Key papers on clinical nutrition

Pharmacist

Gil Hardy
Key Papers in the Field of Clinical Nutrition

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Key Papers in the Field of Clinical Nutrition

- **Parenteral Nutrition Practices in Hospital Pharmacies in Switzerland, France and Belgium.**
  

- **Is Parenteral Nutrition Guilty?**
  

- **Nutrition without frontiers: time for standardisation in clinical nutrition?**
  
  Hardy G & Campos A. Curr Opin Clin Nutr Metab Care 2004:7;279-283
Parenteral Nutrition Practices in Hospital Pharmacies in Switzerland, France and Belgium.
Maisonneuve N et al Nutrition 20:528-535, 2004

Introduction

• “PN is associated with metabolic risks, infectious and mechanical complications [but] ..physicochemical instability and substrate precipitation.... can be avoided by following pharmaceutical and clinical guidelines”

• “NST pharmacists have been acknowledged as experts in compounding PN and are responsible for the logistical aspects and integrity of PN product lines”

• “multi-compartment bag development has increased the shelf-life of PN...and results in cost savings”
Parenteral Nutrition Practices in Hospital Pharmacies in Switzerland, France and Belgium.
Maisonneuve N et al Nutrition 20:528-535, 2004

**Results:** (cf to UK unpublished survey BPNG 2003)

Response rate from 378 hospitals:

CH 55.6%  F 30.5%  B 24.5%  cf: UK 94% (n=100)

Ready-To-Use (industrial) Bags:

(Adults): CH 86%  F 79%  B 86%*  cf: UK 50%

*50% Hosp Pharm

(Peds): CH 20%  F 29%  B 14%

(HPN): CH 4%  F 20%  B 7%
Additives:

- vitamins and trace elements added by nurses in CH and F

- “rarely supervised by pharmacists”

- vitamins and trace elements added by pharmacists in B (and UK)

- NB. In UK vitamins and trace elements not added to 33% RTU bags

Sources of Phosphate:

- Glucose-1-Phosphate F/B/UK
- Glycero-Phosphate CH/UK (mostly IP)
Nutrition Support Teams:

~ 40% (32-45%) mostly Univ Hosp
  cf UK 60% BUT ONLY 40% prescribe PN!

• “NST rarely consulted to initiate treatment or evaluate nutritional needs nor involved in patient follow up”

• “PN initiated mostly by Physicians”

• “dietitian consulted for nutritional needs” (13-28%)

• “PN prescription checked by pharmacist” (16-66%)
Quality Control:

75% B 85% CH 95% F
visual - gravimetry - sterility
(No UK data)

Contradictory Quality Statements:
“a risk of error has not been established for the addition of micronutrients or electrolytes to bags on the ward”

“To prevent contamination, PN must be prepared with aseptic techniques in a sterile environment”
Reasons for using Standard Bags:

- “to decrease manufacturing error rates and [increase] shelf-life”

- cf UK the principal factors have been:
  - staff
  - facilities
  - workload
  - costs

McElroy B & Sizer T 2003 BPNG Survey
Parenteral Nutrition Practices in Hospital Pharmacies in Switzerland, France and Belgium.
Maisonneuve N et al Nutrition 20:528-535, 2004

• Authors Conclusion:
  “Improvement in PN-related services is possible with further involvement of NST”

• Reviewers Conclusion:
  “by limiting tailor-made preparation to special cases, pharmacists might lose a part of their practical knowledge, which is critical for the preparation of highly specific PN formulae”
Is Parenteral Nutrition Guilty?

Varga P et al (10 authors)

Intensive Care Medicine
2003:29: 1861-1864
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

• Response from European Intensivists to “Death by Parenteral Nutrition” by Marik P.E and Pinsky M (Int Care Med 2003:29;867)
  ‘a poison…is a chemical substance that …kills, injures or impairs an organism …by definition TPN meets these criteria for a poison in critically ill patients’
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

RESPONSE
• Something given safely to patients in ICU or Home for years cannot be called ‘poison’
• dose response and toxicity with excess is a feature of most active therapies—even food!
• anything used incorrectly or in excess may do harm
• No evidence that PN not given in excess is harmful
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

• Overfeeding results in: hyperglycaemia, hypertriglyceridaemia, uraemia, metabolic acidosis, electrolyte imbalance etc
• Avoid by conscientious monitoring and titrating quantity of nutrients eg glucose
• Great benefits of glycaemic control for early EN or PN (Van de Berghe et al NEJM 2001:345;1359)
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

• Careful cannulation and sterile techniques prevent or minimise infections
  (Preiser C et al Int Care Med 1999:25;95)

• immuno-suppression can be attenuated by glutamine supplementation
  (Griffiths R, Curr Opin Clin Nutr Metab Care 2003:6;2003)
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

- Most studies in meta analysis of 21 papers on PN v EN had methodological problems (Heyland 1998)
- non critically ill surgical patients (Sanstrom 1993)
- overfeeding in the PN group (Herndon 1989)
- combined PN and EN (Chiarelli 1996)
- early post-op PN in unstable patients (Abel 1976)
- no longer current practice (no lipid) (Abel 1976)
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

• 23% patients on ICU cannot tolerate adequate quantity of nutrients enterally
  (according to Working Group of Nutr and Metab of ESICM 1999)
• 8-10% patients on surgical ICU need PN because EN is not possible or not safe
  (Berger et al Nutrition:1997:13;870)
• EN often provides only partial nutrition and also has risks  (Adam S et al Int Care Med 1997:23;261)
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

• Malnourished patients unable to tolerate EN MUST be given PN

• Underfeeding is a debt that must eventually be repaid - it is worse when compounded
  (Griffiths Nutrition 2000:17;53)

• Failure to give PN to a malnourished patient unable to tolerate EN increases mortality 3x
  (Braunshweig et al Am J Clin Nutr 2001:74;534)
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

- When used wisely PN *can* deliver adequate Nutrition Support SAFELY
- PN and EN are not mutually exclusive
- When PN is correctly applied
  complications are *less likely* to result in death compared with EN

(Woodcock et al Nutrition 2001: 17; 203)
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

Authors Conclusion:
• Well controlled studies in mixed EN patients show possible benefit from supplemental PN with no evidence of harm
  (Bauer et al Int Care Med 2000:26;893)
• We reject that “the acronym TPN represents ‘total poisonous nutrition’ and suggest a more applicable definition of ‘poison’ is ‘wicked, dangerous, hateful’ (OED)
Is Parenteral Nutrition Guilty?
Varga P et al (10 authors)
Intensive Care Medicine 2003:29: 1861-1864

Reviewer’s Conclusion:
• The time has come for the EN versus PN debate to be laid to rest.
• Patients with questionable G.I. Function should be fed using a combination of EN and PN, increasing or decreasing each therapy according to patient’s tolerance

(Woodcock & McFie Nutrition 2002:18;523)
Nutrition without frontiers: time for standardisation in clinical nutrition?

Hardy G & Campos A

Curr Opin Clin Nutr Metab Care 2004:7;279-283
Nutrition without frontiers: time for standardisation in clinical nutrition?  
Hardy G & Campos A  
Curr Opin Clin Nutr Metab Care 2004:7;279-283

Approx 50% hospitalised patients are malnourished in Europe, N and S America  
(Correia Nutrition:2003:19;823-825)

BUT:  
Nutritionists continue to use different terminology to communicate:  
“S.I. Units or Non S.I. Units?”  
“Time to Kill the Kilojoule?”
Nutrition without frontiers: time for standardisation in clinical nutrition?
Hardy G & Campos A
Curr Opin Clin Nutr Metab Care 2004:7;279-283

Survey:
25 experts from 12 countries/5 continents
• Energy: 88% preferred kilocalories
  12% use calories (No kilojoules!)
• Protein: 48% use g Amino Acid
  36% use g Nitrogen
  16% use protein equivs
Nutrition without frontiers: time for standardisation in clinical nutrition? Hardy G & Campos A Curr Opin Clin Nutr Metab Care 2004:7;279-283

Survey:
Electrolytes: 28% use millimoles (mmol) 72% use milliequivalents (mEq) (but 17% / 72% use mmol for Phosphate)

Trace Elements: 52% use microgram (µg) 48% use micromole (µmol)
Other inconsistencies:


“The requirement for energy in kcal (kJ) is patient specific. Calories should be given.”

B A P E N (1996):

“optimal protein requirement 1.5-2.0 g/kg/d”

“recommend 1.5-2.0g amino acid/kg/ day”
Other inconsistencies (continued):

French consensus statement for ESPEN (1996):
Requirements: 120-140 kJ/kg/d and 150-200 mgN/kg/d

Comments from: Canada, Italy, Sweden, Spain, USA
Refer to: calories, kilocalories, g of Nitrogen

Clin Nutr 1996
The International System of Units (S.I.)
‘adopted’ since mid 1950’s (1972 in UK)
S.I. Base Units: metre (m) kilogram (kg)
second (s) mole (mol)
Non S.I: “use for foreseeable future”
minute (min) litre (L) Celsius (°C)
Nutrition without frontiers: time for standardisation in clinical nutrition?
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The amount of a substance according to S.I.
“mole per cubic metre or mole per kilogram”

HOWEVER

“mol or mmol per litre commonly accepted”
From its inception several non-SI units have been maintained and accepted for practical purposes in Nutrition, Medicine and Science - but not the calorie.

Why Not?
EU Commission Directive for Labelling
“available energy in kilojoules and kilocalories and content of protein, carbohydrate and fat, expressed in grams per 100g or per 100ml” (1999)
UK Milk labelling:
“Energy: 147 kJ 35 kcal. Calories per 100mL 35”
* Three energy terms to ‘inform’ consumers *
Energy

• J.P. Joule (1848-1878) established mechanical equivalent of heat as $4.17 \times 10^7$ ergs per calorie ($J = 10^7$ ergs)

• Specific Heat defined as quantity of heat (kcal) to raise temp of 1g substance by 1°C

• Joule not adopted in North or South America and not understood in UK

• Use kcal and Kill the kilojoule?
Protein

- FAO/WHO/UNU(1985): BMR for adults 25 kcal/kg/d with losses of 50 mg N/kg/d
- PN administers L-amino acids or g AA/kg/d
- EN administers protein or g protein/kg/d
- Nitrogen balance is measured or estimated i.e. N in - N out or g N/kg/d
- Use g N?
Electrolytes

• One millimole of substance has the same number of atoms or molecules as 1 mmol of any other substance
• No need to know valency for calculations
• Equivs relate ion conc to 1 mmol Hydrogen
• But for divalent Cations 1 mmol=2mEq
• Use mmol?
Minerals

“Selenium deficiency”  “Zinc supplements”

• BUT it is NOT the base metal that is administered for therapeutic benefits

• “Selenite (Se VII), (Zn II) (Cu II) Sulphate

• No logic to use Unit of Mass (µg)

• Use µmol?
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Authors’ and Reviewer's Conclusions

• In Clinical Nutrition strict adherence to S.I. units does not help international consensus
• Inconsistencies exist in official directives, practice guidelines & professional journals
• Standardisation will simplify nutrition education and scientific communications
• “Nutrition without Frontiers”
IPaNEMA

International Parenteral Nutrition Education & Methodology Advancement

www.parenteral-nutrition.net

http://groups.msn.com/ParenteralNutrition-Ipanema
IPaNEMA

Objectives:
• Improve understanding of the benefits and efficacy of PN
• Standardise international terminology and practices for PN
• Facilitate research and educational fellowships for PN practitioners
• Focus R&D on emerging technologies:
  – nutraceuticals
  – new devices
  – assessment methods
  – compounding advances
  – administration techniques
IPaNEMA

Strategy:

Use the world-wide web, publications and conferences to educate and exchange PN information and experiences with members for improved patient outcome

International Parenteral Nutrition Education and Methodology Advancement

http://groups.msn.com/ParenteralNutrition-Ipanema
IPaNEMA

**ASPEN 2005 Silver Level Sponsor Programme**

“Safe and Efficacious Parenteral Nutrition Support for 2005”

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