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Abstracts of Original Communications

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Long-chain *n*-3 fatty acids enter advanced atherosclerotic plaques and are associated with decreased inflammation and decreased inflammatory gene expression. By A.L. CAWOOD[1], R. DING[1], F.L. NAPPER[1], R. YOUNG[1], J. WILLIAMS[2], M. WARD[1], O. GUDMUNDSEN[3], S. PAYNE[4], H. VIK[5], C.P. SHEARMAN[2], S. YE[1], P.J. GALLAGHER[1], R.F. GRIMBLE[1] and P.C. CALDER[1], [1]*University of Southampton, Southampton SO16 7PX, UK,* [2]*Southampton General Hospital, Southampton SO16 6YD, UK,* [3]*LINK Medical Research, N-2027 Kjeller, Norway,* [4]*St Mary's Hospital, Portsmouth PO3 6AD, UK and* [5]*Pronova Biocare, N-1366 Lysaker, Norway*

Instability of atherosclerotic plaques is due to macrophage inflammatory activity and can result in rupture of the plaque (Plutzky, 1999). We previously showed that long-chain *n*-3 fatty acids enter advanced atherosclerotic plaques and alter their morphology to one indicative of greater stability (Thies *et al*. 2003). Whether these fatty acids decrease inflammatory activity within advanced plaques is not known. The objectives of the present study were to confirm that long-chain *n*-3 fatty acids enter advanced atherosclerotic plaques and to examine the effect on plaque inflammation and on the expression of selected inflammatory genes.

Patients (*n* 121) awaiting carotid endarterectomy were randomly assigned to *n*-3 fatty acid ethyl esters (Omacor; Pronova Biocare AS, Lysaker, Norway) or olive oil as placebo (both 2 g/d) until surgery (7–109 d; median 21 d). Carotid-plaque phospholipid-fatty acid composition was determined by GC. Plaques were subject to histological examination, which identified the extent of inflammation and instability. Levels of mRNA encoding several matrix metalloproteinases (MMP), the inflammatory cytokine IL-6 and intercellular adhesion molecule (ICAM)-1 were determined by real-time RT–PCR using 36B4 as the housekeeping gene.

The *n*-3 fatty acid EPA was significantly higher in plaque phospholipids from patients in the Omacor group (0.83 (SE 0.05) *v*. 0.43 (SE 0.05); $P<0.0001$). Plaque phospholipid-EPA content was significantly negatively correlated with plaque inflammation ($P=0.011$), plaque instability ($P=0.021$) and average plaque histology score, a composite end point that includes several histological features ($P=0.043$). Plaques from patients in the Omacor group expressed significantly lower levels of mRNA for MMP7, MMP9, MMP12, IL-6 and ICAM-1 (all $P<0.05$), but there was no difference in expression of mRNA for MMP3, MMP8 or MMP13.

The present study confirms that long-chain *n*-3 fatty acids are incorporated into advanced atherosclerotic plaques over a short time period. Incorporation of EPA into advanced atherosclerotic plaques is associated with decreased expression of some of the MMP involved in inducing plaque instability and is associated with decreased plaque inflammation and instability. Incorporation of EPA into advanced atherosclerotic plaques is also associated with decreased expression of IL-6 and ICAM-1, indicating that these fatty acids exert anti-inflammatory actions within advanced plaques. These effects may result in increased plaque stability and so may play a role in decreasing cardiovascular events (see Calder, 2004).

This research was funded by Pronova Biocare AS.

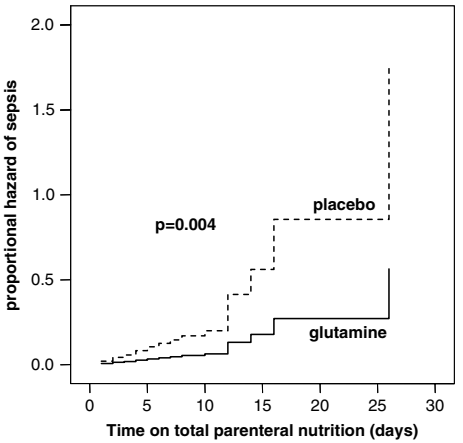
Calder PC (2004) *Clinical Science* **107**, 1–11.
Plutzky J (1999) *American Journal of Cardiology* **84**, 15J–20J.
Thies F, Garry JMC, Yaqoob P, Rerkasem K, Williams J, Shearman CP, Gallagher PJ, Calder PC & Grimble RF (2003) *Lancet* **361**, 477–485.

Glutamine decreases risk of sepsis in neonates receiving total parenteral nutrition. By E.G.P. ONG, S. EATON, A.M. WADE, V. HORN and A. PIERRO, *Institute of Child Health, London WC1N 1EH, UK*

The aim of the present study was to determine whether glutamine supplementation of parenteral nutrition (PN) in neonates who had undergone surgery reduces (1) time to full enteral feeding (2) occurrence of sepsis and septicaemia.

A prospective double-blind UK multi-centre randomised controlled trial was performed in neonates <3 months old who had undergone surgery. Patients were randomised by balanced minimization to receive 0.4 g glutamine/kg per d (treatment group) or isonitrogenous isoenergetic PN (control) until full enteral feeding. Sepsis was defined according to published criteria; septicaemia as sepsis with positive blood culture. Incidence of sepsis was compared using Fisher's exact test. Time to full enteral feeds was compared using linear regression analysis of logged data, and Cox regression analysis was used to compare risk of sepsis, accounting for time on PN. These analyses were corrected for minimisation criteria (hospital, gestational age, diagnosis, enrolment weight, functional small-bowel length, functional ileo-caecal valve).

		Control n=87 n	Glutamine=87 n	p Chi-square test
Diagnosis	Abdominal wall defect	50	48	0.97
	Congenital bowel obstruction	24	24	
	necrotizing enterocolitis	3	4	
	Other	10	11	
Gestational age	<30 weeks	2	4	0.67
	30–36 weeks	39	36	
	>36 weeks	46	47	
Enrolment weight group	<1000 g	0	2	0.23
	1000–2000 g	25	19	
	>2000 g	62	66	



One-hundred and seventy-four patients were randomised, aged 10±1.6 days (mean±SEM). Characteristics of the patients are shown in the Table. Complete datasets were available from 164 patients, 82 from each group. There were no complications related to glutamine administration. There was no difference in the median time (d) to full enteral feeding (glutamine 19.5 (range 1–89), control 15.5 (range 2–72); $P=0.44$) or median time (d) to first enteral feeding (glutamine 6 (range 1–52), control 6 (range 1–45); $P=0.44$). Glutamine had no effect on overall incidence of sepsis (glutamine 51% *v*. control 44%; $P=0.36$) or septicaemia (glutamine 31% *v*. control 24%; $P=0.31$). However, during total PN (before the first enteral feed), glutamine significantly reduced the risk of developing sepsis (relative risk 0.32 (95% CI 0.15, 0.69); $P=0.004$; see Figure). Glutamine supplementation during the whole period of PN (including partial enteral feeding) was not beneficial. However, it reduced the risk of sepsis by 68% during total PN. Neonates who had undergone surgery and receive no enteral feeding appear to benefit from glutamine supplementation of PN.

Relationship between birth weight and handedness. By M. ELIA[1], J. MULLIGAN[2], P. BETTS[2] and R.J. STRATTON[1], [1]*Institute of Human Nutrition, DOHaD Division, University of Southampton, Southampton SO16 7PX, UK and* [2]*Southampton University Hospitals NHS Trust, Southampton SO16 6YD, UK*

There is some controversy about the relationship between birth weight (an indicator of fetal growth, influenced by nutrition) and handedness (an indicator of brain development and function). Although some studies suggest that low birth weight is related to left handedness, others find no such relationship (Tan & Nettleton, 1980; Petridou *et al*. 1994; Powls *et al*. 1996). Such uncertainty may be explained partly by the impact of a variety of confounding factors (such as birth order, gender, smoking during pregnancy etc.), which are often not taken into account. Thus, this analysis of a prospective longitudinal study (Wessex Growth Study, UK) aimed to evaluate the potential link between handedness and birth weight whilst controlling for confounding factors.

The handedness (writing hand) of 212 children (boys 117, girls 95; mean birth weight z score –0.48), with well-documented antenatal and birth history (including gestational age, birth order, smoking in pregnancy, trauma during birth), was assessed at age 14–16 years, as part of the prospective Wessex Growth Study, and related to SD scores (z scores) of birth weight using the 1990 UK growth charts.

Left handedness was more common in lower-birth-weight children (logistic regression using birth-weight z scores; OR 1.374 (95% CI 1.105, 1.709); $P<0.004$), and was threefold more common in children in the lowest tertile of birth-weight z score (20% left-handedness) than in the upper tertile (6%; OR 1.83 (95% CI 1.107, 3.039); $P=0.019$). Handedness was not significantly related to gestational age, gender, projected adult height, birth order, trauma during birth, or smoking during pregnancy. Birth-weight z scores remained significant in logistic regression in the presence of these confounding variables. Left handedness was more common in children with lower z scores of measured height at 16 years (OR 1.526 (95% CI 1.086, 2.123); $P=0.015$) and tended to be (but not significantly; $P=0.097$) more common in those with lower projected adult height (based on maternal and paternal z scores for height). The analysis was repeated by considering only the children with projected adult heights between the 20th and 80th percentile (± 1.28 z score for projected adult height; n 142). The relationship between left handedness and lower birth-weight z score (OR 1.412 (95% CI 1.103, 1.808)) and tertiles of birth weight (19% left handedness in the lowest tertile compared with 6% in the highest tertile; OR 2.171 (95% CI 1.104, 4.648); $P=0.046$) persisted in logistic regression.

The results suggest that left handedness is established or 'programmed' during early development by factors that also determine or are linked to birth weight, independently of a variety of confounding factors.

Petridou E, Flytzani V, Youroukos S, Lee IM, Yen YY, Tong D & Trichopoulos D (1994) *Human Biology* **66**, 1093–1101.
Powls A, Botting N, Cooke RW & Marlow N (1996) *Developmental Medicine and Child Neurology* **38**, 594–602.
Tan LE & Nettleton NC (1980) *Cortex* **16**, 363–373.

Improved outcome of referrals for intestinal transplantation in the UK. By GIRISH GUPTE[1], SUSAN BEATH[1], SUE PROTHEROE[2], M. STEPHEN MURPHY[2], PAUL DAVIES[3], KHALID SHARIF[1], PATRICK MCKIERNAN[1], JEAN DE VILLE DE GOYET[1], IAN BOOTH[2] and DEIRDRE KELLY[1], [1]*Liver Unit,* [2]*Department of Paediatric Gastroenterology and* [3]*Statistical Advisory Service, Birmingham Children's Hospital, Birmingham B4 6NH, UK*

The medium- to long-term survival in children with chronic intestinal failure (IF) has improved over the last two decades. For children who develop life-threatening complications, intestinal transplantation (ITx) may be a life-saving option. The first ITx in the UK was performed in 1993 (Beath et al. 1996). From 1998 new strategies implemented to manage children referred for ITx were: combined en-bloc reduced liver–small bowel transplantation; isolated liver transplantation for infants with short-bowel syndrome and progressive liver disease.

The aim of the present study was to describe the outcome of children with IF referred to Birmingham Children's Hospital for consideration of ITx, to determine factors for an adverse outcome and to analyse the impact of post-1998 strategies on survival.

A retrospective analysis was performed of children referred for ITx assessment between January 1989 and December 2003. Children were assessed by a multidisciplinary team and categorized into: (a) stable on parenteral nutrition (PN); (b) unsuitable for transplant; (c) recommended for transplantation. To analyse the impact of the post-1998 strategies on survival a comparison was made between the two eras (pre-1998 and post-1998).

Children with chronic IF were identified (n 152; males 63, females 89; median age 10 (range 1–170) months). After assessment sixty-nine children were considered stable on PN (5-year survival 95%), twenty-eight children were considered to be unsuitable for transplant (5-year survival 4%) and fifty-five children were recommended for transplantation (5-year survival 35%, which includes fourteen children who died waiting for size-matched organs and seven children whose families declined transplantation). Twenty-three ITx and nine isolated liver transplants (overall 5-year survival 56%) were performed. In a multivariate analysis the following factors in combination had an adverse effect on survival: the presence of a primary mucosal disorder ($P=0.007$, OR 3.16 (95% CI 1.37, 7.31); the absence of involvement of a nutritional care team at the referring hospital ($P=0.001$, OR 2.55, (95% CI 1.44, 4.52); a serum bilirubin of >100 μmol/l ($P=0.001$, OR 3.70 (95% CI 1.84, 7.47).

Earlier referral (median serum bilirubin 78 μmol/l in the post-1998 era *v*.237 μmol/l in the pre-1998 era; $P=0.001$) may be a contributory factor to improved survival. The strategies of combined en-bloc reduced liver–small bowel transplantation and isolated liver transplantation resulted in fewer deaths on the waiting list in the post-1998 era (two deaths in post-1998 era *v*. twelve deaths in pre-1998 era).

The overall 3-year survival in the post-1998 era (69%) has improved compared with the pre-1998 era (31%; $P<0.001$).

The changing characteristics at the time of referral, including earlier referral and innovative surgical strategies have resulted in improved long-term survival of children referred for ITx, in Birmingham.

Beath SV, Kelly DA, Buckels JA & Mayer AD (1996) *Transplant Proceedings* **28**, 2736–2737.

An audit of dietitian-prescribed snacks and supplements to elderly care inpatients at a London teaching hospital. By M. P. BREMANG[1], L. J. CALLOW[1] and C. E. WEEKES[2], [1]*Department of Nutrition and Dietetics, King's College London, 150 Stamford Street, London SE1 9NN, UK and* [2]*Department of Nutrition and Dietetics, St Thomas' Hospital, Lambeth Palace Road, London SE1 7EH, UK*

In the management of malnutrition in the elderly the role of oral nutritional supplements (ONS) and provision of snacks is well established. However, limited data exist on the proportion of prescriptions that reach the patient and the reasons why patients fail to receive their prescribed items. The aims of the present study were to determine how frequently elderly inpatients failed to receive dietitian-prescribed snacks and ONS, and to investigate the main reasons for the failure.

The study was conducted on four elderly care wards over a 6-week period. During the initial 4 weeks, the following data were recorded for all thirty-one elderly inpatients identified by dietitians as requiring snacks and/or ONS: number of dietitian-prescribed items; number of items that arrived on the ward; number of patients who received the correct prescription. A qualitative study was conducted over the following 2 weeks to establish reasons why snacks and ONS did not arrive for the correct patient. The average length of stay for the elderly care unit at St Thomas' Hospital in December 2005 was 17 d. Allowing 24 h for first delivery and potential delay over the weekend, an audit standard was calculated that patients should receive the correct dietitian-prescribed items a minimum of 95% of the time, within 24 hr.

	Total no. of patient cases for audit	No. of items prescribed	Items meeting the audit standard for patient delivery (%)
Snacks	119	329	26
ONS	136	302	9

Of the snack and ONS prescriptions 100% were documented by dietitians in the medical notes. While errors were made throughout the delivery system, the main area in which snack provision failed was in the catering department loading bay, where thirty-three (10%) snacks were incorrectly labelled and thirty-six (11%) were unlabelled. In addition, eighty-six (26%) snacks were over-ordered by dietitians who had failed to remove patients from the computerised ordering system when they were discharged, transferred or had died. Once snacks arrived on the ward, however, 304 (92%) were correctly delivered to the patient. The main area in which ONS provision failed was in prescription documentation on the drug chart. Of the supplement requests by the dietitian 195 (65%) were correctly prescribed by doctors. On fifty-six (18%) occasions, however, doctors prescribed the wrong supplement and on fifty-one (17%) occasions doctors prescribed the incorrect amount, e.g. three cartons daily rather than two cartons daily.

In the present study only about one-quarter of patients received the correct snacks and approximately 10% received the correct ONS. The reasons why patients failed to receive the correct snacks were different from the reasons why they failed to receive the correct ONS, thus requiring different strategies to address the problems. The potential effects on clinical outcome of these failures of provision merit further investigation.

Subjects with different dietary fructo-oligosaccharide intakes have similar concentrations of faecal bifidobacteria. By K. WHELAN, A. DATTA and S. KALLIS, *Nutritional Sciences Research Division, King's College London, London SE1 9NN, UK*

Fructo-oligosaccharides (FOS) are short-chain (oligofructose) or long-chain (inulin) non-digestible oligosaccharides contained in a variety of foods including bananas, artichokes and asparagus (Van Loo *et al*. 1995). Supplements of between 5 and 15 g FOS/d stimulate the growth of colonic bifidobacteria (Bouhnik *et al*. 1999), leading to their extensive investigation and use in clinical nutrition. However, it is not known whether habitual dietary FOS intakes impact on the colonic microbiota. Thus, the aim of the present study was to investigate dietary FOS intakes and their correlation with faecal microbiota in healthy subjects.

Healthy subjects between the ages of 18 and 50 years were recruited to this cross-sectional survey of dietary FOS intakes and faecal bifidobacteria concentrations. Exclusion criteria were gastrointestinal disorders, use of antibiotics within the preceding 3 months, the consumption of probiotics or prebiotics within the preceding month or the current use of drugs that could potentially impact on the colonic microbiota.

Subjects completed a 7 d semi-weighed-food diary. As food composition databases for FOS do not exist, the method previously used to calculate FOS intakes in the USA was replicated in the present study (Moshfegh *et al*. 1999). First, the foods consumed were converted into commodities consumed using the Food Commodity Intake Database (Department of Agriculture, USA). These data were then converted into FOS consumed using the known FOS content of a comprehensive range of commodities (Van Loo *et al*. 1995). The day after completing the 7 d food diary a fresh faecal sample was collected, which was analysed for bifidobacteria by fluorescent *in situ* hybridisation (FISH) using the Bif164 probe.

Thirty healthy subjects (eleven males, nineteen females) with a mean age of 31 years 1 month (SD 7 years 3 month) were recruited to the study. Mean daily intakes (g/d) of oligofructose and inulin were 4.5 (SD1.4) and 4.8 (SD1.4) respectively, resulting in a mean total FOS intake of 9.3 (SD2.8) g/d. The differences in total FOS intakes between males (10.6 (SD3.7) g/d) and females (8.6 (SD 2.0) g/d) were not statistically significant (P=0.073). The majority of FOS intake came from wheat (73%) followed by onion (17%), garlic (4%), banana (3%) and other commodities (3%).

There was no correlation between total daily FOS intake and concentrations of faecal bifidobacteria (Pearson's correlation coefficient 0.187, P=0.323). Furthermore, there were no differences in faecal bifidobacteria between subjects in the different tertiles of dietary FOS intake (ANOVA; P=0.784).

	Tertile of FOS intake (g/d)						
	Lowest (5.0–8.2)		Medium (8.2–9.6)		Highest (9.9–19.2)		
	Mean	SD	Mean	SD	Mean	SD	*P*
Bifidobacteria (log_{10}/g)	9.1	1.1	8.9	0.6	9.2	0.9	0.784

Dietary FOS intakes in the UK (9.3 g/d) are much higher than those reported in the USA (5.1 g/d) despite the use of the same methods of quantification. Despite extensive evidence of a bifidogenic effect of supplemental FOS on faecal bifidobacteria, there was no evidence that differences in habitual intakes of dietary FOS impact on faecal bifidobacteria. Further research will investigate whether there are differences in the proportion of bifidobacteria or composition of other bacterial groups.

Moshfegh AJ, Friday JE, Goldman JP & Ahuja JK (1999) *Journal of Nutrition* **129**, 1407S–1411S.
Van Loo JAE, Coussement P, Leenher LD, Hoebregs H & Smits G (1995) *Critical Reviews in Food Science and Nutrition* **35**, 525–552.
Bouhnik Y, Vahedi K, Achour L, Attar A, Salfati J, Pochart P, Marteau P, Flourie B, Bornet F & Rambaud JC (1999) *Journal of Nutrition* **129**, 113–116.

Clinical outcomes can be improved by increasing patient knowledge with an information booklet. By A. CULKIN[1], S. GABE[2] and A. MADDEN[3], [1]*Nutrition and Dietetics and* [2]*Department of Gastroenterology, St Mark's Hospital, Harrow HA1 3UJ, UK and* [3]*Department of Health and Human Sciences, London Metropolitan University, London N7, UK*

Chronic intestinal failure (IF) occurs when the function of the small intestine is lost either through extensive resection or as a result of chronic conditions such as radiation enteritis and pseudo obstruction. Patients are advised to adhere to appropriate dietary advice to avoid diarrhoea or unmanageable output from a stoma or fistula, dehydration and oxalate kidney stones. By manipulating the diet patients can maintain or improve nutritional status, thus avoiding or reducing dependency on home parenteral nutrition (HPN) or fluids (Jeppensen & Mortensen, 2001). A study has shown that patients have inadequate knowledge of HPN (O'Connor *et al*. 1988). The aim of the present study was to assess the effectiveness of a booklet on patients' knowledge of the IF regimen and clinical outcomes at St Mark's. Patients completed a 3 d food diary and a questionnaire to assess their knowledge of the IF regimen. Height, weight, mid-arm circumference and triceps skinfold thickness were measured and BMI and mid-arm muscle circumference calculated. The volume and content of HPN was recorded. Patients were provided with the booklet and given individually-tailored advice by a dietitian and reassessed at their next appointment. The booklet contains information on the causes and consequences of IF, eating and drinking, medication and follow up. Paired *t* tests were used to compare data. Forty-eight patients (thirty-one female, seventeen male; mean age 56.1 (SD 13.4) years) completed the study. Twenty-five patients had Crohn's, twelve mesenteric infarct, three radiation enteritis, five surgical resections and three other conditions. Thirty-two patients had a stoma. Thirty-three patients received HPN, four intravenous fluids, two subcutaneous fluids and four oral nutritional supplements. There was a significant increase in patients' knowledge, oral energy, fat intake and BMI. A reduction in parenteral energy, glucose, volume and frequency was observed (see Table). Men improved their knowledge more than women, but the difference was not statistically significant (male 25.5 (SD 29.4) %, female 11.0 (SD 21.6) %; $P=0.06$). Patient age ($P=0.26$), time since diagnosis ($P=0.22$) or the presence of a stoma ($P=0.8$) did not affect change in knowledge. There was a significant correlation between initial Hb and an improvement in knowledge ($P=0.03$).

	Before		After		
Variable	Mean	SD	Mean	SD	*P*=
Knowledge score (%)	64.5	27.0	80.7	14.8	<0.001
Oral energy (kJ)	509	214	560	235	0.04
BMI (kg/m^2)	22.3	2.9	22.8	2.6	0.04
Parenteral energy (kJ)	211	125	192	130	0.02
Parenteral volume (ml)	2311	880	2198	950	0.02
Parenteral frequency (d)	6.3	1.9	5.9	1.5	0.003

The present study shows the positive effect of ongoing education in patients with stable IF, which can result in clinical benefits, including the reduction of HPN requirements. Patients who are anaemic may benefit from treatment to improve the ability to retain information, which may lead to further improvements in clinical outcomes.

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O'Connor M, Malone M & Hambleton R (1988) *Journal of Clinical Pharmacy and Therapeutics* **13**, 403–409.

The effects of oesophago-gastric surgery on antioxidant status. By J. SULTAN[1], F. DI-FRANCO[1], I. ANDERSON[1], S. JOHNSON[1], S.M. GRIFFIN[1] and C.J. SEAL[2], [1]*Northern Oesophago-Gastric Cancer Unit, Royal Victoria Infirmary, Newcastle upon Tyne NE14LP, UK and* [2]*School of Agriculture, Food & Rural Development, University of Newcastle, Newcastle upon Tyne NE17RU, UK*

Patients undergoing surgery are at risk of increased oxidative stress. The trauma of a surgical procedure is known to promote a pro-oxidative state, due to ischaemia–reperfusion processes (Halliwell, 1997), the release of tissue contents having pro-oxidative capability (e.g. free Fe and Cu; Haliwell, 1989) into the circulation and the activation of the inflammatory response, including cytokines, which can increase oxidant production (Grimble, 1994). This burden is additional to any pre-existing oxidative load due to the underlying pathology. Reductions in total antioxidant status have been previously reported during aortic aneurysm repair (Khaira *et al*. 1996), surgery in general (Baines & Shenkin, 2002) and during femoro-distal bypass (Spark *et al*. 1998). However, there have been few studies to consider the antioxidant levels of patients undergoing oesophago-gastric surgery for malignancy. Total antioxidant capacity (TAC; analysed using the ferric-reducing antioxidant capacity (FRAP) and Trolox equivalent antioxidant capacity (TEAC) methods), Hb, urate, albumin and C-reactive protein (CRP) were measured in eighty-six patients undergoing oesophago-gastric surgery for proven malignancy. Blood samples were taken 7 d and 1 d pre-operatively and 1 and 8 d post-operatively.

Patient demographics were: age 64.5 (SD 9.6) years; male:female 3.5:1; subtotal oesophagectomy 66; total gastrectomy 20; neo-adjuvant chemotherapy 47; malnourished (10% weight loss) 6. The results are shown in the Table.

	7 d pre-operative		1 d pre-operative		1 d post-operative		8 d post-operative		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*P*<*
FRAP (μM ferrous ion equivalents)	894	204	900	211	775	226	751	222	0.01
TEAC (μM Trolox equivalent units ×100)	0.78	0.12	0.77	0.28	0.65	0.27	0.70	0.26	0.01
Urea (mmol/l)	6.1	2.2	6.9	2.3	7.9	2.8	5.8	2.7	0.01
Uric acid (mmol/l)	0.34	0.11	0.31	0.11	0.26	0.11	0.22	0.11	0.01
Albumin (g/l)	41.6	3.4	40.4	3.7	22.2	5.0	25.9	3.6	0.01
Total protein (g/l)	70.9	4.1	68.3	4.9	42.3	6.3	50.0	5.3	0.01
Hb (g/dl)	14.0	1.8	13.2	1.4	10.3	1.7	10.4	1.2	0.01
CRP (mg/l)	12.1	14.2	8.0	5.7	129.0	63.8	100.1	85.1	0.01

*Repeated measures analysis using SPSS version 12 (SPSS, Chicago, IL, USA).

Uric acid, total protein and Hb concentrations fell post-operatively. Urea and CRP concentrations were significantly elevated. TAC was significantly reduced following oesophago-gastric surgery and by day 8 post-operatively it had failed to recover to baseline values. The consequences of these changes on morbidity and mortality are currently being investigated in this vulnerable group of patients.

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Calcium intakes in patients with coeliac disease and inflammatory bowel disease: are they meeting British Society of Gastroenterology guidelines? By J.E. DART[1,2], M. ABRAHAM[1], S.P.L. TRAVIS[3], D.P. JEWELL[3] and K. WHELAN[1], [1]*Nutritional Sciences Research Division, King's College London, London SE1 9NN, UK and* [2]*Dept of Nutrition and Dietetics and* [3]*Dept of Gastroenterology, Oxford Radcliffe Hospitals NHS Trust, Oxford OX3 9DU, UK*

Osteoporosis is a complication of coeliac disease and inflammatory bowel disease (IBD). In addition to the recognised risk factors for osteoporosis a variety of disease-related mechanisms also exist, including alterations in Ca intake, absorption and metabolism and, in IBD, the use of steroid treatment. Consequently, the British Society of Gastroenterology (BSG) recommends that patients with coeliac disease and IBD should consume 1500 mg Ca/d (Scott *et al*. 2000), compared with recommendations for the general adult population of 700 mg/d (Department of Health, 1991). There is little information about the dietary and supplemental Ca intakes in these patients and, in particular, whether differences exist in the intakes between disease groups.

Patients with coeliac disease (*n* 20), Crohn's disease (*n* 21) and ulcerative colitis (*n* 15) were recruited to a cross-sectional survey from the gastroenterology outpatient clinic at the John Radcliffe Hospital, Oxford, UK. The exclusion criteria were patients with previous bone fracture, breaks or diagnosed osteoporosis. Dietary Ca intakes were assessed using a validated FFQ adapted to the UK population (Montomoli *et al*. 2002). Ca supplementation was measured using both prescription data from medical notes and patients' self-reported intakes. Ca intakes were compared between patient groups using non-parametric analysis and the proportion of patients achieving recommended guidelines for Ca intakes were compared using the chi-squared test.

	Coeliac disease		Crohn's disease		Ulcerative colitis		
	Mean	SD	Mean	SD	Mean	SD	*P*=
Dietary Ca intake (mg/d)	1125	289	931	510	815	375	0.043
Supplementary Ca intake (in supplemented patients only; mg/d)	542 (*n* 12)	456	714 (*n* 5)	263	–		0.002
Total Ca intake (mg/d)	1466	537	1130	649	886	432	0.012
No. and percentage of patients achieving 700 mg Ca/d	19, 95		15, 71		10, 67		0.174
No. and percentage patients achieving 1500 mg Ca/d	6, 30		5, 24		2, 13		0.807

Mean dietary (*P*=0.043) and total (*P*=0.012) Ca intake was significantly different between patients with coeliac disease, Crohn's disease and ulcerative colitis. Supplemental Ca was prescribed to 60% of patients with coeliac disease and 24% of patients with Crohn's disease (*P*=0.09). Despite having the lowest total Ca intake, no patients with ulcerative colitis were prescribed supplemental Ca. The majority of patients were not achieving the BSG (Scott *et al*. 2000) guidelines of 1500 mg/d, and about one-third of patients with IBD were not meeting the Department of Health (1991) recommendations of 700 mg/d. Recent guidelines for patients with Crohn's disease recommend a minimum intake of 1000 mg/d, which was achieved by 43% of patients.

There are variable intakes of dietary and supplemental Ca in patients with coeliac disease and IBD. Targetted interventions are required to optimise Ca intakes in these patients at risk of osteoporosis.

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Home enteral tube feeding in children with inherited metabolic disorders: safety issues. By S. EVANS, A. MACDONALD, A. DALY, C. HOLDEN, V. HOPKINS, C. HENDRIKSZ and A. CHAKRAPANI, *Birmingham Children's Hospital, Steelhouse Lane, Birmingham B4 6NH, UK*

Many children with inherited metabolic disorders (IMD), at risk of hypoglycaemia and metabolic decompensation, are dependent on long-term overnight home enteral tube feeding. A number of clinical incidents have been reported both in the literature (Leonard & Dunger, 1978; Dunger & Sutton, 1995) and in our own centre; some due to human error, others to faulty equipment. However, the safety issues associated with this form of feeding have not been evaluated in this high-risk patient group.

In order to identify common safety and practical problems experienced in patients with IMD on home enteral tube feeding, thirty-four patients (median age 4.1 (range 1.2–15.8) years) with IMD requiring overnight tube feeding were recruited (twelve with glycogen storage disease (GSD), nine with organic acidaemias, eight with fatty acid oxidation disorders; four with urea cycle disorders and one with galactosaemia. Over half the patients (56%) were fed by gastrostomy and 44% were fed by nasogastric tube. A questionnaire administered to carers by face-to-face interview addressed child safety issues, training, equipment reliability, ability to obtain and manage feeds and equipment, and night time disturbance.

The main safety issues identified were: untrained secondary carers (71%); tube leakage (65%); frequent tube blockages (45%) due to the use of maize starch or medications or inadequate flushing; faulty pumps or misuse of pumps (50%), resulting in hypoglycaemia and hospitalisation in two children; equipment tampering by small children (29%), frequently causing disconnection of giving sets from the feeding tube; regular tube entanglement (71%), including around the neck (54%). Carer and family sleep disturbance (98%) was common, with 73% reporting that pumps alarmed at least once or twice nightly. The main reasons for disturbance were the child lying on the tube and blocking the flow (68%) and the pump alarming for an unknown reason (38%).

Children with IMD are frequently on long-term enteral tube feeding. Consequently, the maintenance of knowledge and skills in administering feeds is paramount in order to maximise safety. In addition, reliable equipment is vital. Sleep disturbance is more common in this group than in other home enterally-fed children (Evans *et al*. 2006), probably a reflection of the greater risk associated with these disorders.

Significant safety risks for children with IMD on overnight home enteral tube feeds have been identified. Procedures, training and equipment design need urgent attention, to prevent decompensation, hospitalisation and potentially fatal complications resulting from overnight tube feeding in IMD.

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Developing services for young adults who underwent small bowel transplantation in childhood. By S.V. BEATH[1], M. GABRIEL[2], L. HOGG[1], D. HARTT[1], G. GORDON[1], J. TAYLOR[1] and G. GUPTE[1], [1]*Liver Unit, and* [2]*British Intestinal Failure Survey, Birmingham Children's Hospital, West Midlands B4 6NH, UK*

Since small bowel transplantation began in the UK in 1993, over forty children and fifteen adults have undergone transplantation. There are currently four adult survivors between two centres (St James Hospital Leeds and Addenbrookes, Cambridge) and nineteen paediatric survivors in a third centre (Birmingham Children's Hospital) from the adult centres. Some of the children are of an age (10–12 years) when they would normally be referred to transition clinics. Since no transition clinics for small bowel transplantation exist at present, the views of the patients and their parents were canvassed by questionnaire.

The questionnaire consisted of twenty-five questions and was the same style (a statement followed by five choices: strongly agree; agree; no opinion; disagree; strongly disagree) and subject for both child and parent, although the wording was altered for children and an extra question for parents was asked to identify whether they were mother or father. The questions were grouped into (1) feelings about being transferred, (2) preferences for location of transition clinic, (3) preferences for organisation of clinic and ward, (4) skills expected of the new hospital, (5) preferences about the composition of the multi-disciplinary team (MDT). Seventeen pairs of questionnaires were distributed; exclusions were because of illiteracy (1) and transplant within 12 weeks (1).

Questionnaires were returned by six children aged 9–13 years (four boys) and seven parents (three fathers) anonymously. Group 1 questions: four of six children and six of seven parents were very worried about going to an adult hospital; five of six children and all parents wanted the adult MDT to meet them in the children's clinic first. Group 2 questions about location revealed differences in opinion, but they were all in agreement with the statement, 'I wouldn't mind travelling a long way if the care was good'. Group 3 questions: all parents and five of six children strongly agreed about having direct access to the ward in emergencies. Group 4 questions: the children had high expectations of the adult hospital, strongly agreeing that it should know a lot about intestinal failure and liver transplantation and should have experience of intestinal transplantation. The parents showed less strong agreement, but like the children were unanimous in strongly agreeing that the adult hospital should know about drugs used to treat rejection. Both children and adults expressed a strong opinion that the new hospital team 'should be willing to learn and listen to my opinion'. Group 5 questions about the composition of an adult MDT indicated that it was of greater concern to parents than children, but both strongly agreed that there should be specialist nurse who could be phoned for advice. The parents strongly agreed that a dietitian and psychologist should be available, whereas the children had no opinion about these team members.

The children and parents have clearly indicated that they want an experienced team, expert in prescribing immune-suppression drugs and managing rejection in patients who have undergone small bowel transplant, to take over their care when the time comes for transition. They also want the adult MDT to travel to the children's outpatient clinic to meet them before they transfer to the new hospital, but they are prepared to travel outside their region after transfer. The strong response about being listened to reflects the unique pioneering position that the children and families find themselves in.

Specialist dietetic input for gastroenterology outpatients: is there a need for joint clinics? By J. LE COUTEUR[1] and D.S. ROWBOTHAM[2], *Departments of* [1]*Dietetics and* [2]*Gastroenterology, Queen Elizabeth Hospital, Stadium Road, Woolwich, London SE18 4QH, UK*

Recent studies have shown that ≤40% of all patients admitted to hospital in the UK are underweight (Stratton & Elia, 2000) and ≤60% of hospital inpatients are clinically malnourished (Elia, 2003). It is well documented that improved nutritional status improves clinical outcome, regardless of the underlying diagnosis. Predicted savings for UK hospitals would be £226×10^6 annually if malnourishment was identified and treated appropriately (Lennard-Jones, 1992). National Institute for Health and Clinical Excellence (2006) guidelines state that all patients who attend hospital outpatient clinics should be screened for nutritional problems at their first clinic appointment. Screening should be repeated whenever there is clinical concern. Outpatient referral to the dietetic department of the Queen Elizabeth Hospital NHS Trust, however, has been hampered previously by substantial waiting lists for dietetic clinics (≤3 months), potentially adversely affecting outcomes for the patients.

The aim of the present study was to document the proportion of the Trust's routine gastroenterology outpatients who would benefit from specialist dietetic input, and to determine if it would be worthwhile to incorporate a parallel dietetic clinic into the regular gastroenterology clinics.

For a trial period of 7 weeks a senior dietitian observed consultant-led gastroenterology clinics. Relevant data collected during the clinic included total number of patients seen in the entire clinic (multiple doctors in different rooms); number of patients seen by the consultant (and observed by the dietitian); number of patients who, in the opinion of the dietitian, would have benefitted from specific dietetic advice; the range of diagnoses seen and the specific diagnoses of patients who would benefit from dietetic advice.

Over the 7-week study period the clinics treated a total of 210 patients. The dietitian directly observed consultant-led consultations with 127 patients. Eighteen patients (14%) were referred by the consultant for dietetic advice (conditions such as inflammatory bowel disease (IBD), gastrointestinal cancer, coeliac disease and alcoholic liver disease (ALD)). In the opinion of the dietitian, however, specialist dietetic advice would have been beneficial in an additional eighteen patients (14%), including conditions such as coeliac disease, obesity-related symptoms, weight loss, IBD and ALD.

To conclude, there is a clear need for specialist dietetic input into the gastroenterology outpatient service, at the Queen Elizabeth Hospital, and the volume of potential work suggests the aim should be to establish a regular dietetic clinic to run alongside the large combined gastroenterology clinics. A secondary observation is that gastroenterology consultants may not be making full use of all available dietetic services for their patients.

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Methicillin-resistant *Staphylococcus aureus* (MRSA) in gastrostomy sites: prevalence, route of transmission and relationship to clinical infection and symptoms. By B.M. HALL and P.J. NEILD, *Department of Gastroenterology, St George's Hospital, Blackshaw Road, London SW17 0GT, UK*

Localised gastrostomy (percutaneous endoscopic gastrostomy; PEG)-site infections are a recognised complication of PEG insertion and occur in approximately 15% of cases. A previous study at St Georges Hospital found a high prevalence of MRSA PEG-site infections, particularly in patients who were already colonised before PEG insertion. We carried out a prospective study of fifty patients referred for PEG placement, to assess: the prevalence of MRSA in patients referred for PEG tube placement; the incidence and potential route of MRSA colonisation at PEG sites post procedure; the relationship between clinical infecttion and the presence of MRSA; the relationship between pain at the stoma site and the presence of MRSA or infection.

Full MRSA screening before PEG insertion was requested. After endoscopic insertion of the PEG tube, an occlusive dressing was placed over the site for 24 h. Visual, microbiological and pain assessments of the site were made at 24 h (after which the dressing was removed) and at 7 d.

Thirty of the fifty (60%) patients were male. The median age was 74 (range 23–94) years. Forty-seven patients (94%) had an MRSA screen sent before PEG insertion and eleven patients (23%) were MRSA positive in one or more sites before insertion. Information was available for thirty-four patients at 24 h and thirty-one patients at 7 d. Ten of thirty-four (29%) patients had MRSA identified in the PEG site within 24 h, nine of whom had also been positive at initial screening. Nine of thirty-one (29%) patients had MRSA identified in the PEG site within 7 d, five of whom had also been positive at initial screening. Four of thirty-four (12%) patients had evidence of infection at their PEG site within 24 h, three of whom showed colonisation with MRSA($P<0.05$). Three of four (75%) of these patients reported moderate or severe pain compared with four of thirty (13%) of those with no evidence of infection ($P<0.05$). Twelve of thirty (40%) patients had evidence of infection at their PEG site at 7 d, five of whom showed colonisation with MRSA. Six (50%) of these patients reported moderate or severe pain compared with none of the patients with no evidence of infection ($P<0.0005$).

	24 h				7 d			
	No infection (*n* 30)		Infection (*n* 4)		No infection (*n* 19)		Infection (*n* 12)	
	n	%	*n*	%	*n*	%	*n*	%
Pain: Nil to Mild	25	83	1	25	19	100	6	50
Moderate to severe	5	17	0		0		6	50
MRSA	5	17	3	75*	4	21	5	42

The present study confirms that patients already colonised with MRSA are highly likely to develop MRSA within their PEG site. There is a suggestion that the presence of MRSA increases the risk of clinical infection and pain at the site. Although the numbers are small, it is interesting that three of the eight patients who developed MRSA within their PEG site at 24 h only had positive swabs from their nose at the initial screening, thus raising the possibility that initial spread may occur via the gastroscope. However, it should also be noted that four of the nine patients with evidence of MRSA at 7 d had not been previously positive, a serious concern relating to infection control.

Use of percutaneous endoscopic gastrostomy tubes to provide nutrition following liver transplantation. By C.F. DONNELLAN, J.H. LEAPER, S.M. HAMLIN and C.E. MILLSON, *Department of Hepatology, St James's University Hospital, Leeds LS9 7TF, UK*

The prevalence of malnutrition in patients undergoing orthotopic liver transplantation (OLT) has been reported to be between 70 and 100% (McCullough & Bugianesi, 1997). Recent European Society for Parenteral and Enteral Nutrition guidelines (Plauth *et al*. 2006) have therefore advised nutritional assessment of all patients pre-transplant, with early consideration of nasogastric (NG) or jejunostomy enteral feeding. However, no mention is made of the benefits and/or risks of feeding via percutaneous endoscopic gastrostomy (PEG) tubes, although placement of a PEG in patients with liver cirrhosis outside a transplant setting is not recommended.

We collected data retrospectively on all patients undergoing PEG placement following OLT. These data included nutritional status pre-transplant, use of NG, nasojejunal (NJ) and jejunal tubes immediately post-transplant, indication for PEG placement, number of days between OLT and PEG feeding, PEG-related complications and indication to stop PEG feeding.

Between 1996 and 2005 sixteen males and seventeen females had PEG placed post-OLT, with a mean age of 42 (range 16–70) years. Underlying indications for OLT were alcoholic liver disease (eight patients), primary biliary cirrhosis (six patients), hepatitis C (four patients), primary sclerosing cholangitis (two patients), autoimmune hepatitis (two patients), paracetamol overdose (two patients) and others (nine patients). Four patients (12%) were fed via NG tubes before transplant.

Immediately post-operatively, twenty of thirty-three (61%) were fed via NG tubes, nine of thirty-three (27%) via NG followed by NJ tubes, one of thirty-three (3%) via an NJ tube, one of thirty-three (3%) via NG followed by a jejunostomy, one of thirty-three (3%) via NG tube followed by parenteral nutrition (PN) and one of thirty-three (3%) via NG, NJ and lastly PN. Subsequently, PEG were sited a median of 42 (range 11–176) d post-OLT, either for recurrent displacement of feeding tubes in 8/33 (24%) or due to a requirement for medium-term enteral feeding in 25/33 (76%).

Complications of PEG insertion occurred in six patients (18%) with either infection (*n* 4) or haematoma formation (*n* 2). In addition, six patients experienced diarrhoea, four vomiting and one poor feed absorption. The result was four PEG-related admissions in three patients (9%), two relating to diarrhoea and two with PEG site infections. PEG were removed after a median of 61 (range 8–289) d with median in-patient stay of 78 (range 12–206) d, which was higher than usual. In twenty-three of thirty-three patients (70%) PEG feeding was stopped because of adequate oral intake, eight of thirty-three (24%) because of death, which was equivalent to mortality in all patients undergoing OLT during this period, one of thirty-three (3%) because of placement of a jejunostomy and one of thirty-three (3%) because of non-compliance. Of the thirty-three patients, six patients required a further transplant, highlighting the complexity of patients in this group.

In summary, PEG feeding was initiated in thirty-three patients post OLT over a period of 9 years. These patients had high morbidity and mortality with long inpatient stays. Despite this outcome, PEG feeding was well tolerated and was continued until adequate oral intake was achieved in 70% of the patients. Although other modes of enteral feeding remain first-line strategies, PEG should be considered for those patients requiring longer-term enteral nutrition.

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Percutaneous endoscopic gastrostomy (PEG) placement: patient and carer perceptions of decision-making. By A.M. BROTHERTON, J. ABBOTT and P.J. AGGETT, *University of Central Lancashire, Preston PR12HE, UK*

Appropriate patient selection for PEG placement is crucial, yet the process in decision-making remains poorly defined, as is the role in this process of healthcare professionals (Angus & Burakoff, 2003), and patients who should be given understandable evidence that enables them to make informed choices (Ford *et al*. 2002). The present qualitative study explored the patients' and their carers' perceptions of decision-making and provision of information in PEG feeding.

The study was a cross-sectional qualitative design employing purposive sampling, selecting patients from a Home Enteral Tube Feeding register, in central Lancashire. Sixty-seven semi-structured interviews, containing open and closed questions, were undertaken (sixteen adult patients, twenty-seven carers of adults and twenty-four parents of children receiving PEG feeds) to obtain participants' views. The interviews were transcribed and the dialogues for the questions analysed for each subgroup. The responses (% total) for each group of participants are shown in the Table.

	Adult patients (*n* 16)			Carers of adult patients (*n* 27)			Parents of children (*n* 24)		
Question	Yes	No	Unsure	Yes	No	Unsure	Yes	No	Unsure
Did you have any choice in the decision to place a PEG?	25	69	6	41	55	4	50	33	17
Did you receive sufficient information?	25	62	13	37	48	15	71	21	8
Was the information useful?	25	6	69	44	4	52	92	–	8
Has PEG feeding been successful?	94	6	–	89	4	7	92	–	8
Would you have the PEG reinserted if given the choice again?	75	25	–	70	15	15	83	–	17
Would you choose to withdraw feeding if given the choice?	50	44	6	15	59	26	21	71	8

Participants' experiences were diverse and some perceptions appeared inconsistent. There was a perception that healthcare professionals were paternalistic and prescriptive in recommending PEG placement. Patients and carers felt excluded from decision-making, especially (but not exclusively) in adult services. Approaches to decision-making and the use of decision-making models seemed to be inconsistent. Perceived barriers to patient choice included attitudes of medical and nursing staff, lack of information before PEG placement, no information on alternatives to PEG feeding and the need to address more urgent medical issues. Participants described being well informed of the procedure for PEG insertion, but said they had little or no information regarding the practicalities and organisation of feeding, especially the requirements of the feeding regimen. Barriers to patient choice and poor communication need to be addressed. Standard interdisciplinary and participative practices in agreeing shared treatment goals and evaluation of patients' experiences, to improve patient and carer decision-making in PEG feeding, should be introduced and evaluated.

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Ford S, Schofield T & Hope T (2002) *Patient Education and Counselling* **47**, 179–185.

A nutrition screening tool based on the British Association for Parenteral and Enteral Nutrition four questions reliably predicts hospitalisation and mortality in respiratory outpatients. By C.E. WEEKES[1], P.W. EMERY[2] and M. ELIA[3], [1]*Department of Nutrition & Dietetics, Guy's & St Thomas Hospitals NHS Foundation Trust, London SE1 7EH, UK,* [2]*Nutritional Sciences Research Division, Kings College London, London SE1 9NN, UK and* [3]*Institute of Human Nutrition, University of Southampton, Southampton SO16 6YD, UK*

The aim of the present study was to assess whether a nutrition screening tool (NST) can predict hospitalisation and mortality in hospital outpatients suffering from chronic respiratory disease.

A total of 361 outpatients with chronic obstructive pulmonary disease were screened during a routine visit to the chest clinic. The NST was based on four variables considered to be the minimum required to identify patients who are nutritionally at risk, i.e. weight, height, recent unintentional weight loss and poor dietary intake (Lennard-Jones *et al*. 1995). Patients were allocated to a nutrition risk category (low, medium or high) according to the NST score (Weekes *et al*. 2004). A retrospective review of computerised records from Guy's & St Thomas Hospitals NHS Foundation Trust was conducted to establish the number of patients admitted to hospital non-electively, length of hospital stay and mortality (both in hospital and the community) in the 12 months following nutrition screening.

	Patients screened		Patients admitted to hospital		Length of stay in 12 months (d)			
NST risk category	*n*	%	*n*	%	Median	Range	Mean	SD
0 (low)	255	71	71	28	0	0–49	4.1	9.5
1 (medium)	51	14	23	45	0	0–51	8.0	12.5
2 (high)	55	15	28	51	1.0	0–72	9.6	15.4

The proportion of patients admitted to hospital non-electively (see Table) increased with malnutrition risk category ($P<0.001$; χ^2 test). The mean length of hospital stay increased with malnutrition risk, and remained significant after controlling for the effect of age ($P<0.004$; Rank ANCOVA). The 12-month mortality also progressively increased with risk (low, *n* 16 (6%); medium, *n* 6 (12%); high, *n* 9 (16%); $P=0.04$), and remained significant after controlling for the effect of age ($P=0.03$; Cox regression).

The present study shows that an NST based on BMI, unintentional weight change and poor dietary intake can predict outcome in outpatients with chronic respiratory disease.

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Weekes CE, Elia M & Emery PW (2004) *Clinical Nutrition* **23**, 1104–1112.

Greater total vitamin intakes post-operatively with liquid oral nutritional supplements than food snacks. By R.J. STRATTON[1], G. BOWYER[2] and M. ELIA[1], [1]*Institute of Human Nutrition, University of Southampton, Southampton SO16 6YD, UK and* [2]*Trauma and Orthopaedics Directorate, Southampton University Hospitals NHS Trust, Southampton SO16 6YD, UK*

Dietetic practice often recommends dietary approaches first to treat malnutrition before oral nutritional supplements (ONS). However, in some groups a liquid multinutrient supplement may be a more effective first-line treatment. We have previously shown in patients with fractured neck of femur that total energy and protein intakes are significantly greater in those given liquid ONS than in those given food snacks in addition to a hospital diet post-operatively (Stratton *et al*. 2006). However, the effect of these two commonly-used forms of oral nutrition support (ONS *v*. food snacks) on total micronutrient intakes has not been investigated in this patient group. This randomised trial tested the hypothesis that total intakes of water-soluble vitamins are significantly greater in patients receiving liquid multinutrient supplements (ONS) than in those receiving isoenergetic food snacks in addition to a hospital diet.

Fifty patients with fractured neck of femur (median age 82 (range 46–97) years; forty-two women, eight men; median BMI 19 (range 12.5–26) kg/m^2) at risk of malnutrition (screened using the 'Malnutrition Universal Screening Tool' ('MUST') (Elia, 2003) were recruited. Patients were randomised (stratified for malnutrition risk) to receive liquid ONS (Fortisip, Fortifresh, Fortijuce (Nutricia, Trowbridge, Wilts., UK), 1250 kJ (300 kcal) per carton) or isoenergetic readily-available food snacks (cakes, biscuits, puddings, 1250 kJ (300 kcal) per portion) *ad libitum* post-operatively until discharge. Compliance with ONS or food snacks was measured daily and intake of the hospital diet was assessed using food charts and 24 h dietary recall. Mean total daily intake of water-soluble vitamins was assessed using WISP (Tinuviel Software, Warrington, Cheshire, UK).

Patients randomised to ONS had greater total intakes of all water-soluble vitamins (thiamin, riboflavin, vitaminB_6, vitamin B_{12}, folate, niacin, panthothenate, biotin, vitamin C, see Table for significant differences). Mean intakes of all water-soluble vitamins met or exceeded the reference nutrient intakes (RNI; Department of Health, 1991) in the ONS group but not the snack group.

	ONS group (*n* 26)		Food snack group (*n* 24)		
Vitamin	Mean	SD	Mean	SD	RNI†
Thiamin (mg/d)	1.59*	1.36	0.73	0.38	0.8
Riboflavin (mg/d)	1.80*	1.24	0.98	0.49	1.1
Vitamin B_6 (mg/d)	1.60**	0.75	0.84	0.41	1.2
Folate (μg/d)	221**	110	108	49.6	200
Niacin (mg/d)	15.8**	7.72	7.98	4.73	12
Vitamin C (mg/d)	77.0**	41.1	37.4	20.1	40

Mean total intakes were significantly greater than those for the food snack group (unpaired *t* test): *$P<0.004$, **$P<0.0005$. †RNI for healthy individuals aged >50 years (requirements in this group likely to exceed the RNI). Intakes of biotin and panthothenate for the ONS group were significantly greater than those for the food snack group ($P<0.0005$) and fell within safe intakes (Department of Health 1991).

This trial in post-operative patients with fractured neck of femur suggests that liquid multinutrient supplements are a more effective first-line treatment than food snacks, enabling significantly greater total mean intakes of water-soluble vitamins that meet or exceed the RNI for these nutrients.

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Elia M (2003) *Screening for Malnutrition: A Multidisciplinary Responsibility. Development and Use of the 'Malnutrition Universal Screening Tool' ('MUST') for Adults*. Redditch, Worcs.: BAPEN.
Stratton RJ, Bowyer G & Elia M (2006) *Clinical Nutrition* (In the Press).
Department of Health (1991) *Dietary Reference Values for Food Energy and Nutrients for the United Kingdom*. London: H.M. Stationery Office.

Impact of combination therapy with peginterferon α-2a and ribavirin on the energy intake and nutritional status of adult patients with hepatitis C. By C. HAMER, *Department of Nutrition and Dietetics, St Mary's NHS Trust, Praed Street, London W2 1NY, UK*

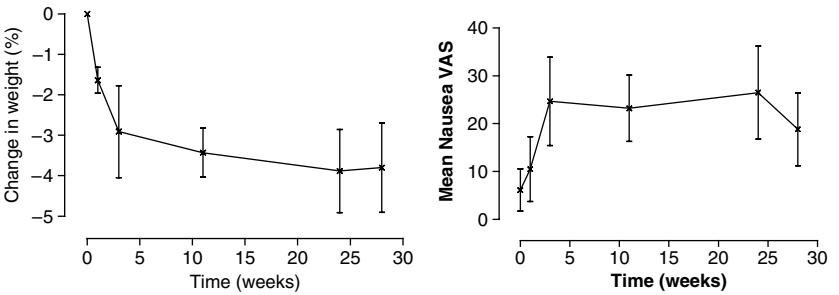
It is recognised that interferon therapy has an adverse effect on the appetite and nutritional status of children with hepatitis B and C (Gottrand *et al*.1996; Lebensztejn *et al*. 2001). The aim of the present study was to investigate whether adults are similarly affected and to identify contributing factors.

The dietary intake of fifteen adult patients with hepatitis C was measured using a 3 d food diary. Nutritional status was assessed using weight profile. Measurements were taken before the start of treatment (week 0) and at weeks 1, 3, 11, 24 and 28 of treatment in order to assess changes at intervals throughout therapy. A visual analogue scale (VAS) was used to investigate patients' perception of fatigue, appetite and nausea. Values are presented as mean with their standard errors.

Fifteen subjects were entered into the study (male:female 12:3, age 48.5 (SE 2.3) years and BMI 24.1 (SE 1.3) kg/m^2).

Fourteen of fifteen (93%) patients lost weight during therapy. The greatest rate of weight loss occurred at week 1 (1.64 (SE 0.32) %; $P<0.05$; Bartlett's test) and continued to week 24. The greatest decrease in energy intake occurred at week 1 (9.74 (SE 4.02) % $P<0.05$; Bartlett's test) and continued until week 24.

VAS scores increased with time until week 24. The greatest change occurred at week 1 (fatigue 53.57 (SE 9.65), nausea 10.5 (SE 6.78), appetite 45.07 (SE 8.83; $P<0.05$; Bartlett's test). Nausea showed the greatest increase from baseline.



The present study indicates that the majority of adult patients with hepatitis C treated with a combination of peginterferon α-2a and ribavirin experienced decreased energy intake and weight loss over time, with the greatest effect occurring at week 1. This decline in nutritional status may be related to the impact of side effects of treatment, in particular nausea.

Routine nutritional screening of this patient group is recommended. Those patients at risk should receive early dietetic referral. Monitoring throughout therapy should focus on identifying side effects of treatment (particularly nausea and associated decline in energy intake). This approach will allow targetted anti-emetic treatment and nutritional support.

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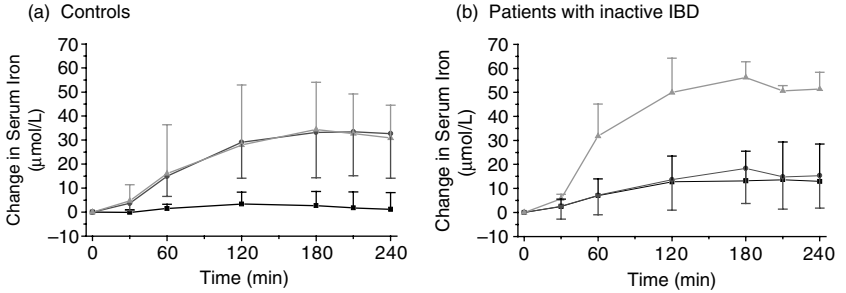
Iron absorption is normal in inflammatory bowel disease but assessing iron requirements is complex. By M.C.E. LOMER[1,2], W. COOK[3], H. JAN-MOHAMED[4], R.P.H. THOMPSON[2] and J.J. POWELL[3], [1]*Nutrition & Dietetics and* [2]*Gastrointestinal Research Laboratory, Guy's & St Thomas' NHS Trust, London SE1 7EH, UK,* [3]*MRC-HNR, Cambridge CB1 9NL, UK and* [4]*Nutrition & Dietetics, King's College London SE1 9NH, UK*

It is well recognised that Fe deficiency is not easily diagnosed in subjects with chronic inflammatory disease due to the duplicitous nature of ferritin. Nonetheless, in inflammatory bowel disease (IBD), a high prevalence of Fe deficiency is suspected. Gastrointestinal blood and protein loss, low dietary Fe intakes and poor Fe absorption have all been proposed in IBD. The aim of the present study was to assess Fe absorption using oral serum Fe curves that allow the kinetics of uptake to be determined.

Healthy control subjects (*n* 28) or patients with quiescent IBD who had not had jejunal surgery (*n* 31; Crohn's disease 25, ulcerative colitis 6) were included and had their Fe status measured at baseline. Following a single oral dose of ferrous sulphate (200 mg), sequential serum Fe concentrations were measured at 0, 30, 60, 120, 180, 210 and 240 min. Subjects (controls and IBD) with Fe deficiency were classified with (1) serum ferritin <20 μg/l or (2) serum ferritin 20–55 μg/l and either serum Fe <14 μmol/l or transferrin saturation <10 %. Mild anaemia was present where Hb concentrations were 110–130 g/l (male) and 105–125 g/l (female). Local ethical approval was obtained and absorption data was analysed using a repeated measures ANOVA (SPSS version 12, SPSS, Chicago, IL, USA).



Serum Fe concentrations post dose for controls were: Fe replete (■), *n* 13; NS; Fe deficiency (●), *n* 10; $P<0.001$; Fe-deficiency anaemia (▲), *n* 5; $P<0.001$. Serum Fe concentrations post dose for patients with inactive IBD were: Fe replete (■), *n* 16; $P=0.01$; Fe deficiency (●), *n* 11 NS; Fe-deficiency anaemia (▲), *n* 4; $P<0.001$.

Fe absorption is normal in subjects with inactive IBD but the detection of Fe deficiency in the absence of anaemia is difficult in subjects with IBD. Unlike controls, some patients with normal haematinics showed high Fe absorption (suggestive of high Fe requirements) while most with signs of Fe deficiency showed low Fe absorption. Better criteria are required for determining Fe needs in subjects with IBD.

Impact of cholestasis and restricted breast-feeding on developmental outcome in children undergoing liver transplantation before the age of 12 months. By S.V. BEATH[1], C. PATCHELL[2], I.D. VAN MOURIK[1], A.J. CASH[3], C. LLOYD[1] and D.A. KELLY[1], [1]*The Liver Unit and* [2]*The Department of Dietetics, Birmingham Children's Hospital, Birmingham B4 6NH, UK and* [3]*The Institute of Child Health, The University of Birmingham, West Midlands B4 6NH, UK*

As a result of advances in surgical techniques and immunosuppression, liver transplantation (LTx) for infants became available for the first time in the UK in the late 1980s. A cohort of seventeen babies who were transplanted between 1989 and 1992 has been followed up in relation to developmental outcome (van Mourik *et al*. 2000). All the babies were jaundiced with end-stage liver disease and malnourished before transplant, and the majority were obliged to discontinue breast-feeding and received continuous nasogastrically-administered artificial feeds that were devoid of DHA and other long-chain PUFA. Recent publications have highlighted the importance of DHA in development, especially domains related to behaviour and concentration. The aim of the present study was to relate the experience of breast-feeding (the only source of DHA for these babies before the age of 12 months) to developmental outcome.

Twelve of the mothers agreed to participate by answering questions about whether they had ever breast-fed their baby and for how many days. Four infants were not breast-fed at all, four were breast-fed for 6 months and four were breast-fed for between 2 and 11 weeks. The results were correlated with the previous weight Z scores and developmental (Griffiths (1986) scale for the mental abilities of babies) domain scores held on database (van Mourik *et al*. 2000). Eleven babies had biliary atresia and one had α-1 anti-trypsin deficiency, and they were transplanted at a mean of 8 (range 6–10) months of age.

	Development quotient					
	Pre-LTx		4 years post LTx*		Correlation with	
Domain	Mean	SD	Mean	SD	breast-feeding* (r^2)	*P* value*
Eye–hand coordination	111	19	104	15	0.4	0.43
Performance	101	16	107	15	0.51	0.09
Language	98	16	108	15	0.67	0.016
Social skills	110	23	106	14	0.72	0.009
Motor skills	89	20	93	16	0.63	0.032

None of the pre-LTx domains correlated with breast-feeding experience, but three domains at 4 years post LTx showed a significant positive relationship (Spearman correlation) with duration of breast-feeding pre-LTx. However, weight Z scores pre- and post LTx did not correlate with breast-feeding and nor did weight Z scores correlate with development scores.

The present pilot study indicates that absent or limited breast-feeding may have had an influence on developmental progress ≤4 years post LTx in babies with severe congenital liver disease. Formula feeds now contain DHA supplements, but it is not clear how much DHA should be given to jaundiced infants with fat malabsorption. These preliminary results suggest that all children transplanted in infancy for end-stage liver disease before routine DHA supplementation was available should have developmental progress re-evaluated, especially in relation to language, motor and social skills, and consideration should be given to DHA supplementation.

Griffths R (1986) *Griffiths Mental Developmental Scales*. High Wycombe, UK: The Test Agency.
van Mourik IDM, Beath SV, Brook GA, Cash AJ, Mayer AD, Buckels JA & Kelly DA (2000) *Journal of Pediatric Gastroenterology and Nutrition* **30**, 269–275.

Referral for intestinal transplantation: an audit of patients with intestinal failure. By A.A. ZABRON[1], D.A.J. LLOYD[1], S.J.L. RALPHS[1], J.M. WOODWARD[2], N.V. JAMIESON[3], S.J. MIDDLETON[2] and S.M. GABE[1], [1]*Lennard-Jones Intestinal Failure Unit, St Mark's Hospital, Watford Road, Harrow HA1 3UJ, UK and Departments of* [2]*Gastroenterology and* [3]*Transplant Surgery, Addenbrookes Hospital, Hills Road, Cambridge CB2 2QQ, UK*

Survival after intestinal transplantation continues to improve and it has become a viable alternative to home parenteral nutrition (HPN) in patients with intestinal failure (IF) who are developing complications associated with HPN. Intestinal transplantation is a cost-effective alternative to HPN and may confer improved quality of life. Guidelines for referral for intestinal transplantation have been published (American Gastroenterological Association, 2003).

The aim of the present study was to review numbers of patients receiving HPN who were eligible to be considered for intestinal transplantation in a UK tertiary referral centre, assess the proportion of eligible patients who had been referred and compare details with patients who had undergone intestinal transplantation.

Case records of patients receiving HPN at a single UK centre on 31 December 2005 were reviewed. Patients were considered eligible for referral for intestinal transplantation if they fulfilled one or more of the following criteria: advanced parenteral nutrition-associated liver disease (PNALD); chronic cholestasis (1.5×upper limit of normal of two or more of γ-glutamyl transpeptidase, alkaline phosphatase or bilirubin for >6 months); thrombosis of two or more major veins; frequent central venous catheter (CVC)-related sepsis (two or more episodes in the previous 12 months, fungaemia or septic shock); frequent severe dehydration; patient request. Outcomes of patients fulfilling these criteria were recorded. Available case records of patients with intestinal failure receiving HPN who had undergone intestinal transplantation at a single UK transplant centre were also reviewed.

Records of 123 patients receiving HPN on 31 December 2005 were reviewed. The median age was 51 (range 19–80) years. Forty-five patients (37%) fulfilled one or more criteria for referral. The median age for this group was 48 (range 24–76) years. Underlying aetiologies of IF in these patients were: Crohn's disease 31%; vascular 27%; pseudo-obstruction 16%; surgical complications 13%; other 13%. Of patients eligible for referral only seven (16%) had been referred; three of these fulfilled multiple criteria for referral. The number of patients fulfilling each criterion and the percentage referred was as follows: advanced PNALD 2 (100%); chronic cholestasis 18 (11%); multiple venous thrombosis 16 (19%); CVC sepsis 16 (12%); frequent dehydration 1 (100%); patient request 1 (100%). Of those not referred, referral was precluded by perceived comorbidity in 24% and psychosocial or compliance issues in 13%; alternate management strategies were employed in 24% and referral was not considered warranted in 34%. Other reasons were recorded in 5%.

Records of four patients with IF who had undergone intestinal transplantation were available for review. Their median age was 30 (range 22–44) years. Indications for referral for transplantation for each of these patients were as follows: multiple venous thrombosis and recurrent CVC sepsis; advanced PNALD and recurrent CVC sepsis; recurrent CVC sepsis; advanced desmoid disease.

In conclusion, over one-third of patients receiving HPN fulfil broad criteria for consideration of intestinal transplantation. At present, the number of adult patients who have undergone intestinal transplantation in the UK is small and patients are usually only referred once complications are multiple and have become life threatening. Earlier referral may improve transplantation outcomes, although this option must be balanced against favourable survival in patients receiving HPN. Close liaison with transplant centres is needed to ensure appropriate referral and to optimise the timing of surgery.

American Gastroenterological Association (2003) *Gastroenterology* **124**, 1111–1134.

Occluded superior vena cava! They think it's all over. By G. GUPTE[1], C. MEHTA[2], K. SHARIF[1] and J. De GIOVANNI[2], [1]*Department of Paediatric Cardiology and* [2]*Liver Unit, Birmingham Children's Hospital, Steelhouse Lane, Birmingham B4 6NH, UK*

Children with irreversible intestinal failure require parenteral nutrition administered through central venous lines for long-term survival. Multiple line insertions and infections can lead to thromboses in the major vessels of the neck and impaired venous access. We report on a new technique for central line insertion in children with occluded vessels in the neck, which is a useful alternative to transhepatic line and right atrial line placement requiring a sternotomy.

The aim of the present study was to describe our experience with the use of the stereotactic technique in children with impaired venous access.

A retrospective review of the intestinal failure database was conducted to identify children having stereotactic long needle puncture of the superior vena cava (SVC) stump using biplane fluoroscopy. Once the vessel was punctured, using the Seldinger technique, a sheath was placed in the vessel and a subcutaneous tunnel created for the Hickman line, which was placed at the right atrial–SVC junction (Higgs *et al*. 2005). A review of the medical records was conducted to document the demographic details and complications (see Table).

Seven Hickman lines inserted stereotactically were identified in five patients. The median age at insertion was 5 years.

Case no.	Age (years)	Diagnosis	Weight (kg)	Duration (months)	Outcome
1	4.5	Short bowel syndrome	17.6	2	Transplant
2	16	Hirschprung's disease	52	2	Transplant
3	8	Hirschprung's disease	28	7, 3	Candida infection, transplant
4	2	Short bowel syndrome	11.1	4 months 1 d	Line displaced, died
5	5	Hirschprung's disease	18.6	2 weeks	On transplant list

There were two identified complications: death within 24 h (*n* 1); pericardium breached with guide wire, no sequelae (*n* 1). The patient who died within 24 h did not show bleeding in the peritoneal cavity or the liver (transhepatic puncture performed), haemomediastinum or any lung injury on post-mortem examination, thus excluding any possibility of procedure-related complications.

Two patients had repeat line insertion 3 and 7 months apart because of inadvertent removal by the patient and recurrent line infections respectively.

This is a new and relatively non-invasive technique, which allows safe insertion of central venous catheters even in clinically frail children with severely compromised venous access, who are awaiting small bowel transplantation.

Higgs ZC, Macafee DA, Braithwaite BD & Maxwell-Armstrong CA (2005) *Lancet* **366**, 1407–1409.

Should malnutrition screening be implemented in general surgical outpatient clinics? By J. SARVESWARAN, K.G. HEUSER, J. DICK, J. SCANTLEBURY and D. BURKE, *Department of Colorectal Surgery, Leeds General Infirmary, Leeds LS1 3EX, UK*

The British Association for Parenteral and Enteral Nutrition (2003; BAPEN) have developed the 'malnutrition universal screening tool' (MUST) to identify patients at risk of malnutrition. The National Institute for Health and Clinical Excellence (2006) has recently recommended its routine use. In a recent study on our general surgical wards we found that the majority of patients classified as high risk for malnutrition with MUST were from the upper gastrointestinal (GI) and colo-rectal specialities. The aim of the present study was to assess the use of MUST in the general surgical outpatients, in particular upper GI and colo-rectal, clinics.

Local ethical approval was obtained. Patients seen in the upper GI and colo-rectal outpatient clinics over a 2-week period were approached for the study. The MUST score was calculated for each patient. Patients who had received dietetic advice were identified from a prospective database.

A total of 225 patients, of whom 115 were male, were recruited into the study. The mean age was 56.4 (SD 16.5) years. Of the 225 patients, 176 had a low risk of malnutrition (78%). Medium risk was identified in sixteen patients (7%). High risk was identified in thirty-three patients (15%). Of those patients deemed high risk of malnutrition, only six (18%) had seen a dietician.

The MUST score, as recommended by BAPEN, is simple and quick to perform. These results are similar to a previous study conducted in the gastroenterology outpatient setting (Stratton *et al*. 2004). The present study highlights patients at risk of malnutrition who are clearly missed by current screening methods. We recommend the use of MUST in general surgery outpatient clinics.

British Association for Parenteral and Enteral Nutrition (2003) *'Malnutrition Universal Screening Tool' ('MUST')*. Redditch, Worcs.: BAPEN.
National Institute for Health and Clinical Excellence (2006) *Guidance for Nutrition Support in Adults: Oral Nutrition Support, Enteral Tube Feeding and Parenteral Nutrition*. Clinical Guideline no. 32. London: NICE.
Stratton RJ, Hackston A, Longmore D, Dixon R, Price S, Stroud M, King C & Elia M (2004) *British Journal of Nutrition* **92**, 799–808.