest x-ray  
d) aspirate gastric acid  
e) endoscopic confirmation

15. The most common reason for diarrhoea with enteral feeding is?

a) high osmolality feed  
b) antibiotics  
c) lactose  
d) infected feed  
e) rapid infusion

16. A feeding jejunostomy, in preference to a feeding gastrostomy, is indicated in all but one of the following circumstances?

a) hiatus hernia  
b) post-abdominal surgery  
c) head injury  
d) multiple sclerosis  
e) post-oesophagectomy

17. The most important oral treatment for a high output ileostomy is?

a) increase fluids  
b) give salt supplement  
c) give fibre  
d) decrease fluids  
e) give loperamide
18. Parenteral feeding lines most commonly become infected from?

a) exit site  
b) hub connection  
c) urine  
d) teeth  
e) feeding bag

19. Liver function test abnormalities in patients receiving parenteral nutrition most commonly relate to?

a) high carbohydrate feed  
b) high lipid feed  
c) few calories  
d) urinary tract infection  
e) continuous feeding

20. A patient suddenly collapses while receiving parenteral nutrition. This is unlikely to be due to one of the following?

a) hypoglycaemia  
b) hyperglycaemia  
c) air embolism  
d) septicaemia  
e) pulmonary embolism