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Abstracts of Original Communications

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Tailored dietary advice and food fortification results in weight gain and clinical benefit in malnourished patients with chronic obstructive pulmonary disease (COPD). By C.E. WEEKES[1], M. ELIA[2] and P.W. EMERY[3], [1]*Department of Nutrition and Dietetics, Guy's & St Thomas' Hospital NHS Trust, London, UK, SE1 7EH,* [2]*Institute of Human Nutrition, Southampton General Hospital, Southampton, UK, SO16 6YD and* [3]*Department of Nutrition and Dietetics, King's College London, UK, SE1 9NN*

Dietary advice and food fortification are often recommended as the first line of treatment for malnourished patients, yet there is a surprising lack of evidence to support this strategy. Malnutrition in COPD is associated with increased morbidity and mortality and poor quality of life and nutrition intervention studies to date have relied on the use of proprietary nutritional supplements. The aim of the present study was to establish whether or not tailored dietary advice and food fortification in malnourished patients with COPD results in weight gain and measurable clinical benefit.

Fifty malnourished chest clinic out-patients with COPD (BMI <20.0 kg/m^2 or >10% recent weight loss) were recruited and randomised (twenty-eight intervention, twenty-two control; BMI 19.8 (SD 1.6) kg/m^2; age 69.0 (SD 10.9) years). Intervention consisted of tailored dietary advice from a dietitian and a free supply of milk powder (Kerry Foods, Eire) for 6 months. Controls received a leaflet encouraging food fortification. Subjects were followed up for 1 year and the following variables were measured: nutritional status, lung and skeletal muscle strength, lung function (FEV_1 and FVC), MRC dyspnoea (MRC) (perceived breathlessness on physical activity) and activities of daily living (ADL) scores and quality of life (St George's Respiratory Questionnaire (SGRQ)). No subjects attended a pulmonary rehabilitation course during the 1-year study period.

	6 months					12 months				
	Intervention		Control			Intervention		Control		
	Mean	SD	Mean	SD	*P*	Mean	SD	Mean	SD	*P*
SGRQ (change in score)	−1.1	16.7	2.7	8.5	0.365	−7.4	14.0	4.3	11.3	0.006
MRC score	2.8	1.3	3.9	1.0	0.004	3.3	1.4	3.9	1.0	0.100
ADL score	17.2	5.0	19.5	3.8	0.104	16.7	4.2	19.9	3.9	0.027
Weight change (kg)	2.0	4.6	−1.0	2.5	0.018	3.0	6.2	−3.0	3.6	0.002
Sum four skinfolds change (mm)	4.8	10.3	−0.8	4.7	0.040	7.8	12.9	−3.8	6.7	0.003
MAMC change (cm)	0.2	1.2	−0.3	0.8	0.127	0.3	1.4	−0.8	1.3	0.028

Weight gain and fat mass significantly increased in the intervention group throughout the study period while the effects on mid arm muscle circumference (MAMC), SGRQ (in particular the perceived impacts on daily life and physical activity) and ADL were only significant at 12 months. Dyspnoea on physical activity improved during the intervention period but then deteriorated over the subsequent 6 months. There were no other statistically significant differences between the groups.

Tailored dietary advice and food fortification resulted in weight gain and improvements in quality of life, activities of daily living and dyspnoea, in the absence of changes in lung function and muscle strength. Improvements in some variables continued after the intervention period had ceased, suggesting that the clinical benefits of a sustained period of tailored dietary advice and food fortification can extend beyond the intervention period.

Prediction of fat-free mass in long-term haemodialysis patients using dual X-ray absorptiometry (DXA) as the reference method. By S. SMITH[1], H.I.M. DAVIDSON[1] and D.A.S. JENKINS[2], [1]*Dietetics, Nutrition & Biological Health Sciences, Queen Margaret University College, Corstorphine Campus, Edinburgh, UK, EH12 8TS,* [2]*Fife NHS Trust Renal Unit, Whitefield Road, Dunfermline, KY12 0SU*

It is well recognised that long-term haemodialysis patients are at risk of protein–energy malnutrition (PEM) (Quereshi *et al.* 1998) and that this in turn may influence morbidity (in particular quality of life and functional ability) and mortality in this group (DeOro, 1997; Laws *et al.* 2000). The quantification of body composition in relation to fat-free mass (FFM) is vital in order to ascertain the effects of any nutritional intervention aimed at addressing PEM in this group. However, the most appropriate clinical measurements which would achieve this, in addition to the timing of such measurements relative to the dialysis procedure, remain equivocal.

The present study examined a variety of anthropometric measurements used to estimate FFM and compared these measures with those obtained from DXA for FFM. In addition, it aimed to examine the possible effects of timing on anthropometric measurements obtained both immediately post-dialysis and during the interdialytic period. The results reported are part of a larger intervention trial.

Anthropometric measurements were taken post-dialysis and the following interdialytic (non-dialysis) day at the same time as patients attended for a whole body DXA scan (height, weight, BMI, mid-arm circumference (MAC), triceps skinfold (TSF), arm muscle circumference (AMC), calf circumference (CC), calf skinfold (CSF), calf muscle circumference (CMC)). All anthropometric measurements were taken by a trained International Society Advancement of Kinathropemetry (ISAK) anthropometrist (S.S.) following ISAK standard procedures (Norton *et al.* 1996).

DXA scans were conducted using a GE Lunar Prodigy scanner in the Radiology Department to quantify fat mass (DFM) and FFM (DFFM).

Nineteen (nine male, ten female) long-term stable haemodialysis patients (>6 months) consented to participate in the present study: Mean age of the group was 54.1 (SD 10.9) years with a BMI of 25.5 (SD 4.75) Kg/m^2. FFM derived from DXA did not show any significant relationship with BMI or MAC when calculated either post-dialysis or in the interdialytic period. Significant associations between DFFM and anthropometric measurements were evident and are shown in the Table below.

	Post-dialysis		Interdialytic	
	r	*P*	*r*	*P*
DFFM/AMC	0.512	<0.05	0.494	<0.05
DFFM/CC	0.698	<0.01	0.698	<0.01
DFFM/CMC	0.824	<0.01	0.821	<0.01

Simple regression analysis showed AMC (r^2 0.244, $P<0.05$) CC (r^2 0.487, $P=0.001$) CMC (r^2 0.674, $P<0.0001$) in the interdialytic period and AMC (r^2 0.262, $P<0.05$), CC (r^2 0.487, $P=0.001$) and CMC (r^2 0.679, $P<0.0001$) in the post-dialysis period to predict DFFM.

These results suggest that in relation to dialysis the timing of anthropometric measurements may not be crucial and may be equally as reliable in the interdialytic or post-dialysis period. However, whilst AMC is routinely used to indirectly quantify FFM in this group these results strongly suggest that CMC is a more accurate predictor of FFM as derived from DXA.

DeOro PB (1997) *American Journal of Kidney Diseases* **30**, 204–212.
Laws RA, Tapsell LC & Kelly J (2000) *Journal of Renal Nutrition* **10**, 139–147.
Norton K, Whittingham N, Carter L, Kerr D, Gore C & Marfell-Jones M (1996) Measurement techniques in anthropometry. In *Anthropometrica*, pp. 25–75 [K Norton and T Olds, editors]. Sydney: UNSW Press.
Qureshi AR, Alvestrand A, Danielsson A, Divino-Filho JC, Gutierrez A, Lindholm B & Bergstrom J (1998) *Kidney International* **53**, 773–782.

Chronic cholestasis and home parenteral nutrition: how much lipid is it safe to give? By R. VEGA, C.N. KALANTZIS, G. GEORGIOS, W. LIM, C. PAPADIA, D. POLYMEROS, A. FORBES and S.M. GABE, *St Mark's Hospital, Northwick Park, Harrow, UK, HA1 3UJ*

Chronic cholestasis (CC) has been described as a life-threatening complication related to home parenteral nutrition (HPN). Recent evidence suggests that CC is less frequent if the parenteral lipid energy administered is <1 g/kg per d. The aim of the present study was to assess the prevalence of CC and contributing factors in a cohort of adult patients on HPN.

Patients on HPN followed in a specialist unit from 1979 to 2003 were reviewed (*n* 188). Probability of survival and probability of developing CC were calculated using the Kaplan-Meier method. CC was defined as 1.5-fold the upper limit of normal on two of three liver function measurements (γ glutamyl transferase, alkaline phosphatase and serum bilirubin) for at least 6 months. Prognostic factors of survival and contributing factors for CC were identified with log-rank tests and Cox regression models.

The mean duration of HPN was 4.7 (range 0.1–22.5) years. Small bowel length was <50 cm in 14% patients, 50–99 cm in 21%, 100–149 cm in 20% and >150 cm in 43%. Fifteen patients (60% male, 40% female) were diagnosed with CC. Nine of these patients developed CC after an average of 31 (range 1–69) months. The remaining six patients had CC before starting HPN. Liver-failure-related death was attributed to five of the fifteen CC-diagnosed patients. The average of parenteral lipid infusion was 7067 (SD 5556) and 5071 (SD 5184) kJ/week (1689 (SD 1328) and 1212 (SD 1239) kcal/week) in patients with and without CC, respectively ($P<0.001$). The average parenteral lipid infusion (g/kg per d) was 0.58 (SD 0.16) in patients with CC and 0.32 (SD 0.22) in patients without CC ($P=0.03$). The prevalence of HPN-related CC at 1, 2, 3, 5 and 10 years was 1.2, 2.6, 3.5, 6.6 and 10.5%. In the univariate analysis, prevalence of CC was significantly related to gender and amount of lipid parenteral infusion. In the multivariate analysis no contributing factors could be identified, probably due to the small sample size.

These data suggest that CC occurs in patients receiving > 0.5 g/kg per d as lipid. This challenges the amount of lipid that should be given to patients in the long term and raises the question of more formal screening for fibrotic liver disease.

A comparison of malnutrition screening tools in acute hospital admissions to a district general hospital. By C.M.M.B. FOLEY[1], C. WONG[2], A. FORBES[3] and S.M. GABE[3], [1]*Imperial College, London, UK,* [2]*Dietetic Department, Northwick Park Hospital, London, UK, HA1 3UJ and* [3]*St Mark's Hospital, London, UK, HA1 3UJ*

Nutrition screening identifies malnourished patients or those at risk of malnutrition to prevent the development of malnutrition-related complications. The Malnutrition Universal Screening Tool (MUST) was developed for this purpose. Our aim was to compare a number of different screening tools in unselected admissions and assess if these tools can identify patients more at risk of developing in-patient complications and a greater length of stay (LOS).

One hundred unselected patients (forty-eight males, fifty-two females; age 64 years, range 23–104 years) were recruited through Casualty in a district general hospital (seventy medical, twenty-two surgical and eight orthopaedic). Each patient was assessed within 48 h of admission. Patients were asked questions covering the MUST, Nutrition Risk Index (NRI), Subjective Global Assessment (SGA) and Northwick Park Assessment (NWP) screening tools. The NWP tool scores recent weight loss, appetite and intake. Anthropometric data (weight, height, triceps skinfold and mid-arm circumference) were recorded by a single observer. LOS and in-patient complications were noted 1 month after admission.

Mean age was 64 (SD 19) years, BMI 24.5 (SD 4.8) kg/m^2 and LOS was 7 (SD 6) d. The prevalence of malnutrition was 12, 16 and 36% using anthropometry, BMI and SGA, respectively. Using the MUST, NRI and NWP screening questions 38, 42 and 55% of hospital admissions were classified as being at medium to high risk of malnutrition. There were twenty-five in-patient complications (44% non-infective, 40% infective, 16% both). Malnourished patients had the longest LOS ($P<0.05$) and highest complication rate ($P<0.01$). In-patient complications were significantly more frequent according to the degree or risk of malnutrition (see Table). Similar findings were seen for infective and non-infective complications.

	Total in-patient complications according to degree or risk of malnutrition						
	Low		Medium		High		
Assessment tool	Mean	SD	Mean	SD	Mean	SD	*P* value
Anthropometry	0.19	0.52	0.60	0.51	1.50	0.71	<0.001
SGA	0.09	0.34	0.26	0.44	1.08	0.86	<0.001
MUST	0.07	0.25	0.31	0.60	0.77	0.81	<0.001
NRI	0.17	0.42	0.25	0.65	1.00	0.63	<0.001
NWP	0.13	0.34	0.33	0.68	0.50	0.67	0.08

Odds ratios for risk of complications in patients malnourished or at risk of malnutrition compared with well-nourished patients were 11.8, 9.4, 11.7, 2.2 and 2.4 using anthropometry, SGA, MUST, NRI and the NWP tools, respectively. Well-nourished patients classified 'at risk' had more frequent in-patient complications than the well nourished. The odds of developing a complication if well nourished and classified 'at risk' was 3.1, 0.95 and 0.57 using the MUST, NRI and NWP tools, respectively. The risk of complications when malnourished was 7.8. Comparing the tools there was only good agreement between the MUST and SGA (k 0.72).

The prevalence of malnutrition in patients admitted to hospital ranged from 12 to 42%, and 38–54% were malnourished or at risk of malnutrition. The MUST, along with SGA and anthropometry were the best tools at detecting patients at greatest risk of complications. The MUST can identify well-nourished at-risk patients with a higher complication rate.

Percutaneous endoscopic gastrostomy insertion – can current antibiotic prophylaxis guidelines be effective? By E.A.B. CAMERON, J. McGOVERN, L. HINDLE, C. MILLER and I.W. FELLOWS, *Department of Gastroenterology, Norfolk and Norwich University Hospital, Colney Lane, Norwich, UK, NR4 7UY*

Percutaneous endoscopic gastrostomy (PEG) feeding tubes are frequently placed to aid nutrition in dysphagic patients (particularly following stroke). Peristomal infection occurs in 5–30% of patients and may be as high as 65% in patients with malignancy. The British Society of Gastroenterology currently recommends antibiotic prophylaxis with either a cephalosporin or co-amoxiclav to prevent infection (British Society of Gastroenterology, 2001). Recent studies suggest that the majority of infections occur with methicillin-resistant *Staphylococcus aureus* (MRSA), an organism resistant to both types of antibiotics (Hull *et al*. 2001). At the Norfolk and Norwich University Hospital, we do not routinely use prophylactic antibiotics for PEG insertion. We have studied the rate of peristomal infection and the organisms involved.

Forty-six consecutive patients undergoing PEG insertion between May and September 2003 were studied and followed up for 30 d. Endpoints for the present study were rates of peristomal infection (defined as the use of topical or systemic antibiotics for suspected peristomal infection) and positive peristomal swabs (only taken when considered indicated).

The median age of the patients was 77 (range 20–92) years; 52% were female. Underlying reasons for PEG tube insertion were cerebrovascular accidents (78%), other neurological disorders (20%) and cancer (2%). In eighteen patients, French-sized (Fr) 9 Fr tubes were inserted and 15 Fr in twenty-eight. Of the patients, 33% developed a peristomal infection (22% received systemic antibiotics and 11% topical antibiotics). Positive peristomal swabs were taken from 35% of patients (MRSA 81%, streptococci 25%, coliforms 13% and anaerobes 6%). There was no association between peristomal infection and indication for PEG insertion (P=0.460, Fisher's exact test), size of PEG tube (P=0.575, Pearson χ^2 test) or age (P=0.348, Mann–Whitney U test) or between positive peristomal microbiology and indication for PEG insertion (P=1.000, Fisher's exact test), size of PEG tube (P=0.424, Pearson χ^2 test) or age (P=0.368, Mann–Whitney U test). Of the patients in the present study, 28% grew MRSA from peristomal swabs. Similar rates of peristomal infection and MRSA infection have been found previously in the UK. The strength of the present study is that it reflects normal clinical practice. Infections were defined by the antibiotic usage of the clinician caring for the patients rather than by a research tool and microbiological specimens were only sent when deemed clinically indicated by the team caring for the patients and hence are less likely merely to represent colonisation. Current antibiotic prophylaxis guidelines are unlikely to make any significant impact on peristomal infection rates whilst the commonest organisms involved are resistant. Use of broad-spectrum antibiotics in this situation is likely to increase resistance and predispose to *Clostridium difficile* diarrhoea. Alternative strategies are required to reduce peristomal infections with MRSA.

British Society of Gastroenterology (2001) *Guidelines in Gastroenterology*, pp. 1–10. http://www.bsg.org.uk/pdf_word_docs/prophylaxis2001.pdf
Hull M, Beane A, Bowen J & Settle C (2001) *Alimentary Pharmacology and Therapeutics* **15**, 1883–1888.

Nasogastric feed infusion in healthy volunteers: can different methods of feed administration promote gastric emptying? By C. SOULSBY, E. YAZAKI, D. EVANS and J. POWELL-TUCK, *Centre for Adult and Paediatric Gastroenterology, Institute for Cell and Molecular Science, Barts and the London Medical School, London, UK*

Nasogastric feed can be delivered as a continuous infusion or as a bolus. Although continuous infusion is the commonly used method in hospitalised patients, there are no data available on gastric emptying (GE) patterns and it is not known whether it promotes GE compared with bolus infusion. The aim of the present study is to investigate the effect of bolus and continuous infusion of enteral feed on GE in healthy volunteers.

GE was measured using electric impedance tomography (EIT) in healthy volunteers. Exclusion criteria were any previous history of gastrointestinal disease or surgery, diabetes mellitus or use of medication that may affect GE. Volunteers were studied following an overnight fast and were randomised to receive continuous followed by bolus infusion or vice versa. A standard 4.2 kJ (1 kcal)/ml enteral feed (400 ml) was given to each volunteer; (1) as a bolus and (2) as a continuous infusion (100 ml/h). GE was monitored for 200 min while the volunteer lay on a bed with their head elevated 45° with a rest period of 60 min between regimens. At the end of each study final gastric volume of feed was estimated using EIT (estimated gastric volume; EGV) or measured by aspirating gastric contents (gastric residual volume; GRV). EGV and GRV were compared using a paired t test.

Twenty-four volunteers were recruited; data analysis was not possible in one subject due to excessive movement during the study period. All the volunteers tolerated boluses of 400 ml enteral feed, and compared with continuous administration, bolus feeding promoted a lower gastric volume after 200 min. However, the results should be interpreted with caution as EGV is estimated using changes in epigastric impedance and has not been validated for measuring volume change. Also, the large differences in EGV and GRV suggest neither method might be particularly reliable in estimating gastric volume.

	EGV (ml)				GRV (ml)			
	Bolus feed		Continuous feed		Bolus feed		Continuous feed	
No. of volunteers	Mean	SD	Mean	SD	Mean	SD	Mean	SD
23	83*	101	194*	138	6**	15	31**	57

* P=0.003, ** P=0.03.

To conclude, bolus feeding is well tolerated in volunteers and, compared with continuous infusion of enteral feed, promotes GE.

A double-blind, randomised, controlled cross-over trial of glutamine supplementation in home parenteral nutrition. By A. CULKIN[1], S. GABE[2], I. BJARNASSON[3], G. GRIMBLE[4] and A. FORBES[2], [1]*Department of Nutrition and Dietetics,* [2]*Department of Gastroenterology, St Mark's Hospital, Harrow, UK, HA1 3UJ,* [3]*Department of Clinical Biochemistry, King's College Hospital, London, UK and* [4]*School of Life Sciences, University of Surrey, Roehampton, UK*

Studies have documented the nutritional and clinical efficacy of glutamine-supplemented parenteral nutrition. The aim of the present study was to determine if the inclusion of parenteral glutamine as part of the N source of home parenteral nutrition reduces rates of infection, improves intestinal permeability and absorption, alters quality of life, nutritional status or plasma amino acid levels.

In thirty-five patients currently on home parenteral nutrition, a standard feed was compared with an equinitrogenous feed containing 10 g free glutamine. No difference was seen between the groups at randomisation regarding nutritional status, intestinal permeability and absorption, quality of life, nutritional status or plasma amino acid levels.

A total of twenty-two patients completed the trial. No difference was detected between the groups for infective complications; 55% in the standard group and 36% in the glutamine-supplemented group (P=0.63). There were three deaths during the study; two on standard feed and one on the glutamine-supplemented feed (not significantly different). The present study showed that the addition of glutamine to parenteral nutrition did not affect intestinal permeability or absorption as assessed by the Lactulose:Rhamnose (L:R) ratio and xylose/3-0-methyl-D-glucose tests respectively, contrary to other studies where glutamine prevented deterioration in gut permeability compared with standard parenteral nutrition (van der Hulst *et al.* 1993). Quality of life as measured by the EuroQol and SF-36 was not improved whilst receiving glutamine-supplemented parenteral nutrition despite studies resulting in an improvement in mood (Young *et al.* 1993) and nutritional status, as assessed by weight, BMI, triceps skinfold thickness and mid-arm muscle circumference, remained constant during the study period. The addition of glutamine had no significant effect on levels of plasma glutamine as was demonstrated in a study of glutamine-supplemented parenteral nutrition (Powell-Tuck *et al.* 1999) despite other amino acid levels increasing which appeared to be due to the different composition of the two amino acid products used. Fortunately, it was shown that the addition of glutamine did not increase liver function test result as reported in a trial in home parenteral nutrition patients over 4 weeks (Hornsby-Lewis *et al.* 1994).

The present study has shown that glutamine as part of the N source of parenteral nutrition is safe for patients on home parenteral nutrition and can be given for 6 months without any adverse effects. The inclusion of glutamine in home parenteral nutrition did not reduce the incidence of infective complications, as it is possible that an inadequate dose was used.

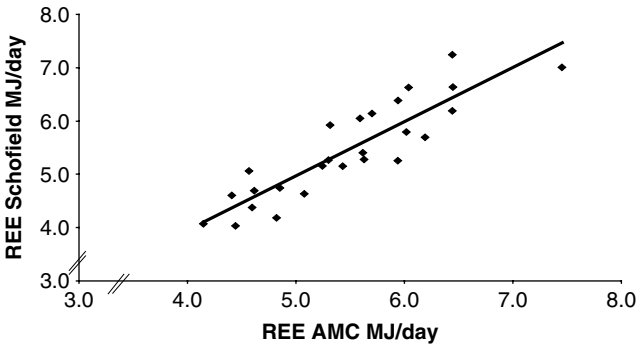
Hornsby-Lewis L, Shike M, Brown P, Klang M, Pearlstone D & Brennan M (1994) *Journal of Parenteral and Enteral Nutrition* **18**, 268–273.
Powell-Tuck J, Jamieson CP, Bettany GE, Obeid O, Fawcett HV, Archer C & Murphy DL (1999) *Gut* **45**, 82–88.
van der Hulst RR, van Kreel BK, von Meyenfeldt MF, Brummer RJ, Arends JW, Deutz NE & Soeters PB (1993) *Lancet* **341**, 1363–1365.
Young LS, Bye R, Scheltinga M, Ziegler TR, Jacobs DO & Wilmore DW (1993) *Journal of Parenteral and Enteral Nutrition* **17**, 422–427.

Predicting energy expenditure from arm anthropometry. By T. FUJIWARA[1], H.I.M. DAVIDSON[2] and R.A. RICHARDSON[1], [1]*Department of Dietetics and Nutrition, South Glasgow University Hospitals Trust, Glasgow, UK and* [2]*Department of Nutrition and Biological Science, Queen Margaret University College, Edinburgh, UK, G42 9TY*

The Schofield equation (Schofield, 1985) used to estimate basal (resting) BMR is dependent on body weight. A large proportion of hospitalised patients cannot be weighed due to disease severity and immobility; therefore, estimation of EE is not possible in this group. Resting energy expenditure (EE) is mostly related to lean body mass, and arm muscle circumference (AMC) is reflective of this component of body composition. The present study compared the use of AMC in predicting EE with the Schofield equation.

Previous work from our group (Hansell *et al.* 1987) in surgical patients (seventy-three males and sixty-nine females) found a significant relationship (male r 0.58; female r 0.63) between EE measured by indirect calorimetry with AMC (EE male=1644+(188×AMC) kJ/d (393+(45×AMC) kcal/d); EE female=1594+(163×AMC) kJ/d (381+(39×AMC) kcal/d)). The derived equation that uses AMC was compared with EE derived from Schofield in a group of surgical patients. Results are expressed as means and SEM. In pairwise comparison, Student's t test was used and Pearson's correlation coefficient to determine association between variables.

Twenty-six patients (thirteen males and thirteen females; mean age 66 (SEM 3.2) years) were recruited. There was no difference in EE estimated by Schofield or AMC EE (Schofield=5427 (SEM 176) kJ/d (1297 (SEM 42.1) kcal/d); AMC=5452 (SEM 155) kJ/d (1303 (SEM 37.1) kcal/d)). There was a significant relationship between Schofield EE and AMC EE (r^2 0.79; P<0.0001) (see Figure).



The present study has shown that AMC is comparable with the Schofield equation in predicting EE. This provides an alternative method for estimating EE in patients who cannot be weighed (critically ill, immobile). In addition, this approach permits estimation of EE on an individual rather than population basis. It may be that using AMC is more responsive to changes in EE on an individual basis but further longitudinal studies that use indirect calorimetry are required.

Hansell DT, Richardson RA, Davies JWL & Burns HJG (1987) *Clinical Nutrition* **7**, 51–57.
Schofield WN (1985) *Human Nutrition, Clinical Nutrition* **44**, Suppl., 1–19.

The effects of different macronutrient infusions on appetite, satiety and ghrelin levels in parenterally fed patients. By C.D.R. MURRAY[1], C. GOUVEIA[1], C. LE ROUX[2], M. GHATEI[2], A.V. EMMANUEL[1] and S.M. GABE[1,3], [1]*Physiology Unit, St Mark's Hospital, Harrow, UK,* [2]*Department of Metabolic Medicine, Hammersmith Hospital, UK and* [3]*Department of Nutrition, St Mark's Hospital, London, UK*

The control of appetite and satiety in patients on parenteral nutrition (PN) is poorly understood. In particular, it remains unclear whether PN has any effect on appetite or satiety (Stratton *et al*. 1999). Ghrelin, a twenty-eight amino acid peptide predominantly released from the stomach, increases in level immediately pre-prandially, suggesting a role in meal initiation. Ghrelin levels decrease immediately postprandially (Tschop *et al*. 2001). This fall in ghrelin level requires the ingestion of nutrients, as water and gastric distension have no effect. Furthermore, nutrient contact with the proximal small bowel is required, since cuffing of the pylorus abolishes this effect. Enteral macronutrients have differential effects on ghrelin levels; carbohydrate and lipid decrease levels whereas protein appears to increase levels (Erdmann *et al.* 2003). It is not known what effects the different constituent macronutrients of PN have on ghrelin levels, or whether any change in levels is associated with changes in appetite or satiety.

Six fasted medically stable patients (four men, two women, 32–73 years, median BMI 21 kg/m^2) with intestinal failure requiring long-term PN were randomly assigned to have one of three separate isoenergetic infusions over a 2 h period on three separate study days. The infusions consisted of carbohydrate (10% dextrose), fat (10% Intralipid) or mixed protein+carbohydrate PN. Blood was sampled at baseline and at 30, 60 and 120 min for glucose and ghrelin levels. Indirect calorimetry was performed before and during each infusion to measure resting energy expenditure (REE) and the respiratory quotient (RQ). Subjective assessment of appetite, hunger and satiety were assessed throughout each infusion with standardised description anchored visual analogue scores. Changes in ghrelin and RQ were assessed using the Wilcoxon ranked sign test, and visual analogue scores over time by two-way ANOVA.

The baseline ghrelin concentration was 994.4 (SEM 249.2) pmol/l. Intravenous carbohydrate and protein+carbohydrate infusions significantly decreased ghrelin levels (−22 (SEM 3.3)% and −22.7 (SEM 6.6)% respectively; $P<0.05$, 120 min). Lipid infusion, however, had no effect on baseline ghrelin concentration (+3.9 (SEM 12)%; $P>0.05$). The REE was not altered by any of the infusions but the RQ was significantly decreased during the lipid infusion ($P<0.05$). None of the infusions had any effect on subjective feelings of hunger, appetite or satiety ($P>0.05$).

Intravenous carbohydrate and protein+carbohydrate PN significantly decrease ghrelin levels in patients with intestinal failure. However, this decrease in levels is not associated with any subjective change in feelings of appetite, hunger or satiety.

Erdmann J, Lippl F & Schusdziarra V (2003) *Regulatory Peptides* **116**, 101–107.
Stratton RJ & Elia M (1999) *Clinical Nutrition* **18**, 63–70.
Tschop M, Wawarta R, Riepl RL, Friedrich S, Bidlingmaier M, Landgraf R & Folwaczny C (2001) *Journal of Endocrinological Investigation* **24**, RC19–RC21.

Intravenous lipid utilisation in infants and children with sepsis and systemic inflammatory response syndrome. By E. CARESTA[1,2], A. PIERRO[1], M. CHOWDHURY[1], M.J. PETERS[1], A.J. PETROS[1], M. PIASTRA[1,2] and S. EATON[1], [1]*Institute of Child Health and Great Ormond Street Hospital for Children, University College London, London, UK, WC1N 1EH and* [2]*Paediatric Intensive Care Unit, Catholic University, Rome, Italy*

During sepsis in adults, fat becomes a preferred fuel; however, oxidation may be impaired relative to circulating fatty acid levels. Little is known about the ability of infants and children to utilise lipids during systemic inflammatory response syndrome (SIRS) and sepsis. The aim of the present study was to examine the oxidation of exogenous lipid in critically ill infants and children.

Sixteen critically ill children with SIRS and sepsis (median 21.8 (interquartile range 9.1–39.0) months) and eight controls (median 20.7 (interquartile range 5.6–44.1) months) with no evidence of sepsis were studied. An intravenous lipid utilisation test was performed (1 h of 3 ml glucose (10%)/kg per h, followed by 3 h of 1 ml glucose (10%)/kg per h plus 0.5 ml Intralipid (30%)/kg per h) and respiratory gas exchange measured by indirect calorimetry. Respiratory quotient (RQ, 1 for carbohydrate and 0.7 for fat utilisation) was measured, and blood taken for measurement of plasma triacylglycerols (TG), NEFA and malondialdehyde (MDA) at the beginning and end of the infusion. Results were compared by repeated-measures ANOVA, paired or unpaired *t* tests.

There was no difference in baseline RQ between controls and patients with SIRS and sepsis (0.82 (SEM 0.03) *v.* 0.82 (SD 0.01)). RQ of controls dropped significantly to 0.775 (SEM 0.027) at 240 min ($P<0.001$). RQ of patients with SIRS and sepsis also fell, to 0.775 (SEM 0.015) ($P<0.01$). However, four patients with meningococcal septicaemia were unable to oxidise Intralipid; RQ was 0.80 (SEM 0.04) after 240 min. Baseline plasma TG levels were higher in SIRS and sepsis patients than controls (1.35 (SD 0.16) *v.* 0.91 (SEM 0.09) mM; $P=0.03$) and increased after lipid ($P=0.0001$). Baseline NEFA levels were higher in SIRS and sepsis patients than controls ($P<0.001$), and increased after lipid infusion ($P<0.01$). However, there was no increase in NEFA in patients with meningococcal septicaemia, suggesting impairment of lipoprotein lipase. There was no significant alteration in plasma MDA in either group.

Infants and children with SIRS and sepsis are able to oxidise intravenous lipid. However, patients with meningococcal septicaemia are unable to oxidise exogenous lipid, possibly due to inhibition of lipoprotein lipase.

Necrotising enterocolitis: role of P-selectin in the development of intestinal inflammation and histological injury. By G. STEFANUTTI[1], P. LISTER[2], V. SMITH[1], M.J. PETERS[2], N.J. KLEIN[3], A. PIERRO[1] and S. EATON[1], [1]*Department of Paediatric Surger,* [2]*Portex Anaesthesia Unit,* [3]*Unit of Immunobiology, Institute of Child Health and Great Ormond Street Hospital, London, UK, WC1N 1EH*

Necrotising enterocolitis (NEC) is the most common gastrointestinal emergency in neonates. NEC is characterised by a high mortality rate, as well as long-term sequelae including short-bowel syndrome and malabsorption (Stevenson *et al*. 1980). Inflammation is a key feature of NEC, and the major pathway leading to tissue injury in the intestine.

P-selectin, together with other adhesion molecules, promotes adherence of leucocytes to the endothelium in inflammatory processes (Ley *et al.* 1995) and in animal models of necrotising enterocolitis (Xia *et al.* 2003), but its role in neonates with NEC is unknown.

The aim of the present study was to investigate the expression of P-selectin and its role in the development of inflammation in neonates with NEC.

Twenty-nine bowel specimens from thirteen neonates with NEC and seven control neonates with congenital gastrointestinal abnormalities were stained with haematoxylin and eosin for histological assessment. Standard techniques were used for immunohistochemical detection of P-selectin, neutrophils and macrophages. Histological damage, expression of P-selectin and neutrophil infiltrate were graded blindly (1=low, 5=high).

Results are expressed as median and interquartile range. The Mann–Whitney test was used to compare groups and Spearman rank test was used for correlations.

Median expression of P-selectin was increased in NEC compared with controls both in medium-sized vessels (4 (interquartile range 2–4) *v.* 2 (interquartile range 1–2); P=0.03) and the microcirculation (2 (interquartile range 1–4) *v.* 1 (interquartile range 1–2); P=0.03), but not in larger vessels (P=0.72). P-selectin expression on medium-sized vessels correlated with the degree of histological injury (P=0.02; r 0.4253). P-selectin expression was greatest in areas of active inflammation but markedly lower in necrotic areas.

The degree of neutrophil infiltration was strongly correlated with P-selectin expression on both medium-sized vessels (P=0.004; r 0.5129) and the microcirculation (P=0.001; r 0.5777), but not on large vessels (P=0.3).

These results show that expression of P-selectin is increased in medium-sized vessels and the microcirculation in intestinal specimens of neonates with NEC compared with neonatal controls. Expression of P-selectin is associated with the recruitment of neutrophils and the severity of histological injury, although P-selectin expression is lost in necrotic tissue. These novel findings contribute to the understanding of the pathogenesis of NEC in neonates.

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Association of hyperglycaemia with increased morbidity and mortality in neonates with necrotising enterocolitis. By N.J. HALL, M. PETERS, S. EATON and A. PIERRO, *Institute of Child Health and Great Ormond Street Hospital for Children, University College London, London, UK, WC1N 1EH*

Recently the importance of immuno-hormonal interactions has been described in critically ill adult patients. Maintaining blood glucose levels below 11.9 mmol/l using insulin appears to improve morbidity and mortality (Van den Burghe *et al*. 2001). The aim of the present study was to investigate the relationship between glucose levels and outcome in neonates with necrotising enterocolitis (NEC).

All glucose measurements (n 6508) in ninety-five neonates with confirmed (Bell stage II or III) NEC admitted to the surgical intensive care unit (ICU) were reviewed. Maximum glucose concentration during admission (G_{max}) was determined for each infant and correlated with outcome. G_{max} is expressed as mean and SEM. Statistical comparisons were made using Student's t test, Fisher's exact test and by linear regression.

Thirty-two infants died (34%). Treatment was withdrawn within 24 h in eleven infants with pan-intestinal NEC and gangrenous intestine. These infants were excluded from the analysis. Eleven infants died within 10 d of admission to the ICU and ten died after >10 d. Mean G_{max} in the eleven infants who died at <10 d (11.2 (SEM 12.37) mmol/l) was significantly lower than those who died after >10 d (18.48 (SEM 1.95) mmol/l); P=0.03. The late (>10 d admission) mortality rate was significantly higher in infants with G_{max}>11.9 mmol/l (27%) than those with G_{max}<11.9 mmol/l (2%); P=0.0005.

The median length of stay was 9.3 d. More infants with G_{max}>11.9 mmol/l required a stay of >10 d compared with those with G_{max}<11.9 mmol/l (79 *v.* 29%; P<0.0001). Linear regression analysis indicated that G_{max} was the only independent factor significantly related to length of stay (P<0.0001).

In infants with NEC admitted to intensive care, hyperglycaemia is associated with an increase in late mortality and longer intensive care stay. Aggressive glycaemic control may improve outcome in this group of infants.

Van den Burghe *et al* (2001) *New England Journal of Medicine* **345**, 1359–1367.

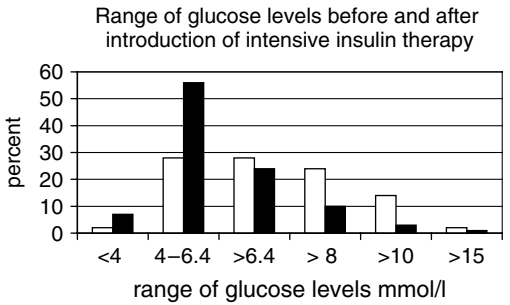
The importance of 24 h enteral feeding in achieving tight glycaemic control in critically patients. By P. TURNER, J. HARPER, A. BREEN and A. SHENKIN, *Intensive Therapies Unit, Royal Liverpool University Hospital, Prescot Street, Liverpool, UK, L7 8XP*

There is strong evidence that maintaining critically ill patients' blood glucose between 3 and 6 mmol/l with intensive insulin therapy dramatically reduces morbidity and mortality (Van den Burghe *et al.* 2001). However, the traditional 4–8 h breaks in enteral feeding used on many intensive therapy units (ITU) can make such control very difficult and greatly increase the risk of dangerous hypoglycaemia. Before introducing an intensive insulin policy on our ITU we reviewed the evidence for breaks in enteral feeding.

The rationale for enteral feeding rest periods is to allow the gastric pH to drop and theoretically reduce the risk of gastric colonisation and ventilator associated pneumonia (VAP). However, a recent review of the literature (MacLaren *et al.* 2001) concluded that enteral nutrition has variable effects on gastric pH. A study by Bonten *et al.* (1996) that compared continuous enteral feeding (CEF; 24 h/d) with intermittent enteral feeding (IEF; 18 h/d) found that IEF was less well tolerated, with only a slight drop in intragastric pH and no influence on colonisation or respiratory tract infection. Furthermore, if stress ulcer prophylaxis with H2 antagonists or proton pump inhibitors is used, gastric pH is unlikely to drop significantly during a feeding break. Finally, an American Society for Parenteral and Enteral Nutrition consensus statement on aspiration in the critically ill (McClave *et al.* 2002) actually recommended continuous 24 h feeding to reduce the risk of VAP, as a slower infusion rate reduces the risk of aspiration.

A new protocol abolishing feeding breaks and using 24 h CEF was therefore introduced at the same time as intensive insulin therapy on our ITU. Approximately 85% of patients received CEF; the remainder continuous parenteral nutrition. Blood glucose levels were audited by chart review three times per week for 2 months.

The Figure shows the comparison of daily glucose levels before (□) and after (■) the introduction of CEF and intensive insulin therapy.



The Figure shows the improvement in glycaemic control with the introduction of CEF and intensive insulin therapy. Taken together with the difficulties in optimising insulin provision in patients undergoing IEF, it is recommended that CEF and intensive insulin therapy should become standard practice on the ITU.

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An investigation into the peri-operative nutritional management of upper gastrointestinal carcinoma in major cancer centres. By P.M. MURPHY[1], J. RAHAMIN[2], T. WHEATLEY[2], S. McQUARRIE[1] and S.J. LEWIS[3], [1]*Departments of Nutrition and Dietetics,* [2]*Surgery and* [3]*Gastroenterology, Plymouth Hospitals NHS Trust, Derriford, Plymouth, UK, PL6 8DH*

Malnutrition is common in patients with cancer, especially those with upper gastrointestinal (GI) carcinoma. The aim of the present study was to examine current practice for the nutritional management of patients undergoing upper GI surgery in the major cancer treatment centres in England. A questionnaire was sent to the dietetic departments of all those hospitals in England that have been allocated to perform upper GI surgery for carcinoma.

Questions on nutritional assessment, pre-operative and post-operative nutritional support were asked. A total of eighty-two departments were identified and a total of sixty-six responses were received (80%). Thirty-one centres (47%) have a dedicated dietitian. Routine nutritional assessment is performed in 33% of centres. Parameters measured were body weight (95%), height (86%), BMI (91%) and percentage weight loss (82%). Units with a dedicated dietitian are more likely to perform a routine pre-operative nutritional assessment (55%) than those without (14%) (χ^2 12.17; P=0.001).

Nutritional support is provided routinely pre-operatively in 17% and post-operatively in 70% of centres. The majority of centres (77%) provide enteral nutrition support via the jejunal route with 4% providing parenteral nutrition support. Those units with a dedicated dietitian are more likely to provide early post-operative nutritional support routinely (87%) than those without (57%), (χ^2 7.195; P=0.013). There is dietetic input into the decision to continue or discontinue enteral feeding in 74% of centres. Timing of discontinuing feeding and tube removal varies considerably between centres.

Oral nutritional supplements are offered routinely on the introduction of oral fluids in 39% of centres and later in the post-operative course in 45%. In the majority of centres (72%), supplements are continued for an undetermined length of time post-operatively. Real food snacks are available and offered in addition to sip feeds in 81% of centres.

Patients are reviewed by a dietitian following discharge from hospital in 64% of centres. Patients are more likely to be reviewed following discharge when there is a dedicated dietitian (81% compared with 49%) (χ^2 7.31; P=0.01).

This questionnaire highlights that a high proportion of hospitals allocated to be specialist centres for the surgical treatment of upper GI carcinoma in England lack formal dietetic input. Centres with a dedicated dietitian are more likely to perform a pre-operative nutritional assessment, more likely to provide protocol-guided post-operative nutritional support and more likely to be given dietetic support following discharge from hospital than those without. However, even in those centres with a dedicated dietitian the nutritional management of these patients is not uniform. Peri-operative nutrition support varies enormously with a high proportion not providing any routine post-operative support (30%). This may reflect the lack of scientific studies identifying the most effective means of managing the nutritional needs of these patients who are at high risk of malnutrition.

Meta-analysis suggests post-operative enteral nutritional support reduces complication rates in patients undergoing gastrointestinal surgery. By R.J. STRATTON and M. ELIA, *Institute of Human Nutrition, University of Southampton, UK, SO16 6YD*

Controversy surrounds the potential benefits of using liquid, multi-nutrient oral nutritional supplements (ONS) and enteral tube feeding (ETF) in the post-operative surgical patient. Therefore, this meta-analysis was undertaken to investigate the impact of the post-operative use of ONS and ETF *v.* routine clinical care on complication rates and mortality in patients undergoing gastrointestinal (GI) surgery.

Following a systematic review of the literature (up to April 2004), a meta-analysis of eighteen randomised controlled trials (RCT) (*n* 907) was undertaken using methodology described by Stratton *et al.* 2003. All trials involved patients undergoing a variety of surgical procedures on the upper and lower GI tract. Six RCT (*n* 418) compared ONS (multi-nutrient, whole protein supplements; 1046–2520 kJ (250–600 kcal) for 7 d–10 weeks) with routine care (standard hospital diet). Twelve RCT (*n* 489) compared ETF (multi-nutrient, whole protein or elemental feeds; 3477–11 933 kJ (831–2852 kcal) for < 11 d; jejunal and duodenal routes), mostly started within 24 h of surgery, with routine care (intravenous fluids, nil by mouth, progressive introduction of diet). The incidence of complications (for example, wound and respiratory infections, intra-abdominal abscesses, anastomotic dehiscence) and mortality were recorded. Meta-analysis using a fixed effects model was undertaken after tests for homogeneity using the MetaWin 2.0 statistical package.

Complication rates were significantly lower with enteral nutritional support (all ONS and ETF trials) compared with routine care post-operatively (see Table). There were also fewer complications when trials of ONS and ETF compared with routine care were analysed separately (see Table).

		Complications	
RCT	*n*	Effect size (odds ratio)	95% CI
All trials (eighteen trials)	907	0.357	0.252, 0.507
ETF trials (twelve trials)	489	0.331	0.196, 0.557
ONS trials (six trials)	418	0.385	0.213, 0.696

In seven out of the twelve RCT that reported mortality (*n* 403), there were no deaths in either the intervention or control groups. In the remaining five RCT (*n* 265 only), no significant differences in mortality were found (odds ratio 0.745 (95% CI 0.254, 2.183)).

This meta-analysis of eighteen RCT in GI surgical patients suggests that intervention in the post-operative period with multi-nutrient liquid ONS or duodenal/jejunal ETF significantly reduces complication rates.

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Stratton RJ, Green CJ & Elia M (2003) *Disease-related Malnutrition: An Evidence-based Approach to Treatment*. Oxford: CABI Publishing.

Nasojejunal feeding does not improve clinical outcomes and is poorly tolerated following colorectal surgery. By L.J. MULROONEY[1], J.S. BAGLEY[1], J.A. WILKINSON[2], C. KELTY[1], A.O. COKER[1] and G. JACOB[1], [1]*Doncaster Royal Infirmary, Armthorpe Road, Doncaster, UK, DN2 5LT and* [2]*Leeds Metropolitan University, City Campus, Leeds, UK, LS1 3HE*

Enteral feeding is the method of choice where artificial nutritional support is indicated as it has been shown to favour the growth of intestinal villi, promote gut motility, and is more economic than the parenteral route (Klein *et al.* 1997). The benefits of early post-operative feeding have been well documented and previous studies suggest that nasojejunal (NJ) feeding is safe and well tolerated following gastrointestinal (GI) resection (Carr *et al.* 1996; Braga *et al.* 2002).

A randomised controlled trial was undertaken in patients undergoing colonic resection to assess whether early initiation of NJ feeding is well tolerated and improves outcome. Patients were randomised to receive either conventional treatment (nil by mouth (NBM) and intravenous fluids) or to have an NJ tube placed peri-operatively, followed by a uniform feeding regimen until oral intake met at least half of the nutritional requirements. Energy, protein and fluid requirements were calculated using formulae devised by Elia (1990). The measured outcomes were GI adverse effects, length of hospital stay, incidence of infection, and mortality.

Seventy-three patients were randomised (NBM (control), *n* 37; NJ feed (intervention), *n* 36). The two groups were demographically similar; there were no significant differences between the median age, mean BMI and underlying conditions of the control and intervention participants. Oral intake was commenced on average on post-operative day 4 (±1.5 d) in the control group and enteral feeding on day 1 (±0.25 d) in the intervention group. The nutritional goal was attained by day 3 or 4 in the intervention group. Thirty-one (86%) patients in the intervention group successfully started on enteral feed. Twenty-four (77%), however, had their feed discontinued prematurely owing to displacement of the tube caused by vomiting or discomfort. Thirty-nine (61%) of the sixty-four patients assessed for nausea or vomiting reported no symptoms and there was no significant difference between the groups. There was no significant improvement in the length of hospital stay, incidence of post-operative infection or mortality rate in the intervention group.

Tolerance to the enteral feed in the intervention group was poor. The effect of post-operative treatment protocols could be investigated further as a way to improve this. The equal reporting of nausea and vomiting between the two groups indicates that enteral feeds may be discontinued prematurely as the adverse GI symptoms reported are wrongly perceived to be a result of the feed. Early post-operative feeding does not appear to confer any significant benefit in terms of reduced complications or earlier discharge in this group of patients. However, further work in this area is merited.

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Differential effects of laparoscopic and open surgery on post-operative protein metabolism. By M. McHONEY, V.P. CARNIELLI, S. EATON, R. HOWARD, E.M. KIELY, D.P. DRAKE, L. SPITZ, and A. PIERRO, *Institute of Child Health and Great Ormond Street Hospital for Children, University College London, London, UK, WC1N 1EH*

Major abdominal surgery in adults results in an immediate decrease in protein turnover and catabolism. We hypothesise that open and laparoscopic surgery in children have different effects on post-operative protein metabolism.

The aim of the present study was to compare the effects of laparoscopic and open Nissen fundoplication on whole-body protein metabolism in children.

A randomised controlled trial was performed in twenty-seven children undergoing Nissen fundoplication. Patients were randomised to laparoscopy (*n* 14) or open (*n* 13) surgery by minimisation with respect to age, neurological impairment and operating surgeon. Patients received a standardised infusion of glucose pre-operatively. Anaesthesia, pain management and fluid management (intra-operative and post-operative) were standardised. Blood was taken to measure plasma hormone levels. Whole-body protein turnover was measured using a stable isotopic infusion of [^{13}C]leucine pre-operatively and 4 h post-operatively. At steady state, leucine flux and protein catabolism (νmol/kg per h) were determined. Data are expressed as mean and SD. Pre-operative and post-operative data were compared using paired *t* tests. Correlations were performed using the Pearson test.

Open surgery resulted in a significant decrease in protein catabolism (pre-operatively 2964 (SD 1320) μmol/kg per h; 4 h post-operatively 2111 (SD 1246) μmol/kg per h; P=0.03). Conversely, laparoscopic surgery did not cause significant changes in protein catabolism (pre-operatively 2802 (SD 1494) μmol/kg per h; post-operatively 2430 (SD 1426) μmol/kg per h; P=0.51). Both open and laparoscopic surgery resulted in a post-operative decrease in plasma insulin levels and concomitant increase in plasma glucose. In the open group, higher post-operative insulin levels were associated with lower protein catabolism (r^2 0.44; P=0.036). This correlation was not present in the laparoscopy group (P=0.9). Post-operative protein catabolism was negatively correlated with plasma glucose levels in the laparoscopy group (r^2 0.35; P=0.04) but not in the open group (P=0.2).

Open surgery in children results in an immediate decrease in protein catabolism, as reported in adults. These changes are abolished by laparoscopic surgery. The type of surgery may modulate the interaction of the insulin–glucose axis with protein metabolism.

Weighing hospital patients, Quality Improvement Scotland standards and the Malnutrition Universal Screening Tool. By C. McATEAR, *Department of Nutrition and Dietetics, South Glasgow University Hospital Division, 1345 Govan Road, Glasgow, UK, G51 4TF*

In 2003 Quality Improvement Scotland (QIS) launched their clinical standards 'Food, Fluids and Nutritional Care in Hospitals' (NHS Quality Improvement Scotland, 2003). Standard 2.1 recommends 'when a person is admitted height and weight are identified and recorded within 1 day of admission as part of medical/nursing assessment'. Standard 2.2 recommends 'assessment includes screening for undernutrition using a validated screening tool' and that 'the use of Malnutrition Universal Screening Tool (MUST) for adults and the calculation of body mass index would be appropriate' (MAG Standing Committee of BAPEN, 2003).

In South Glasgow University Hospital Division (SGUHD) measuring patients' weight, height and the subsequent calculation of BMI are recognised elements of the routine nursing and medical admission procedure. Since 1995 the Department of Nutrition and Dietetics in SGUHD have been auditing annually (point prevalence 1st May) the incidence of weight and height being measured and recorded for in-patients on admission. Table 1 illustrates the most recent results.

Table 1

Date	No. of in-patients	No. of patients weighed	No. of patients with height recorded
1 May 2003	1136	520 (46%)	61 (6%)

It may be hypothesised that the 54% of patients who were not weighed could have been. During May 2003 a prospective 1-month audit of all patients referred to the Department of Nutrition and Dietetics was carried out. The aim of this audit was to investigate the reasons for weight being omitted as part of routine admission assessment. In this month 330 patients were referred for nutritional intervention. Of these, 153 (46%) had a weight measured and recorded; 177 (54%) had not. The reasons for not weighing are documented in Table 2.

Table 2

Reason for not weighing	Frequency	Percentage
Patient refused	2	1%
ITU non-weighing bed	17	10%
Patient too unwell	38	22%
Patient unable to stand	28	16%
Other reason	21	12%
Not recorded	71	39%

This audit demonstrates that it was not possible to weigh 100% of patients within 1 d of admission to SGUHD. In order to achieve the QIS recommendations it is necessary that health care professionals are aware of the need to use valid and reliable surrogate methods; for example, those described in the MUST, for estimating weight and height, to enable them to calculate BMI and complete nutritional screening for undernutrition.

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NHS Quality Improvement Scotland (2003) *Food, Fluids and Nutritional Care*. Edinburgh: NHS Quality Improvement Scotland.

Impact of the nutrition support team on parenteral nutrition over 5 years. By A.L. JUKES, A.B. HAWTHORNE, J.B. WRIGHT, A.M. ABDOOLLA and S.J. HARWOOD, *Nutrition Support Team, University Hospital of Wales, Cardiff, UK, CF14 4XW*

A multidisciplinary nutrition support team (NST) was set up at the University Hospital of Wales in 1998. The primary objective of the team was to reduce inappropriate parenteral nutrition (PN) usage and its associated complications, particularly catheter-related infection (CRI). It was estimated that a 10% reduction in usage and CRI would be achieved and the resulting cost savings used to provide substantive funding for the NST.

Before the NST, data were collected by both the pharmacy and dietetic departments in order to support the NST business case. Data have been collected for all patients referred to the NST since 1998.

The primary objective of the NST was achieved. Within 1 year, PN usage had been reduced by almost 50%. This was not only a direct result of the NST, but also a result of other enteral feeding initiatives in the hospital. The reduction in PN has since been sustained due to continued education and support from the NST.

	Pre-NST (1997–98)	At 1 year (1998–99)	At 5 years (2002–03)
Total PN referrals received	351	225	113
Total patients who received PN	327 (93%)	168 (76%)	66 (56%)
No. of patients fed enteral route	24 (7%)	57 (24%)	48 (44%)
Mean PN duration (d)	9	9	20
PN wastage (%)	10	5	2
Friday PN referrals (%)	NA	29	21
Weekend PN referrals (%)	NA	18	0
Speciality area (%)			
General surgery*	26	26	43
Critical care	28	19	16
Haematology	16	24	11
Nephrology	9	8	12
Medicine*	10	10	11
Miscellaneous*	11	13	7

NA, not applicable.
* Non-specialist areas.

The significant reduction in PN usage has had implications throughout the hospital, and the challenges facing the NST now are different from those 5 years ago. All areas have less experience with PN. Specialist areas, although they routinely use central lines, may have fewer than ten patients on PN annually. More than 60% of PN patients are nursed in non-specialist areas (see Table) who often have fewer than four patients on PN annually. Although it has been difficult to quantify due to incomplete data, the incidence of suspected or proven CRI remains unacceptable in our hospital.

We have taken this as an opportunity to redefine the role of the clinical nurse specialists (1.3 whole time equivalents) within the NST into parenteral and enteral lead nurses. The NST is now working towards designated ward areas for patients receiving PN, and a competency-based training programme for these clinical areas, with the aim of increasing expertise at ward level.

Nutrition support referrals for gastrointestinal surgery patients – timely and appropriate? By N. WARD, *Glenfield Hospital, University Hospitals of Leicester NHS Trust, Groby Road, Leicester, UK, LE3 9QP*

Patients that undergo gastrointestinal surgery are at risk of nutritional depletion from inadequate nutritional intake; both pre-operatively and post-operatively, the stress of surgery and the subsequent increase in metabolic rate. Post-operative nutritional support improves nutritional status and clinical outcome (Beier-Holgersen & Boesby, 1996), whilst also reducing morbidity and length of stay (Askanazi *et al.* 1986). Prompt referral is essential to ensure targeted and appropriate nutritional support by the most clinically appropriate route.

The present prospective audit aimed to ascertain how appropriate were referrals to the nutrition support team for general surgical patients and whether these were received at a time to result in optimal benefit for the patient.

Thirty-one patients were referred during a 6-month period. All patients were referred for parenteral feeding. The reasons for referral were high nasogastric output or not absorbing nasogastric feeds (33%), patients made nil by mouth (29%), vomiting on oral diet (13%), not tolerating nasogastric tube (10%), obstruction or ileus (6%), low serum albumin (6%) and admitted on parenteral nutrition (3%). Of the patients, 68% were post-operative at referral. The most common pre-operative referrals were for patients with probable obstruction. Surgically managed patients were referred at a mean of 4.9 (range 0–11) d post-operatively. Of the patients, 48% were on intravenous fluids as their sole nutrient source at referral, but the majority of these patients were <24 h post-operative. However, one patient was referred 11 d post-operatively and received intravenous fluids only during this period. Patients were assessed for co-existing risk factors for nutritional depletion (inflammatory bowel disease, malignancy,>10% weight loss, poor pre-operative nutritional intake). Over 75% of patients had more than one risk factor at referral. Mean serum albumin at referral was 23 (range 11–36) g/l and mean BMI was 24 (range 14–34) kg/m^2. Parenteral nutrition was used for a mean of 8.5 (range 1–21) d. Seven patients referred for parenteral nutrition never commenced feeding via this route due to line insertion problems such as lack of available trained personnel or failed line insertion attempts.

The majority of referrals were appropriate. Further clarification was often required to ascertain the reasons for referral. The two referrals for low serum albumin were not entirely appropriate. Enteral feeding was encouraged, along with discussion with the referring surgical team regarding the role of serum albumin as a marker of nutritional status. Most patients were promptly referred post-operatively and did not experience a sustained period without nutrition, with one major exception. Although the BMI of most patients was within normal ranges, most patients had at least one risk factor for nutritional depletion and had low serum albumin levels: highlighting the importance of maintaining adequate nutritional intake throughout the peri-operative period. The lack of a coordinated line insertion service was identified as a major factor that delayed the prompt initiation of intravenous nutrition support. Suitable strategies are being investigated to address this issue, including the increased utilisation of peripherally inserted central catheter lines.

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Barriers to the use of a nutrition screening tool. By L. CARTER[1], S. CHOWDHURY[2], C.E. WEEKES[2] and P.W. EMERY[1], [1]*Department of Nutrition and Dietetics, King's College London, UK, SE1 9NN and* [2]*Department of Nutrition and Dietetics, Guy's & St Thomas' Hospital NHS Trust, London, UK, SE1 7EH*

As a response to BAPEN recommendations, a validated nutrition screening tool (NST) was launched on the general medical and elderly care wards of St Thomas' Hospital in March 2000. In Spring 2003, an audit of NST completion showed 44% of patients were screened on admission, the range on different wards varying from 31 to 65%. The aims of the present study were to investigate the barriers to the use of the NST as perceived by senior nursing staff and to make recommendations to aid the implementation of mandatory, electronic, trust-wide nutrition screening.

An invitation was sent by email to all heads of nursing, for dissemination to their senior ward staff. A semi-structured questionnaire was designed to address the following issues: nurses' knowledge of the significance, prevalence and identification of malnutrition (maximum score=5); awareness of nationwide screening initiatives; nurses' opinions of NSTs in use on their wards and suggestions for improving NST completion rates. Thirty-four senior nurses, from eighteen wards, agreed to be interviewed. The questionnaire was administered during one-to-one interviews that lasted from 10 to 45 min.

The mean score for the knowledge questions was 2.3 (SD 0.8). Only four nurses (12%) correctly recalled the desirable range for BMI although a further nine (26%) knew where to find the information. Three nurses (9%) were aware of the Malnutrition Universal Screening Tool (MUST) and ten (29%) were aware of the nutrition aspects of the Essence of Care initiative. The NST was present on ten wards but nurses reported that it was never used on two and only sometimes used on five. Lack of knowledge was the most frequently reported barrier to NST completion, being cited by thirty-two (42%) nurses. Twenty-five nurses (32%) cited lack of time, too much paper work and low priority as barriers. Sixteen (47%) felt that they would be able to identify malnourished patients without making objective measurements or using a formal screening tool. Seven (21%) did not use the NST because they lacked confidence in calculating BMI, despite the presence of BMI charts on all of the wards.

These results suggest that nurses perceive the major barrier to NST completion in this Trust is lack of nursing knowledge of the significance of unrecognised malnutrition and the use of simple screening methods in the identification of 'at risk' individuals. A continuous education programme for all staff is an essential adjunct to the introduction of effective nutrition screening.

Geographic inequalities in malnutrition prevalence in the elderly across England. By R.J. STRATTON and M. ELIA, *Institute of Human Nutrition, University of Southampton, UK, SO16 6YD*

A variety of socio-economic and health inequalities exist within England, which are worse in the north than the south (Graham, 2000). It is not clear if there are also geographic inequalities in malnutrition. Therefore, the present study aimed to examine the hypothesis that there is a north–south divide in the prevalence of malnutrition within England.

In a secondary analysis of data from the National Diet and Nutrition Survey of people aged 65 years and over (Finch *et al.* 1998), individuals were placed into one of three categories of malnutrition risk based on BMI and unplanned weight loss over the previous 6 months: high risk (BMI <18.5 kg/m^2 or BMI 18.5–20 kg/m^2 and weight loss of ≥3.2 kg or BMI>20 kg/m^2 and weight loss>6.4 kg); medium risk (BMI 18.5–20 kg/m^2 and weight loss of <3.2 kg or BMI>20 kg/m^2 and weight loss 3.2–6.4 kg); low risk (BMI >20 kg/m^2 and no weight loss). These categories are similar to those used by the Malnutrition Universal Screening Tool ('MUST') (Elia, 2003). The malnutrition prevalence was assessed according to three regions within England: northern England (the North, North West, Yorkshire, Humberside); central England (East Midlands, West Midlands, East Anglia); southern England (London, South East, South West).

The prevalence of malnutrition (medium+high risk) was highest in the northern region (19.8%) and lowest in the southern region (11.2%) (P=0.002; see Table).

		Malnutrition risk	
Geographic location	*n*	Low (%)	Medium+high (%)
England*	1155	86.1	13.9 (7.0+6.9)
Northern England	340	80.6	19.8 (9.4+10.4)
Central England	310	87.7	12.3 (6.8+5.5)
Southern England	505	88.7	11.2 (5.5+5.7)

* P=0.002, χ^2 (χ^2 for trend P=0.001 across three regions within England).

There were also significant differences in the prevalence of malnutrition risk (medium+high risk) between the northern and southern regions (odds ratio (OR) 1.826 (95% CI 1.289, 2.587)) and between northern and central regions (OR 1.752 (95% CI 1.131, 2.714)), after adjustment for age, sex and domicile (free-living or institution) (binary logistic regression).

The present analysis suggests that there are substantial geographic inequalities in risk of protein–energy malnutrition within England, detrimentally affecting the northern region to a greater extent than the central and southern regions. This is consistent with a strong north–south divide in the status of several individual nutrients (Elia & Stratton, 2004).

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A review of the quality of life of patients receiving parenteral nutrition at home. By J.P. BAXTER[1], P.M. FAYERS[2] and A.W. McKINLAY[3], [1]*Ninewells Hospital, Dundee, UK, DD1 9SY,* [2]*Department of Medical Statistics, University of Aberdeen, Aberdeen UK, AB25 and* [3]*Department of Gastroenterology, Aberdeen Royal Infirmary, Aberdeen, UK, AB25 2ZN*

Home parenteral nutrition (HPN) is an established method in the management of intestinal failure. This treatment may be life-long and imposes severe restrictions on daily life. The effect of HPN on the quality of life is an important consideration in the patients' management. The aim of the present review was to identify studies that assessed the quality of life of patients receiving HPN, either using existing instruments or using instruments specifically developed for this purpose.

A systematic search of electronic databases and relevant publications was carried out to identify generic or treatment-specific questionnaires used to assess quality of life of HPN patients. The databases included Medline, Cinahl, Embase, PsychInfo Conference Proceedings and the keywords used included paraenteral nutrition, long-term, quality of life.

Thirty-one publications (twenty-six papers and five conference abstracts) carried out research studies into the quality of life in HPN patients.

Fifteen used non-specific generic instruments; the rest used non-validated questionnaires, a combination, or no formal tool. Few systematic patterns emerged.

The Table shows the quality of life issues identified.

From studies using SF-36	From studies using disease- or HPN-specific questionnaires
Physical functioning	Sleep, tiredness, fatigue
Physical role	Emotion – stress, worry
Bodily pain	Financial
General health	Anorexia
Vitality	Inability to cope
Social functioning	Employment status
Emotional role	Ability to travel/holiday
Mental health	Pain/discomfort
	Length of time on HPN
	Social function

SF-36, short form-36.

There are little available data about the quality of life of HPN patients. Studies have used generic instruments or non-validated questionnaires to measure clinicians' or patients' perspectives.

We conclude that there is a need for a standardised, scientifically validated, treatment-specific instrument to measure quality of life in this patient population.

Enteral feeding in the community: a study of health economic outcomes. By J. EDINGTON[1], H. KNIGHT[2], I. GIROD[2], A. SALEH[2] and F. PANG[1], [1]*Abbott Laboratories, Maidenhead, UK, SL6 4XE and* [2]*Mapi Values, Bollington, UK, SK10 5JB*

The National Institute for Clinical Excellence (NICE) is currently preparing guidelines on nutritional support in adults, but few published cost effectiveness data exist for NICE to use as a basis for its recommendations. To inform the guidelines, we analysed the General Practice Research Database to determine which patients in primary care were prescribed enteral nutrition (sip and tube feeds) and the associated health economic outcomes compared with a matched group of controls.

Patients prescribed enteral nutrition during 2000 and 2001, who had a height and weight recorded in their notes, were extracted from the database. For each patient, we obtained age, sex, primary diagnosis and height and weight measurements. We determined rates for the main health economic outcomes shown in the Table below compared with controls. A total of 2.34 million patients were registered on the database. Diagnostic categories were cancer, dysphagia combined with feeding difficulties and anorexia, stroke, gastrointestinal (GI), neurological and respiratory disorders, cystic fibrosis, renal disease, and other. Of the patients, 13 153 (0.6%) received ≥ one prescriptions for enteral nutrition, of whom only 1332 had a recorded height and weight measurement. Results are for the three largest diagnostic categories, GI disorders, cancer and the combined dysphagia group.

Primary diagnosis	Cases	Controls
GI disorders	67	67
Age (years: mean and SD)	69.9 (17.6)	71.3 (17.0)
Sex (% male)	26.9	35.8
Mean no. GP visits*	18.0	19.2
Mean no. of Rx*	31.5	33.3
Enteral nutrition Rx as % of total Rx**	3.1	0.0
Mean no. of hospital admissions*	0.6	0.5
Cancer	61	61
Age (years: mean and SD)	74.0 (11.6)	74.3 (11.7)
Sex (% male)	39.3	55.7
Mean no. GP visits*	13.8	18.4
Mean no. of Rx*	21.4	27.9
Enteral nutrition Rx as % of total Rx**	6.0	0.0
Mean no. of hospital admissions*	0.5	0.9
Dysphagia, feeding difficulties and anorexia	186	186
Age (years: mean and SD)	67.4 (17.4)	68.2 (17.5)
Sex (% male)	25.8	34.4
Mean no. GP visits*	15.2	15.2
Mean no. of Rx*	32.3	28.7
Enteral nutrition Rx as % of total Rx**	4.9	0.0
Mean no. of hospital admissions*	0.3	0.4
Total (all nine diagnostic categories)	472	472
Age (years: mean and SD)	68.7 (16.3)	69.5 (16.2)
Sex (% male)	32.6	41.3
Mean no. GP visits*	16.5	17.3
Mean no. of Rx*	32.8	30.6
Enteral nutrition Rx as % of total Rx**	6.0	0.0
Mean no. of hospital admissions*	0.4	0.5

* Per year (2001); ** by primary diagnostic category; ** Rx=prescriptions.

The number of nutritional prescriptions was small compared with total prescriptions. Of all patients who received ≥ one prescription for enteral nutrition, only 10.1% had a recorded height and weight. Control patients with cancer required almost twice as many hopitalisations as cases. It is possible that some patients in the community who could benefit from enteral nutrition may not be receiving it due to lack of nutritional assessment.

Vitamin and mineral supplementation to reduce infection in adults: a systematic review. By A.I. STEPHEN and A. AVENELL, *Health Services Research Unit, Polwarth Building, University of Aberdeen, Foresterhill, Aberdeen, UK, AB25 2ZD*

Multiple nutritional deficiencies exist in the UK population, particularly in older individuals (Finch *et al*. 1998). Infection is a major contributor to morbidity and mortality statistics. Across all age groups upper respiratory infections are responsible for 130 GP consultations per 1000 population (ISD Scotland, 2003). There is some evidence of the influence of micronutrient supplementation on infection (Tomkins, 2002). The present review examined the evidence from trials of the effectiveness of supplementation in terms of infection.

Electronic databases were searched: Cochrane Controlled Trials Register, EMBASE, MEDLINE, BIOSIS, CAB abstracts. Hand searching of nutrition journals and reference lists was carried out. Randomised controlled trials and quasi-randomised trials of supplementation with at least two vitamins or minerals or a combination were selected. All adult age groups were included.

Over 300 potential trials were found; nineteen were included in the final review. Both reviewers independently extracted data and assessed trial quality. Authors were contacted for further information as necessary. Overall the quality of the trials was fair. The analyses were carried out with and without some small studies with methodology that has been questioned (BMJ Publishing Group Ltd, 2004). In the results presented here these are excluded. Supplements varied between trials and duration of the trials was from 2 weeks to 8 years.

Small numbers of studies were included in each meta-analysis. There was no significant difference in the number of episodes of infection between those supplemented and those not supplemented, overall WMD 0.04 (95% CI −0.06, 0.14). There was also no significant difference between the groups in the number of individuals with at least one infection; overall relative risk (RR) 0.92 (95% CI 0.82, 1.03). Subgroup analyses suggested that supplemented individuals aged 65 years or over may benefit more if they are undernourished and supplemented for over 6 months, weighted mean difference −0.67 (95% CI −1.24, −0.10). There is also suggestion that longer duration of supplementation may reduce the numbers with infection in younger adults; RR 0.54 (95% CI 0.39, 0.74).

Further large trials of supplementation are needed, particularly for undernourished older individuals. Trials of longer supplementation periods, 1–5 years, are also recommended.

This review was funded by The Health Foundation.

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A pilot study of the effect of nasal mupirocin, before percutaneous endoscopic gastrostomy, upon peristomal colonisation and infection. By J. McGOVERN, I.L.P. BEALES and I.W. FELLOWS, *Nutrition Support Team, Norfolk and Norwich University Hospital, Norwich, UK, NR4 7UY*

A percutaneous endoscopic gastrostomy (PEG) is commonly used for the provision of long-term enteral nutrition but the procedure is not without morbidity and mortality. Peristomal infection occurs in 5–30% of patients; this can lead to abscess formation, interruption of feeding and in severe cases necessitate tube removal. The role of broad-spectrum prophylactic antibiotics at PEG-insertion to prevent infection remains controversial. *Staphylococcus aureus*, particularly the methicillin-resistant form (MRSA) is major causative organism in the UK. Broad-spectrum prophylaxis is unlikely to be effective in this situation and risks generating both antibiotic-resistance and complications such as *Clostridium difficile* diarrhoea. Nasopharyngeal MRSA colonisation is associated with later peristomal infection.

We have investigated the effect of nasal mupirocin upon the bacteriology of peristomal colonisation and infection following PEG insertion using a randomised controlled trial of nasal mupirocin *v.* standard care (no prophylactic antibiotics). Mupirocin was administered for 5 d before PEG insertion. Nasopharyngeal swabs, PEG site appearance and bacteriology were recorded up to 10 d post-PEG. Before the full study, a pilot study was conducted to assess the feasibility and practicalities of the protocol, the consistency of the scoring tool and to give an indication of the bacteriology with regard to PEG placement.

The pilot, of fourteen patients, indicated that the protocol was feasible and the scoring tool easy to use with good inter-rater reliability. The patients were typical of UK PEG patients (age 60–89 years, 85% of PEG insertions for stroke) and the experimental groups were well-matched. Pre-PEG MRSA nasal colonisation was found in 28% of control patients and 57% of the mupirocin group. MRSA colonisation of the PEG-site occurred in 50% of controls and 16% of mupirocin-treated patients. Peristomal infection was less common in mupirocin-treated patients (16 *v.* 50%).

Nasopharyngeal antisepsis is potentially a safe, effective prophylaxis for peristomal infection. These results support the testing of nasal mupirocin in the full randomised trial.

Geographic inequalities in antioxidant nutrient status among older individuals in England. By M. ELIA and R.J. STRATTON, *Institute of Human Nutrition, University of Southampton, UK, SO16 6YD*

A variety of health inequalities exist within England, which manifest themselves by shorter life expectancy in the north than in the south (Graham, 2000). Antioxidant vitamins have been implicated in the aetiology of a variety of common conditions, including CVD and various types of cancer, which are major determinants of morbidity and death. The aim of the present study is to assess whether there is a north–south divide in the nutritional status of antioxidant nutrients.

A secondary analysis was undertaken of the National Diet and Nutrition Survey of people aged 65 years and over (Finch *et al.* 1998). Venous blood, for the measurement of antioxidant status, was collected from an antecubital vein in subjects that were asked to fast overnight. Details of the randomisation procedures are given in the original report. The results were subdivided according to geographic location: Northern England (the North, the North West, Yorkshire, Humberside); Central England (East Midlands, West Midlands, East Anglia); Southern England (London, the South West, the South East).

	Northern England (*n* 277–300)†		Central England (*n* 264–286)†		Southern England (*n* 384–426)†		
Nutrient	Mean	SE	Mean	SE	Mean	SE	*P* value
Vitamin C (μmol/l)	29.67	1.29	38.08***	1.32	45.52***	1.08	0.000
α-Cryptoxanthin (μmol/l)	0.031	0.002	0.031	0.002	0.038*	0.002	0.010
β-Cryptoxanthin (μmol/l)	0.109	0.008	0.132	0.009	0.155***	0.007	0.000
Lutein (μmol/l)	0.318	0.011	0.388***	0.011	0.386***	0.009	0.000
Lycopene (μmol/l)	0.208	0.011	0.219	0.011	0.278***	0.009	0.000
α-Carotene (μmol/l)	0.061	0.004	0.071	0.005	0.077**	0.004	0.023
β-Carotene (μmol/l)	0.301	0.014	0.334	0.014	0.404**	0.012	0.000

Results are adjusted for age, sex and domicile (free-living and institutional) using a general linear model (ANCOVA).
* $P<0.05$; ** $P<0.01$; *** P 0.001, compared with northern region.
† Number of subjects varies accordingto the analyte measured.

Circulating concentrations of vitamin C and carotenoids varied significantly, with the lowest concentrations in northern England and the highest in southern England (see Table). Severe vitamin C deficiency (<5 μmol/l) was more common in the northern (15%) than central (5.2%) and southern (2.1%) regions ($P<0.001$). There were no significant regional differences in the circulating concentrations of vitamin E (mean values in northern, central, southern regions: α-tocopherol 35.2, 35.8, 35.3 μmol/l and δ-tocopherol 2.3, 2.2, 2.2 μmol/l (*n* 270–394)).

These results show a strong north–south divide in the status of many antioxidant nutrients (vitamin C, various carotenoids), which have been implicated either directly (as antioxidants) or indirectly (as markers of fruit and vegetable intake), in the development of morbidity and mortality from common chronic diseases. This adds to the cluster of other geographic inequalities (Graham, 2000), including life expectancy, socio-economic status and protein–energy status (Stratton & Elia, 2004).

Finch S, Doyle W, Lowe C, Bates CJ, Prentice A, Smithers G & Clarke PC (1998) *National Diet and Nutrition Survey: people aged 65 years and over*. London: The Stationery Office.
Graham H (2000) *Understanding Health Inequalities*. Buckingham: Open University Press.
Stratton RJ & Elia M (2004) Proceedings of the Nutrition Society **63**, A.

Poorer vitamin status in the elderly at risk of malnutrition using the 'Malnutrition Universal Screening Tool'? By M. ELIA and R.J. STRATTON, *Institute of Human Nutrition, University of Southampton, UK, SO16 6YD*

The 'Malnutrition Universal Screening Tool' ('MUST') (Elia, 2003) has been developed to identify risk of protein–energy malnutrition but the extent to which 'MUST' categorisation relates to the status of other nutrients is unknown. The present analysis aimed to investigate the vitamin status of individuals according to malnutrition risk in the elderly.

In a secondary analysis of data from the National Diet and Nutrition Survey for those aged 65 years and over (Finch *et al.* 1998), individuals were placed into one of three categories of malnutrition risk based on BMI and unplanned weight loss over the previous 6 months: high risk (BMI <18.5 kg/m^2 or BMI 18.5–20 kg/m^2 and weight loss of ≥3.2 kg or BMI>20 kg/m^2 and weight loss>6.4 kg); medium risk (BMI 18.5–20 kg/m^2 and weight loss of <3.2 kg or BMI>20 kg/m^2 and weight loss 3.2–6.4 kg); low risk (BMI>20 kg/m^2 and no weight loss). These categories are similar to those used by the 'MUST'. The status of six vitamins (venous blood, for the measurement of circulating vitamin concentrations was collected from an antecubital vein in subjects after an overnight fast) was assessed according to the three malnutrition risk categories.

	Malnutrition risk						
	Low (*n* 856–932*)		Medium (*n* 66–74*)		High (*n* 61–68*)		ANOVA
Vitamin	Mean	SE	Mean	SE	Mean	SE	*P* value
Vitamin A (μmol/l)	2.20	0.22	2.01	0.07	2.07	0.09	0.025
Vitamin C (μmol/l)	41.1	0.81	31.3	3.02	28.4	3.16	0.000
Vitamin D (nmol/l)	52.1	0.86	44.9	2.90	43.1	2.72	0.003
Vitamin E: α-tocopherol (μmol/l)	36.7	0.38	33.0	1.16	32.8	1.49	0.002
γ-tocopherol (μmol/l)	2.35	0.04	1.98	0.08	2.17	0.15	0.022

* Number of subjects varies accordingto vitamin measured.

As the Table shows, the circulating concentrations of some vitamins were significantly lower in those at malnutrition risk (medium+high). However, for other vitamins, there was no relationship with malnutrition risk (mean values for low, medium, high risk: serum folate 14.3, 15.3, 16.6 nmol/l; erythrocyte folate 491, 494, 524 nmol/l; vitamin B_{12} 234, 231, 237 pmol/l).

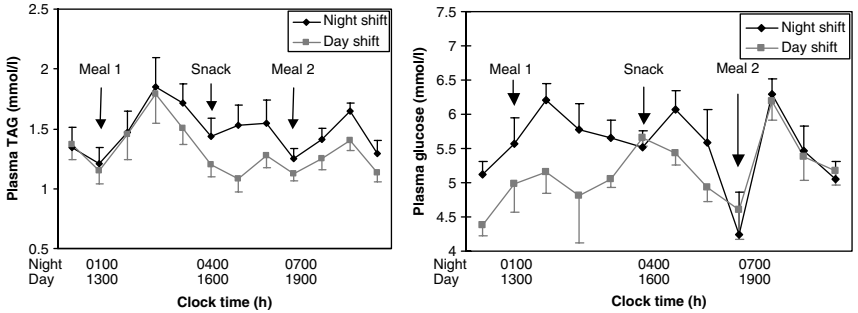
The present analysis suggests that elderly individuals identified as at increased risk of protein–energy malnutrition with the 'MUST' (medium and high risk) are likely to have poorer circulating concentrations of some but not all vitamins than patients at low malnutrition risk. As the 'MUST' may not necessarily predict poor vitamin status, other approaches are required when individual vitamin deficiencies are suspected.

Elia M (chairman and editor) (2003) *The 'MUST' Report. Nutritional Screening of Adults: a Multidisciplinary Responsibility*. Redditch: BAPEN.
Finch S, Doyle W, Lowe C, Bates CJ, Prentice A, Smithers G & Clarke PC (1998) *National Diet and Nutrition Survey: people aged 65 years and over, 1: Report of the Diet and Nutrition* Survey. London: The Stationery Office.

Postprandial responses to sequential meals in simulated day and night shift workers. By S. AL-NAIMI[1], S.M. HAMPTON[2], P. RICHARD[1], C. TZUNG[3] and L.M. MORGAN[3], [1]*Clinical Biochemistry,* [2]*Endocrinology,* [3]*Nutrition and Food Safety, School of Biomedical and Molecular Sciences, University of Surrey, Guildford, UK, GU2 7XH*

The number of individuals working outside of the normal working hours has greatly increased in industrialised countries. Shift work is associated with an increased risk of CVD (Knutsson, 1989). Whilst causes are likely to be multifactorial, an important factor could be the increased incidence of postprandial metabolic risk factors for CVD amongst shift workers, as a consequence of the maladaptation of endogenous circadian rhythms to abrupt changes in shift times. We have previously shown that both simulated and real shift workers show relatively impaired glucose and lipid tolerance if a single test meal is consumed between 00.00 and 02.00 hours (night shift), compared with 12.00 and 14.00 hours (day shift) (Hampton *et al*. 1998). The objective of the present study was to extend these observations to compare the cumulative metabolic effect of consecutive snacks and meals, as might normally be consumed throughout a period of night or day shift work.

In a randomised cross-over study, eight healthy non-obese men (20–33 years, BMI 20–25 kg/m^2) consumed a combination of two meals and a snack totalling 7280 kJ (1740 kcal) (39% fat, 51% carbohydrate, 10% protein) on two occasions following a standardised pre-meal, simulating night and day shift working. Meals were consumed at 01.00 or 13.00 hours and 07.00 or 19.00 hours, and the snack at 04.00 or 16.00 hours. Blood was taken after the first meal for 12 h to measure postprandial responses of glucose, insulin, triacylglycerol (TAG) and NEFA. Mixed meals were a typical representative of Western diets, providing 11 506 kJ (2750 kcal) (carbohydrate 51% energy, protein 10% energy, fat 39% energy).



Repeated measures ANOVA (factors time, shift) showed a significant effect of shift for plasma TAG with higher levels on simulated night shift compared with day ($P<0.05$). There was a trend towards an effect of shift for plasma glucose, with higher plasma glucose at night ($P=0.08$) and there was a time×shift interaction for plasma insulin levels ($P<0.01$). NEFA levels were unaffected by shift. Inspection of the area under the plasma response curve (area under the curve) following each meal and snack revealed that the differences in lipid tolerance occurred throughout the study, with greatest differences occurring following the mid-shift snack. In contrast, glucose tolerance was relatively most impaired following the first night-time meal, with no differences observed following the second meal. Plasma insulin levels were significantly lower following the first meal ($P<0.05$), but significantly higher following the second meal ($P<0.01$) on the simulated night shift. The present findings confirm our previous observations of raised postprandial TAG and glucose at night, and show that sequential meal ingestion has a more pronounced effect on subsequent lipid than carbohydrate tolerance.

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Hampton *et al*. (1998) *Journal of Endocrinology* **158**, 305–310.

Promotion of monocyte HLA-DR expression and attenuation of cytokine response by glutamine supplementation in septic children. By M. CHOWDHURY, S. EATON, M.J. PETERS, N.J. KLEIN, A. GOLDMAN and A. PIERRO, *Institute of Child Health and Great Ormond Street Hospital for Children, University College London, London, UK, WC1N 1EH*

The aim of the present study was to determine whether glutamine administration improves immune response in septic children.

A double-blind randomised controlled trial was performed in critically ill children (3 d–9 years) with defined sepsis receiving intravenous glutamine (Dipeptiven 0.4 g/kg per d; *n* 8) or isonitrogenous placebo (Vaminolact; *n* 6) for 72 h. Randomisation was by minimisation with respect to age, ventilation, and inotropic support. Monocyte HLA-DR expression, pro-inflammatory (IL-6, TNFα) and anti-inflammatory (IL-1ra, IL-10) cytokines (pg/ml) were measured pre-infusion and at 24 h intervals. Cytokines of both septic groups were compared with a control group without sepsis (*n* 13) measured at a single time-point. Results (mean and SEM) were compared by *t* tests.

Pre-infusion median fluorescence intensity (MFI) was similar in the two septic groups (glutamine 25.6 (SEM 1.1) *v.* placebo 46.6 (SEM 16.7); $P=0.17$). During infusion, HLA-DR MFI decreased with placebo but improved with glutamine, with significant difference seen by 48 h (glutamine 34.8 (SEM 3.2) *v.* placebo 23.1 (SEM 0.1); $P=0.01$).

Septic patients had higher cytokines pre-infusion than controls: *IL-1ra* (546 (SEM 165) *v.* 75 (SEM 26); $P<0.001$), *IL-6* (164 (SEM 37) *v.* 17 (SEM 3); $P<0.0001$), *IL-10* (159 (SEM 59) *v.* 23 (SEM 9); $P=0.002$) and *TNFα* (133 (SEM 41) *v.* 10 (SEM 1); $P<0.0001$).

Comparing the cytokine profile with glutamine against placebo, glutamine attenuated *IL-1ra* at 24 h (82 (SEM 9)% of pre-infusion *v.* 453 (SEM 155)% placebo; $P=0.016$), *IL-6* at 24 h (64 (SEM 2) *v.* 113 (SEM 11)% placebo; $P=0.013$) and *TNFα* at 72 h (27 (SEM 19) *v.* 100 (SEM 16)%; $P=0.055$). Non-significant attenuation of *IL-10* (60 (SEM 25) *v.* 133 (SEM 29)%; $P=0.19$) was also seen at 72 h.

Glutamine increases monocyte HLA-DR expression and attenuates both pro- and anti-inflammatory cytokine responses. These novel therapeutic effects of glutamine in sepsis have not been previously demonstrated in human subjects.

Peroxynitrite decomposition catalyst FeTMPyP ameliorates intestinal and pulmonary organ injury in an infant animal model of intestinal ischaemia and reperfusion. By G. STEFANUTTI, A. PIERRO, L. SPITZ and S. EATON, *Department of Paediatric Surgery, Institute of Child Health and Great Ormond Street Hospital, London, UK, WC1N 1EH*

Free radicals, particularly peroxynitrite, play a pivotal role in the development of intestinal ischaemia and reperfusion (I/R) injury, leading to severe intestinal and pulmonary damage (Cuzzocrea *et al.* 2001).

The aim of the present study was to evaluate the effects of peroxynitrite decomposition catalyst FeTMPyP in an infant model of intestinal I/R.

Suckling rats (20–30 g) underwent 40 min superior mesenteric artery occlusion +90 min reperfusion. Immediately before reperfusion, the animals received either saline alone (5 ml/kg) or saline (5 ml/kg)+30 mg FeTMPyP/kg intravenously. Three groups were studied (n 11 per group): (1) control+saline; (2) I/R+saline; (3) I/R+FeTMPyP. Myeloperoxidase (MPO; marker of neutrophil infiltration; mU/mg protein) and malondialdehyde (MDA; marker of lipid peroxidation; nmol/mg protein) were measured in ileum and lungs. Intestinal glutathione (GSH; a major endogenous antioxidant; nmol/g wet weight) were evaluated. Plasma nitrite+nitrate (NOx; reflecting NO production; μmol/l) was determined. One-way ANOVA was used for group comparisons.

MPO was increased in ileum and lungs of I/R+saline rats compared with controls, but FeTMPyP prevented this effect in the ileum. I/R+saline animals also showed higher MDA in ileum and lungs compared with both control saline and I/R+FeTMPyP rats. GSH was decreased in all animals undergoing I/R compared with controls, but oxidised and total GSH were significantly higher in the I/R+FeTMPyP group than in the I/R+saline group. Concentrations of NOx were elevated in I/R+saline animals compared with controls, but no increase was seen in I/R+FeTMPyP animals. Data are reported in the Table.

		Experimental group					
		Control+saline		I/R+saline		I/R+FeTMPyP	
		Mean	SEM	Mean	SEM	Mean	SEM
MPO (mU/mg protein)	Ileum	6.6	1.0	25.5*	5.0	11.1†	0.8
	Lung	56.5	5	103.1*	11	107.4*	13
MDA (nmol/mg protein)	Ileum	0.321	0.05	0.762*	0.10	0.376†	0.07
	Lung	0.646	0.06	1.012*	0.07	0.692†	0.08
Ileum GSH (nmol/g wet weight)	Reduced	301.3	24	48.0*	5	91.5*	15
	Oxidised	117.2	4	28.4*	4	47.6*†	3
	Total	535.7	27	104.8*	10	186.7*†	11
Plasma nitrite+nitrate (μmol/l)		157.2	22	221.6*	16	190.2	16

I/R, intestinal ischaemia and reperfusion.
* $P<0.05$ *v.* control+saline.
† $P<0.05$ *v.* I/R+saline.

The present results showed that FeTMPyP prevented neutrophil infiltration in the ileum and lipid peroxidation in both lungs and ileum, preserved intestinal antioxidant capacity, and blunted systemic NO production in our model of neonatal intestinal I/R. FeTMPyP may therefore be beneficial in clinical conditions associated with neonatal I/R.

Cuzzocrea S, Riley DP, Caputi AP & Salvemini D (2001) *Pharmacological Reviews* **53**, 135–159.

The impact of a nutrition support team on the prescribing of parenteral nutrition. By S.J. HARWOOD, *Pharmacy Department, University Hospital of Wales, Cardiff, UK, CF14 4XW*

The aim of the present study was to investigate how parenteral nutrition (PN) was being prescribed on a variety of wards and to assess whether the nutrition support team (NST) can improve how this is being done. The study was carried out against the standards set in the guidelines for the administration of medicines (United Kingdom Central Council for Nursing, Midwifery and Health Visiting, 2000) and in *Medicines, Ethics and Practice* (Royal Pharmaceutical Society, 2003).

Data were collected over a period of 77 d (n 100) on patients where the NST made no intervention with regards to the prescribing of PN. Data collected included whether a prescription was written on the fluid chart and, if so, whether the nursing staff had signed against this when connecting the PN infusion.

Data collection was repeated 9 months later (n 110) during which time a programme of education and training was carried out by the NST together with prompting of the relevant healthcare professionals each time an omission was identified.

Pre-printed PN information stickers for placing in patients' medical notes were also provided. These were to provide a comprehensive record of what the PN contained, the volume of PN and the route and rate of administration. The purpose of such information is to provide a daily record in the patients' medical notes of what has been given. The present study investigated whether the information stickers were being placed in the medical notes, and if so by whom. The results showed that the information stickers were being placed in the medical notes by nursing staff and members of the NST. The results also showed that a proportion of information stickers were either not supplied or had gone missing.

	Preliminary findings	Repeat study 9 months later
Total number of patients	100	110
Number of prescriptions written by doctor on medicine chart	76	103
Prescriptions written by doctor on medicine chart (%)	76	94
Available prescriptions	76	103
Of available prescriptions, number signed by nurse when PN first connected	54	83
Of available prescriptions, percentage signed by nurse when PN first connected	71	81

The present study demonstrated that education from a nutrition support team can improve both the prescribing of and nursing documentation of PN. This is a clinically effective use of a NST to ensure adherence to national standards and thereby improving patient care. The present study demonstrates that more work is required to achieve a 100% adherence to such standards. Following this preliminary study an intensive programme of education and training is to be instigated by the NST together with a review of the way PN is prescribed and recorded in the medical notes.

United Kingdom Central Council for Nursing, Midwifery and Health Visiting (2000) *Guidelines for the Administration of Medicines*, October 2000. London: United Kingdom Central Council for Nursing, Midwifery and Health Visiting.
Royal Pharmaceutical Society of Great Britain (2003) *Medicines, Ethics and Practice*, 27th ed., July 2003. London: Royal Pharmaceutical Society of Great Britain.

Minimising the risk of hyperglycaemia induced by intradialytic parenteral nutrition. By E. GREAVES[1], J.A. EASTWOOD[2], J. CALDER[1], J. SILCOCK[2] and M.J. WRIGHT[3], [1]*Dietetic Department,* [2]*Pharmacy Department,* [3]*Renal Unit, The Leeds Teaching Hospitals NHS Trust, Great George Street, Leeds, UK, LS1 3EX*

Malnutrition is prevalent in the haemodialysis population and has a negative influence on dialysis outcomes (Hakim, 1999). Intradialytic parenteral nutrition (IDPN) is one of the options available for nutrition support in the haemodialysis population. Evidence for the use of IDPN is equivocal (Foulks, 1999; Cherry & Shalansky, 2002) and there are few studies to support good practice.

Three formulations were assessed for their suitability for use as IDPN and the effect on blood glucose, as avoiding the use of sliding scale insulin was a priority. Each formulation was given to two patients (one diabetic and one non-diabetic) for a 2-week period. Bags A and B were proprietary solutions, Bag C was an in-house formulation. All three bags had total volumes of 1000 mls.

		Non-protein energy		Glucose energy		Lipid energy		Na^+	K^+
Intravenous solution	N (g)	kJ	kcal	kJ	kcal	kJ	kcal	(mmol)	(mmol)
Bag A	7.0	3347	800	1255	300	2092	500	38	15
Bag B	6.6	4351	1040	2678	640	1674	400	0	0
Bag C	7.2	5021	1200	2092	500	2929	700	0	0

Blood glucose levels were monitored before, during and after IDPN infusion.

One-way ANOVA showed that the choice of IDPN formula was significant in influencing the change in blood glucose levels ($P \leq 0.005$). A cut-off for blood glucose of 10 mmol/l was determined; above this point, an insulin infusion might be necessary. Bag A had the least effect on blood glucose with no readings greater than 10 mmol/l. Bag B had the greatest effect on blood glucose with more than 50% of readings during infusion greater than 10 mmol/l. Bag C increased blood glucose levels, but the majority of readings (90%) were less than 10 mmol/l. There were three readings for bag C that were greater than 10 mmol/l; these all occurred on the same day and were preceded by a high pre-dialysis reading.

Further studies are needed with more patients to ensure that in-house formulation is tolerated and to monitor the nutritional status of patients during treatment.

As part of the overall review of the use of IDPN within Leeds, clear criteria for patient selection, a monitoring tool and discontinuation criteria have been developed.

Cherry N & Shalansky K (2002) *American Journal of Health-System Pharmacists* **59**, 1736–1741.
Foulks CJ (1999) *American Journal of Kidney Disease* **33**, 186–192.
Hakim RM (1999) *Journal of Kidney Disease* **33**, 217–220.

Comparison of dietary characteristics in patients with Crohn's disease between UK and Japan. By A. KATO[1], M. KURIHARA[2], M. SASAKI[2] and A. FORBES[1], [1]*St Mark's Hospital and Academic Institute, Watford Road, Harrow, UK, HA1 3UJ and* [2]*Shiga University of Medical Science, Seta-tsukinowa, Otsu, Shiga, 520-2192, Japan*

Crohn's disease (CD) is a chronic inflammatory bowel disease of unknown aetiology. Currently, no cure exists and relapse remains common throughout the life of the patient despite medical interventions. The present study compares the present position of CD patients in relation to diet in Western and Eastern countries. A total of 106 British Caucasian patients (fifty-three male, fifty-three female, average age 39 years) and 106 Japanese patients (sixty-eight male, thirty-eight female, 35 years) with established CD were recruited from a specialist clinic in the UK, and by post through eight CD patient groups in different prefectures in Japan. A detailed questionnaire was used to collect data relating to the patient's social status, dietary intake, and the nature and degree of dietary modification since diagnosis. Analysis used SPSS for Windows (version 11.0).

No significant differences between countries were found with respect to previous Crohn's surgery (UK 76%, Japan 73%), or age at diagnosis (UK 23 years, Japan 25 years). However, there were significant differences in BMI (UK 24, Japan 20 kg/m^2; $P<0.001$), steroid use (ever) (UK 95%, Japan 68%; $P<0.001$), food intolerance (UK 23%, Japan 66%; $P<0.001$), current use of enteral feeds (UK 23%, Japan 80%; $P<0.001$), dietary concern (UK 59%, Japan 80%; $P=0.001$), and specific dietetic consultation (UK 67%, Japan 89%; $P<0.001$). Of the patients, 96% of the British and all the Japanese had dietary modification of some foods (see Table). Of the patients, 59% of the British and 70% of the Japanese modified more than ten of the twenty-four food groups compared. Modifications of vegetables, beans and rice were similar in both countries. British patients who had seen a dietitian showed significantly higher dietary concern than those who had not seen a dietitian (66 *v.* 43%; $P<0.05$), while dietary concern was high in Japan regardless of exposure to dietitians (81 *v.* 82%; NS). British patients tended to express dietary concern relative to general health or as health relates to disease pathophysiology, while in Japanese patients it tended more to reflect food choices to prevent relapse.

Five most increased foods				Five most decreased foods			
UK	%	Japan	%	UK	%	Japan	%
Vitamin pills	50.6	Japanese noodles (udon)	64.8	Nuts	59.5	Fried food	90.8
Fish	38.8	Oily fish	62.5	Beans	46.6	Meat	90.0
Poultry	37.1	Other fish	60.0	Coffee	46.0	Nuts	89.2
Rice	31.1	Tofu	57.1	Spicy food	45.7	Instant noodles	83.1
Vegetables	27.9	Vitamin pills	38.7	Alcohol	44.0	Mushrooms	80.8

In conclusion, different cultural backgrounds are associated with important differences in the patient's approach towards diet. However, regardless of these differences, a high percentage of Crohn's patients in both countries modify their dietary intake. More investigation of the relationship between amended dietary intake and CD could help in our attempts to guide maintained remission.

Home parenteral nutrition and catheter occlusion. A survey by the Looking into the Requirements for Equipment (LITRE) committee. By J. BAYES, M. LEE, J.M.D. NIGHTINGALE, F. SMEDLEY, C. WHEATLEY, L. HARRISON, G. SIMMONETT, C. HARTT and D. WILSON, *The LITRE Committee, Digestive Diseases Centre, Leicester Royal Infirmary, Leicester, UK, LE1 5WW*

Occlusion of a home parenteral nutrition (HPN) catheter is a common problem reported to the Looking Into The Requirements for Equipment (LITRE) committee.

The aim of the present survey was to determine if catheter occlusion is more common in HPN patients infusing lipid, flushing the catheter with saline (rather than heparin), or having no heparin in the parenteral feeding bag.

A questionnaire of nineteen questions was sent to all Patients on Intravenous and Naso-gastric Nutrition Therapy (PINNT) members having parenteral nutrition and to the two intestinal failure units. The questions were about line blockage, lipid infusion, line flushing, the addition of heparin to the parenteral nutrition bag, and methods to treat line blockage.

Of the 360 questionnaires, 103 (29%) were returned. Line occlusion was reported in forty-five (44%).

The Table shows the effect of lipid on line occlusion.

	No occlusion	Occlusion
Lipid	30	27
Separate lipid	9	11
No lipid	19	7*

* P=0.06.

Line occlusion occurred in five, thirteen and twenty-four patients using heparin, saline or a saline then heparin flush after the parenteral nutrition infusion respectively, compared with twelve, fourteen and twenty-five without (NS). Of thirty-two who had heparin added to their parenteral nutrition bag, line occlusion occurred in ten compared with thirty-three of sixty-five (51%) having no heparin in the bag (P=0.05). Of those forty-five who had a blockage, thirty-five (78%) took no precautions to prevent blockage, though six out of ten used an alcohol flush.

In conclusion, occlusion of an HPN catheter is common and patients who do not infuse lipid may have fewer line occlusions than those who infuse it separately or in an all-in-one bag. Patients who have heparin added to their parenteral nutrition bag may also have fewer line occlusions. Randomised prospective controlled studies are needed to further investigate the role of lipid infusions, non-heparin flushing of the catheter and the addition of heparin to parenteral nutrition bags.

Home parenteral nutrition in Norfolk: can a spoke provide the service? By L. HINDLE, J. McGOVERN and I.W. FELLOWS, *Nutrition Support Team, Norfolk and Norwich University Hospital, Norwich, UK, NR4 7UY*

National provision of home parenteral nutrition (HPN) is not distributed equally across the UK. It has been suggested that a hub and spoke system with large national centres and smaller regional ones could redress this imbalance. However, it is necessary to be confident that the smaller centres can provide a safe service. We have reviewed all our cases of HPN from May 1997 to May 2004.

During that time seventeen patients (seven male; median age 47 (range 16–71) years) have been treated with HPN. The underlying diagnoses were four Crohn's disease; three volvulus; two scleroderma; two intestinal pseudo-obstruction; two pancreatic cancer; one radiation enteritis; one mesenteric ischaemia and two other. The total number of HPN days was 8920. Twenty-nine lines were replaced (all Hickman type catheters). Nine episodes of catheter blockage occurred, three of which were salvaged; six catheters displaced including four cuff displacements; three lines fractured and were unable to be repaired; one patient appeared to have an allergy to silicone catheters.

There were thirty episodes of catheter-related sepsis (CRS). Seventeen of these were treated successfully with antibiotics and thirteen were replaced. Overall, the CRS rate was one per 9.9 patient months. However, the majority of infections (twenty-four) occurred in two patients who were both insulin-dependent diabetics. One of these patients showed poor compliance with HPN procedures and the other suffered repeated fungal infections secondary to nephrolithiasis, renal tract infections and diabetic nephropathy. Exclusion of these two patients gave a CRS rate of one per 33 patient months (six episodes in 199 patient months) compared with the value of one per 64.4 patient months from Hope Hospital, Salford (Kaushal *et al.* 2004).

These data form a basis for local audit but raise the possibility that insulin-dependent diabetics are a group at particular risk of CRS in HPN. The latter merits further study.

Kaushal MV, Chadwick PR, Anderson ID, Scott NA, Shaffer JL & Carlson GL (2004) *Proceedings of the Nutrition Society* **63**, 29A.

Confirming gastric placement of nasogastric tubes in critically ill patients using pH measurements: is it feasible? By M. SMALL[1], C.T. SOULSBY[2], K. DURMAN[3], L. HOYLE[4] and J. POWELL-TUCK[2], [1]*Clinical Nutrition,* [3]*Nutrition and Dietetics,* [4]*Intensive Care Unit, Royal London Hospital and* [2]*Centre for Adult and Paediatric Gastroenterology, Barts and the London Medical School, London, UK, E1 1BB*

The 'gold standard' for confirmation of placement of nasogastric tubes is chest X-ray. Confirmation of tube position on initial placement is crucial and periodic checks are necessary to rule out subsequent displacement. Our intensive care unit (ICU) protocol states that pH of nasogastric aspirate should be measured using universal indicator paper (1–14) before use of the tube in order to confirm gastric position. Our ICU enteral feeding protocol consists of 18 h continuous feeding followed by a 6 h rest period, therefore pH measurements are required on a daily basis before commencing feed. The aim of the present audit was to investigate whether this approach was feasible.

Daily pH measurements were taken following a 6 h rest period; a level of ≤4 was taken to confirm gastric placement, increased to ≤5 for patients on acid-suppression therapy. An audit monitoring pH, time of monitoring and use of acid suppression was carried for 25 consecutive days on all ICU patients who were receiving nasogastric feed.

Forty-one patients were audited for a total of 258 patient days. pH was measured at least once on 128 (50%) of the days. Of these 128 d, on 55 d (44%) measured pH was greater than 4 (5 for acid-suppressed patients). Of these fifty-five episodes, fifteen measurements were made erroneously during feed infusion.

	Number of patients	Percentage of total measured days
No acid suppression	80	63
pH ≤4	41	32
pH >4	39	31
Acid suppression	48	38
pH ≤5	31	24
pH >5	16	13

The remaining forty episodes of high pH could not confirm gastric placement. These results could be due to high gastric pH levels, tube tip migration, or inaccurate measurement and require further investigation in a future study.

Patients with ulcerative colitis show an altered frequency distribution of a single novel polymorphism (SNP) in the gene encoding the phospholipid hydroperoxide glutathione peroxidase 4 (GPX4). By A.Q ATATSHEH[1], C.J.S EAL[2], M.R.W ELFARE[3] and J.E.H ESKETH[1], [1]*Institute of Cell and Molecular Biosciences,* [2]*School of Agriculture, Food and Rural Development, University of Newcastle and* [3]*Regional School of Medicine, North Tyneside General Hospital, North Shields, UK, NE29 8NH*

Se is a micronutrient essential for human health. The glutathione peroxidases (GPX1–4) are Se-containing enzymes that have been proposed to have important functions in protecting cells from oxidative stress (Brigelius-Flohe, 1999). Mice lacking both GPX1 and 2 have been found to show symptoms of colitis (Esworthy *et al.* 2001). The Se is incorporated into these proteins as the amino-acid selenocysteine using the UGA codon; this requires a specific structure within the 3′ untranslated region (3′UTR) of the mRNA. Recently, a single novel polymorphism (SNP) was found in the region of the GPX4 gene corresponding to the 3′UTR (Villette *et al.* 2002); furthermore the homozygous variants were found to differ in levels of lymphocyte 5' lipoxygenase metabolites. These metabolites are important regulators of pro-inflammatory cytokines and may impact on inflammatory status in diseases such as colitis. In addition, a SNP which would cause an amino-acid change in the protein has been reported in the coding region of the GPX1 gene (Forsberg *et al.* 2000).

The aim of this work was to extend these observations by examining the frequency of the different allelic variants for both SNP in a group of patients suffering from ulcerative colitis (UC) and from a control, healthy population. The UC patients were from a prospective cohort study investigating the relationship between diet and relapse rate (Jowett *et al.* 2004*a*,*b*); control subjects were taken from a DNA bank of subjects from the Newcastle area. DNA was extracted from whole blood and both the region of the GPX4 gene corresponding to the 3′UTR and the appropriate region of the GPX1 gene amplified by PCR. Allelic variants were then detected by restriction length fragment analysis. In the case of GPX1 digestion of the 331bp fragment with Apa1 produces either a fragment of 331bp or two fragments of 223 and 88bp depending on genotype, whilst for GPX4 the T or C variants produced different patterns of products after digestion with Sty1. Genotype was confirmed in a random selection of samples by direct sequencing of the PCR product. In healthy controls, the GPX1 CC and TC variants were found to occur frequently in a high proportion of the cohort (CC, 45%; TC 44%) but the TT variant was found to occur at low frequency, as observed previously in a Scandinavian population (Forsberg *et al.* 2000). The distribution was unchanged in the patients with UC. In contrast, all three variants of the SNP in the GPX4 gene were found frequently in the healthy controls (CC 29%; TT 22% and TC 52%) and the distribution was different in the patients with UC (CC 29%; TT 14%; TC 57%) such that the TT variant was significantly less frequent in the colitis patients (P=0.027).

The results suggest that the TT genotype may provide a lower susceptibility to UC. The effects of genotype on lipoxygenase metabolites are currently under investigation.

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Are the Scottish Home Parenteral Nutrition Managed Clinical Network standards being met?

By J.P. BAXTER and R.F. McKEE, *The Scottish Home Parenteral Nutrition Managed Clinical Network, Ninewells Hospital, Dundee, UK, DD1 9SY*

A quality assurance framework was prepared by the Scottish Home Parenteral Nutrition (HPN) Managed Clinical Network. This framework consists of a set of clinical standards, a system for audit of clinical outcome and a method of reporting of audit findings. The standards were prepared in NHS Quality Improvement Scotland (NHSQIS) (Scottish Executive Health Department, 1999) format – standard statement, rationale and criteria, and approved by NHSQIS in February 2002. These are the results of the first audit of services provided to patients receiving HPN in Scotland.

The network manager identified all centres managing patients receiving HPN in Scotland. The clinical standards were circulated to all. To complete this audit, visits were made to all centres by the manager who used a prepared audit data collection tool.

Fifteen centres were visited. At the time of the audit, eleven centres were managing sixty-six adult patients and three were managing eight paediatric patients (one paediatric centre was visited but was not treating any patients at the time). The standard statements and the results are shown in the Table below.

		Centres achieving standard			
		Adult		Paediatric	
	Standard statement	*n*	%	*n*	%
1a	There is named lead clinician for HPN services within the trust	11	100	3	100
1b	The management of HPN is multi-professional*	10	92	3	100
2	All health professionals undertake CPD in the subject of artificial nutritional support	9	82	3	100
3	The patient/carer are involved in decision making at all stages of care	11	100	3	100
4	All patients are provided with appropriate information about their diagnosis and treatment	11	100	3	100
5	The patient/carer are involved in discharge planning	10	91	3	100
6	All patients are provided with continuing support after discharge	11	100	3	100

CPD, continuing professional development.
*Consists at least a clinician, dietitian, nurse and pharmacist (Wood, 1995).

The final standard (7) states that participation in prospective clinical audit is integral to participation in the network. All centres agreed to participate.

These results have implications for clinical governance. A report was prepared and sent to the chief executives of all trusts with HPN centres. There was a multidisciplinary approach to care of HPN patients in all centres. Three adult centres did not have a nutrition nurse specialist, considered central to the care of these patients. The structure of nutrition teams was 'informal' in one adult and one paediatric centre. Although one paediatric centre was not treating any patients at the time of the audit, the nutrition team did achieve the standards. Funding for CPD needs to be addressed.

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The importance of the refeeding syndrome.

By J.V. PANTELI[1], M.A. CROOK[2], V. HORN[3] and J. ODONOHUE[4], [1]*Department of Nutrition and Dietetics,* [2]*Consultant Chemical Pathologist,* [3]*Department of Pharmacy and* [4]*Consultant Gastroenterologist, University Hospital Lewisham, London, UK, SE13 6LH*

The refeeding syndrome is a potentially lethal condition. It can be defined as severe electrolyte and fluid shifts associated with metabolic abnormalities in malnourished patients undergoing refeeding whether this is orally, enterally or parenterally; indeed the key prerequisite is chronic nutritional deprivation regardless of the route of energy administration. It can be associated with significant morbidity and mortality. Clinical features are fluid-balance abnormalities, abnormal glucose metabolism, hypophosphataemia, hypomagnesaemia, and hypokalaemia. In addition, thiamine deficiency can occur.

The degree of refeeding is important in the aetiology of the condition and energy repletion should be given slowly particularly during the first week at about 84 kJ (20 kcal)/kg body weight per d. The nutrition support may, therefore, need to be modified over time in accordance with the patients' clinical condition.

The refeeding syndrome is unfortunately encountered in modern clinical practice and is relatively poorly recognised or understood. Patient groups who are more at risk for this syndrome were identified and recommendations about the clinical management of the condition were researched. The information was gained from a Medline and Pubmed search in the area of the refeeding syndrome.

Following publication of a paper (Crook *et al.* 2001), and with reference to previously produced guidelines (Dewer & Horvath, 2000), local clinical guidelines and a Summary Flowchart were established to raise awareness and aid prevention and management of this syndrome. These guidelines were disseminated trust-wide, and are available on the Trust Intranet. They have also been requested by other trusts and there has been interest from overseas. The guidelines have been presented and discussed in many education sessions, to groups ranging from nursing staff to consultants, and the poster was included in the trust's annual Research Day.

Although no formal audit has been carried out as yet, the awareness of the syndrome and identification of patients at risk has increased at ward level, amongst all staff groups.

The trust has an active Nutrition Team, and such groups can be instrumental in providing advice and education in the prevention, recognition and treatment of this syndrome.

Crook MA, Hally V & Panteli JV (2001) *Nutrition* **17**, 632–637.
Dewer H & Horvath R (2000) *Refeeding Syndrome: Guidelines*. Oxford: Oxford Radcliffe Hospitals.

Modulation by hypothermia of hepatic gene expression following intestinal ischaemia-reperfusion. By E.J. PARKINSON, K.M. LAWRENCE, D.S. LATCHMAN, S. EATON and A. PIERRO, *Institute of Child Health and Great Ormond Street Hospital for Children, University College London, London, UK, WC1N 1EH*

Moderate hypothermia reduces multi-organ dysfunction following intestinal ischaemia-reperfusion injury (IIR); its mechanism of action remains unknown. The aim of the present study was to characterise hepatic gene expression following normothermic and moderately hypothermic IIR.

Adult rats underwent intestinal ischaemia (60 min) and reperfusion (120 min) or sham (180 min) at either normothermia (36–37 °C) or moderate hypothermia (31–33 °C). Three groups (n 3) were studied: (1) normothermic sham (NS); (2) normothermic IIR (NIIR); (3) hypothermic IIR (HIIR). Hepatic gene expression was investigated by: (i) microarray analyses of mRNA from each liver sample (results were evaluated by ANOVA); (ii) PCR and Western blotting (tubulin loading control) to confirm gene transcript and protein levels of interest.

A total of 1232 transcripts changed between the experimental groups; forty-one known genes were differentially expressed (P<0.05) between NS and NIIR (twenty-eight increased and thirteen decreased). Twenty-six genes were differentially expressed (P<0.05) between NIIR and HIIR (fifteen increased and eleven decreased). PCR results confirmed the microarray data: expression of a pro-inflammatory cytokine, IL-1β, was induced following NIIR and highly attenuated following HIIR. Western blotting revealed an increase in IL-1β protein following NIIR which was reduced to sham levels following HIIR.

Moderate hypothermia decreases hepatic gene and protein expression of IL-1β indicating attenuation of the pro-inflammatory consequences of IIR. The present findings support the potential therapeutic role of moderate hypothermia.

Developing a percutaneous endoscopic gastrostomy care pathway: a primary and secondary care collaboration. By L. DITCHBURN[1] and W. CHAPMAN[2], [1]*Eastern Birmingham Primary Care Trust, Fernbank Medical Centre, 508–516 Alum Rock Road, Ward End, Birmingham UK, B8 3HX and* [2]*Department of Endoscopy, City Hospital, Dudley Road, Winson Green, Birmingham, UK, B18 7QH*

A care pathway (CP) is a structured multidisciplinary care plan which details the essential steps in the care of a patient with a specific clinical problem. It encourages evidence-based practice and is a means of applying national guidelines in clinical practice (Campbell *et al.* 1998). The gastroenterology clinical nurse specialist and the community nutrition nurse identified shortfalls in percutaneous endoscopic gastrostomy (PEG) care across the primary and secondary care interface and decided to develop a CP.

The patients' experience with PEGs was mapped and key multidisciplinary players in the patient journey identified. A literature review identified essential factors for inclusion in the CP. These included appropriateness of referrals, pre-procedural antibiotic prophylaxis, patient capacity for consent, clinical procedures for placement and after care, feeding position and prevention of tube blockage. Another factor was that the CP would focus the health professional using it on the patient rather than the system (Overill, 1998; Roebuck, 1998).

The CP identifies specific interventions at specific times and variances are noted and analysed as part of agreed outcome indicators, which encourages practice development and improved patient care (Wigfield & Boon, 1996). Patient literature ('What is a PEG' and 'Caring for your PEG tube at home') was developed (Brett & Rosenberg, 2001) parallel to the CP.

Since the launch of the CP, collaborative working between primary and secondary care has been greatly enhanced to the benefit of both patients and staff. Also, nursing roles in managing care across organisational and professional boundaries (Department of Health, 1997) have been fulfilled. However, a need has been highlighted to increase capacity in order for the roles of care pathway coordinator, patient assessor and discharge liaison, developed consequent to the CP, to be undertaken by other than existing staff.

The CP will be reviewed regularly and audited against the outcome indicators and issues arising from implementation addressed as they arise. Study days for training of staff, patients and carers are planned to be ongoing. The links established as a result of the collaborative development of the CP will be further built on.

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Audit of enteral feeding in the community – what's out there? By K. SEARLES, *Nutrition and Dietetic department, Royal Wolverhampton Hospitals NHS Trust, Wolverhampton, UK, WV*

Home enteral nutrition (HEN) has been a rapidly expanding area of healthcare since the early 1990s. In 1997 enteral feeding was already more common in the community than in the hospital environment. In Wolverhampton in November 1999 thirty-five adults were on HEN; by January 2004 this had risen to sixty-four. The patient population is not static; by April 2004 ten of these sixty-four were no longer receiving HEN. However, an additional seventeen had been discharged on HEN. Therefore, the total by April 2004 was seventy-one. Numbers are rising and there is a continual turnover of patients. There were also thirty-five children receiving HEN.

The aim of the audit was to assess and promote best practice in the quality of service for adult patients residing within Wolverhampton Primary Care Trust who receive full or partial enteral feeding.

All adult patients on HEN were visited and they or their carers interviewed. An audit tool (see Table) was developed to examine current practice, patient or carer problems were identified and current practices were compared with recommendations of best practice issued by the European Union, the National Institute for Clinical Excellence and feed companies.

Examples from audit tool		
Stoma appearance	Infected	Yes/no
	Overgranulated	Yes/no
	Leaking	Yes/no
How often is stoma cleaned?.....		
How often is PEG rotated?.....		
PEG tube	Any missing pieces?	Yes/no
	If yes, how many and which?.....	
	Is tube damaged, split or squashed?	Yes/no
Feed – pump or bolus	Is regime available?	Yes/no
	Is regime being followed?	Yes/no
Did you receive training prior discharge?		Yes/no
If yes, by whom?.....		
Did you feel training was adequate?		Yes/no
Did you know who to contact if a problem?		Yes/no
If yes, who?.....		
Do you have the following phone numbers? Dietitian / Feed company / District Nurse		

PEG, percutaneous endoscopic gastrostomy.

Of the patients, 11% had lost or gained significant amounts of weight, therefore requiring changes to their feeding regimen. Single-use syringes were being used for 2 d or more by 33% patients; in two cases the same syringe was made to last for a year. The position of the feeding tube was not being confirmed with litmus paper before feeding by 85% patients. Of stoma sites, 31% were infected, requiring referral for treatment, 9% had some overgranulation, 7.5% had leakage. Stoma sites were not being cleaned daily in 20% cases and 22% patients were not rotating the tube daily. Various problems relating to home management were identified by 30% patients or carers.

To conclude, the audit has highlighted that some patients may not be on the most appropriate feeding regimen. Patients and their carers are not always aware of or follow best practices. Care of gastrostomy tubes and stoma sites seemed quite poor.

It is recommended that training requirements be identified for district nurses and nursing home staff. Patient and carer training regarding stoma sites before discharge is to be improved. Patients on HEN should be reviewed regularly following discharge particularly during the first month. Dietitians are to be trained in an extended role to provide a specialist service.

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The home parenteral nutrition service for adults in Sheffield. By K.B. PAGE, K.E. MADEN, S.R. MORLEY and M.E. McALINDON, *Sheffield Teaching Hospitals NHS Trust Nutrition Support Team, Royal Hallamshire Hospital, Glossop Road, Sheffield, UK, S10 2JF*

The home parenteral nutrition (HPN) service based the Royal Hallamshire Hospital in Sheffield was set up in November 1993. At that stage the total parenteral nutrition (TPN) team consisted of a chemical pathologist, a dietitian, a specialist nurse and a pharmacist. From the beginning there were written protocols and patients were trained and certified proficient for all procedures before discharge. HPN feeds and ancillaries were supplied by a commercial homecare company and patients had 24/7 telephone access to advice from medical and nursing members of the team and were admitted to their own consultants' home ward if they became unwell. Monitoring was typically at 3-monthly intervals on the ward at each patient's convenience. In 1997, increasing numbers of patients led to the appointment of a consultant gastroenterologist with an interest in nutrition, the establishment of a dedicated nutrition clinic and acceptance of the general gastroenterology ward as the home ward. A joint nutrition–bone metabolism clinic has recently been established. New HPN patients are allocated to commercial homecare companies on the basis of competitive quotations and patients who are not in danger of dehydration typically feed 5 nights per week, using mainly lipid-containing feeds.

As at 30 June 2004, we had discharged a total of forty patients on HPN and they had accumulated a total of 19 202 d 'on' HPN, of which 2590 d (13.5%) had been spent in hospital. Patients had administered approximately 12 753 intravenous feeds at home. Approximately one-third of our patients have had malignant disease. Other common diagnoses include Crohn's disease and gastrointestinal motility disorders. Eighteen patients have died, but PN was only considered a contributing factor in three cases.

The overall incidence of catheter-related sepsis (CRS) in our patients is 2.2 cases per 1000 d at home or 2.8 cases per 1000 d feeding at home. This compares favourably with the CRS rate for in-patients given PN via Hickman central venous catheters (5.6 cases per 1000 d feeding). In one case of fatal staphylococcus septicaemia, the Hickman central venous catheter was thought to be the source of infection. There have been six cases of clinically apparent central vein thrombosis, including three cases of superior vena cava obstruction, two of which eventually contributed to the patient's demise. Overt liver disease (jaundice) has only developed in one patient. This patient had a long history of malnutrition and abnormal liver function tests before starting TPN and jaundice developed after 8 years of supplementary HPN (mean 3.5 nights/week).

The increasing numbers of patients referred and discharged on HPN have required an increase in the level of organisation of the service, to the detriment of the original patient-centred ideal. For some patients this is not an issue, but in the case of patients with malignant disease or complex social situations a more flexible service may be required. The challenge for the coming year is to find ways of achieving this within our limited resources.

Without hope? Home parenteral nutrition and malignant disease in Sheffield. By K.B. PAGE, K.E. MADEN, S.R. MORLEY and M.E. McALINDON, *Sheffield Teaching Hospitals NHS Trust Nutrition Support Team, Royal Hallamshire Hospital, Glossop Road, Sheffield, UK, S10 2JF*

Home parenteral nutrition (HPN) is used less frequently in advanced malignant disease in the UK than it is in the USA or parts of Europe. However, thirteen of the forty patients we have discharged on HPN have had advanced malignancy. Use of HPN in this situation is complicated by the severity of the disease process and many other factors. We report five cases illustrating our experiences with this patient group.

A 57-year-old woman with an extensive nasopharyngeal carcinoma suffered a cerebrovascular accident and respiratory obstruction and underwent emergency tracheostomy. She was discharged on HPN, which was discontinued 3 d later by community healthcare staff because of an apparent deterioration that was actually due to bronchial secretions. She died 2 weeks later.

A 47-year-old woman with carcinoma of the jejunum suffered repeated episodes of small-bowel obstruction despite surgery, radiotherapy and chemotherapy. HPN was arranged in order for her to attend her daughter's wedding. There was substantial clinical improvement on HPN and she was able to visit some of her favourite places with her husband. She died peacefully with family around her 4 months after discharge on HPN.

A 47-year-old man with the same condition and a similar clinical course was given HPN in order to support him through further courses of chemotherapy. He had several episodes of catheter-related sepsis. Further bypass surgery did not relieve his vomiting when he was admitted with progression of his disease and the local hospice would not accept him on parenteral nutrition. He died in hospital, 9 months after discharge on HPN.

A 40-year-old man recovering from appendicectomy developed persistent vomiting. He underwent subtotal colectomy for a mass at the splenic flexure and histology showed poorly differentiated signet ring carcinoma. Endoscopic biopsy confirmed a primary gastric carcinoma. HPN was arranged to provide time for him to spend with his young family, but he developed a chest infection and died in hospital, 2 d after the planned discharge.

No further intervention was planned for a 62-year-old woman with advanced gastric carcinoma. However, HPN was arranged because of persistent requests from her husband. Discharge was delayed because of difficulties arranging nursing care at home. She died at home 10 d after discharge on HPN.

These cases illustrate that management decisions require considerable care in advanced malignant disease, that HPN may prejudice admission to a hospice, that events may overtake plans for discharge and that provision of nursing care may be more difficult to arrange than HPN. However, HPN may benefit some patients by offering the choice of further courses of treatment or the opportunity to achieve individual goals.

A randomised double-blind, placebo-controlled trial of the effect of vitamin and mineral supplements on morbidity from infections in men and women aged 65 years and over. By A. AVENELL, A.C. MILNE and A.I. STEPHEN, for the MAVIS TRIAL GROUP, *Health Services Research Unit, University of Aberdeen, Foresterhill, Aberdeen, UK, AB25 2ZD*

The National Diet and Nutrition Survey of the Elderly (Finch *et al*. 1998) found multiple nutritional deficiencies in individuals aged ≥65 years, which may, along with progressive dysregulation of the immune system with ageing, increase the risk of morbidity and mortality from infection. There has been much recent debate about whether mineral and vitamin supplementation influences morbidity from infections in older individuals, with the trial of Chandra (1992) finding a marked reduction in days of infection and days of antibiotic use with supplementation in mainly community-living elderly. We undertook a randomised placebo-controlled trial to ascertain whether improvement of nutritional status in community-living elderly individuals using a cheap and readily available vitamin and mineral supplement reduces morbidity from infections and health service use.

Participants (*n* 910) were recruited from six general practices in Grampian, Scotland between February and December 2002. All individuals aged 65 years or over were eligible, unless already taking supplements or general practitioners considered registered patients too unwell. Participants were randomised to one tablet per d for a year of either a mineral and vitamin supplement (800 µg vitamin A, 60 mg vitamin C, 5 µg vitamin D, 10 mg vitamin E, 1.4 mg thiamin, 1.6 mg riboflavin, 18 mg niacin, 6 mg pantothenic acid, 2 mg pyridoxine, 1 µg vitamin B_{12}, 200 µg folic acid, 14 mg Fe, 150 µg I, 0.75 mg Cu, 15 mg Zn, 1 mg Mn), or matching placebo. We used a nutrition assessment questionnaire based on measurements of blood micronutrient levels, for detecting elderly individuals at risk for deficiencies of vitamins, C, D, folate, and Fe (McNeill *et al.* 2002).

Description of participants	Mineral and vitamin supplement		Placebo	
n (Randomised)	456		454	
Age (years; median and interquartile range)	72	68.0, 76.0	71	68.0, 76.0
Sex (no. female and percentage female)	217	48	214	47
BMI (kg/m^2; mean and SD)	28.2	4.2	27.9	4.1
No. and percentage at high risk for Fe, folate, vitamin C or vitamin D deficiency	145	32	117	26

A single analysis was undertaken based on all participants randomised. Only 13% of participants reported stopping their tablets or were lost to follow-up. There was no statistically significant effect in the supplemented compared with the control group for total contacts with primary care staff (879 *v.* 930; odds ratio 0.96 (95% CI 0.78, 1.19)) or self-reported days of infection (8072 *v.* 7871; odds ratio 1.07 (95% CI 0.90, 1.27)). Quality of life measures were not affected by supplementation. The secondary outcomes – the number of antibiotic prescriptions in primary care, total number of days that antibiotics were prescribed, the number of hospital admissions (including those related to infection), the number of days in hospital with infection, and out-patient visits (in total and infection related) – were also not significantly different between the two treatment groups.

Our trial population had very few individuals aged over 85 years (4%) or in institutional care (3%), who are at higher risk of nutritional deficiency. We cannot exclude the possibility that higher-risk populations may benefit from supplementation in terms of infection-related morbidity.

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Function-enabling diet (FED) study: a randomised, double-blind, placebo-controlled trial of the effects of energy, protein and micronutrient supplementation of hospitalised elderly patients. By S.E. FORSTER, S.E. GARIBALLA and H.J. POWERS, *Human Nutrition Unit, Coleridge House, The University of Sheffield, Northern General Hospital, Herries Road, Sheffield, UK, S5 7AU*

There is evidence linking protein–energy undernutrition in elderly individuals with clinical outcomes in acute and non-acute hospital settings and that nutritional supplements may improve outcomes in some of these settings. However, most studies in this field suffer from methodological flaws including selection, measurement and confounding biases.

Our aim was to evaluate the contribution that undernutrition makes to poor outcome in elderly patients following acute illness.

Using a distant telephone randomisation service we assigned 435 hospitalised patients aged ≥65 years to an oral nutritional supplement (100–150% reference nutrient intake) or a placebo daily for 6 weeks. The placebo has identical taste to the supplement but contains no protein or micronutrients and with a minimum energy content. Patients were stratified according to age (<75, ≥75 years) and Barthel scores (disability). Neither patients nor research officers could distinguish the placebo from the supplement. Outcome measures, including dietary intake, nutritional status, muscle function, disability, quality of life, length of stay, rehabilitation time, non-elective readmission, morbidity and mortality data were collected at baseline and at 6 weeks and 6 months post-randomisation. All outcome assessments were carried out blind to treatment assignment.

Although the randomisation code will only be broken after data collection is complete at the end of December 2004, we report some baseline characteristics of the study population.

	Subjects <75 years old (*n* 176)		Subjects ≥75 years old (*n* 259)	
Variable	Mean	SD	Mean	SD
Barthel*	17	4.4	16	4.7
Albumin (g/l)	38.9	4.4	37.2	4.7
C-reactive protein (mg/l)	53.8	76.0	51.7	72.3
Sex (female)	76	43%	130	50%

* The Barthel scores ten functions on a scale; 0 (fully dependent) to 20 (independent).

We have shown that it is feasible to use a randomised, double-blind, placebo-control trial design to test the effects of energy, protein and micronutrients supplementation on important functional and clinical outcome measures. Our final results will be available in early 2005.