Proceedings of the Nutrition Society

Abstracts of Original Communications

A Scientific Meeting was held at the Telford International Centre, Telford, UK, 16–17 November 2005, when the following papers were presented.

All abstracts are prepared as camera-ready material.

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An economic assessment of perioperative oral nutritional supplements in patients undergoing elective moderate to major lower gastrointestinal surgery. By M. JAMES[1], E. STOKES[1], T. BOWLING[2], F. SMEDLEY[2], P. JONES[3] and D. SILK[4], [1]*Centre for Health Planning and Management, Keele University, Keele, Staffordshire, UK, ST5 5BG,* [2]*Department of Gastroenterology, University Hospital of North Staffordshire, Stoke-on-Trent, UK, ST6 6QG,* [3]*School of Computing & Mathematics, Keele University, Keele, Staffordshire, UK no postcode? and* [4]*Department of Gastroenterology and Nutrition, Central Middlesex Hospital, London, UK, NW10 7NS*

The aim was to determine whether oral nutritional supplements (ONS) improve clinical outcome in surgical patients and are cost efficacious.

The study was a two-phase prospective randomised controlled trial investigating the costs and effects of ONS administered pre- and post-operatively to patients undergoing elective moderate to major lower gastrointestinal surgery (Smedley *et al*. 2004). It ran at three centres in the UK, between October 1998 and March 2001. Patients were randomised to one of four groups: group CC (Control, Control) received no ONS, group SS (Supplement, Supplement) received ONS in both periods, group CS (Control, Supplement) received ONS only post-operatively, and group SC (Supplement, Control) only pre-operatively. Nutritional support comprised *ad libitum* Fortisip (Nutricia, Zoetermeer, The Netherlands). A health service perspective was taken in the measurement of costs and benefits from pre-admission to 4 weeks post-discharge. The costs were determined using a detailed ingredients-based approach. A patient-centred approach was used for enumerating resources and hence assigning costs rather than apportioning average cost data. Benefits were measured in terms of the number of major and minor complications (as defined by Buzby *et al*. 1988).

One hundred and seventy-nine patients were randomised (152 analysed). Cost savings in each ONS group over no ONS were about £300 per patient (NS). There were significantly fewer minor complications in CS and SS groups compared with CC. Compared with CC, all other groups have both a lower complication rate and lower costs – strict dominance in economic terms.

Group . . .	CC (*n* 44)	CS (*n* 35)	SC (*n* 41)	SS (*n* 32)
Supplementation costs (£)	0	53	37	99
Nursing tasks costs (£)	250	226	178	184
Procedures costs (£)	262	233	216	235
Drugs costs (£)	219	154	174	193
Hospital staff contacts (non-nursing) costs (£)	97	113	88	84
Ward costs (£)	1448	1277	1310	1129
Post-discharge costs (£)	342	268	282	365
Average total costs (£)	2618	2324	2286	2290
95% Bootstrap CI (£)	2272, 3181	2018, 2661	2050, 2566	2034, 2717
Total major complications per group	4	2	3	5
Total minor complications per group	30	13*	17	10*
Average no. of minor complications per individual	0.68	0.37	0.41	0.31

* $P<0.05$ *v.* CC (Bonferroni adjusted analysis).

This prospective study is the first that has addressed the economic validity of ONS in hospital and community practice. Savings were realised and the number of minor complications reduced in ONS groups. All ONS groups dominated the control group. ONS is a cost effective intervention in this group of surgical patients.

Buzby GP, Knox LS, Crosby LO, Eisenberg JM, Haakenson CM, McNeal GE, Page CP, Peterson OL, Reinhardt GF & Williford WO (1988) *American Journal of Clinical Nutrition* **47**, 366–381.

Smedley F, Bowling T, James M, Stokes E, Goodger C, O'Connor O, Oldale C, Jones P & Silk D (2004) *British Journal of Surgery* **91**, 983–990.

Food snacks or liquid oral nutritional supplements as a first-line treatment for malnutrition in post-operative patients? By R.J. STRATTON[1], G. BOWYER[2] and M. ELIA[1], [1]*Institute of Human Nutrition, University of Southampton, Southampton, UK and* [2]*Trauma and Orthopaedics Directorate, Southampton University Hospitals NHS Trust, Southampton, UK, SO16 6YD*

There is some controversy about whether additional energy-rich food snacks or liquid oral multi-nutrient supplements are the optimal first-line treatment for hospitalised patients at risk of malnutrition, and comparative trials are lacking (Stratton *et al.* 2003). The present randomised trial tested the hypothesis that energy and protein intake from liquid oral nutritional supplements (ONS) exceeds that from isoenergetic food snacks in post-operative patients at risk of malnutrition.

Fifty fractured neck of femur patients (age 82 (range 46–97) years; forty-two women and eight men; BMI 19 (range 12.5–26) kg/m^2) at risk of malnutrition (screened using the Malnutrition Universal Screening Tool ('MUST')) were recruited. Patients were randomised (stratified for malnutrition risk) to receive liquid multi-nutrient ONS (Fortisip; Fortifresh, Fortijuce, 1255 kJ (300 kcal)/carton) or isoenergetic, readily available food snacks (cakes, biscuits, puddings, 1255 kJ (300 kcal)/portion) *ad libitum* post-operatively. Compliance with ONS or food snacks was measured daily. Pleasantness and satisfaction ratings for each intervention were recorded regularly using 100 mm visual analogue scales (maximum pleasantness or satisfaction rating 100 mm).

ONS intake provided significantly greater energy (1427 (95% CI 1155, 1699) kJ) and protein (11.5 (95% CI 9.6, 13.3) g) than isoenergetic food snacks (679 (95% CI 414, 920) kJ; 1.9 (0.003, 3.1) g)) ($P<0.001$). Although there was a significant reduction in ONS energy and protein intakes during the 7 d post-operative period, they remained greater than the snack intakes throughout (see Table for significance).

	ONS – snack intake			
	Energy (kJ)*		Protein (g)*	
Post-operative day	Mean difference	95% CI	Mean difference	95% CI
1	1264†	736, 1791	13.6†	9.5, 17.7
2	895†	314, 1477	10.1†	6.2, 14.1
3	933†	464, 1402	11.1†	7.6, 14.6
4	628†	105, 1155	8.3†	4.6, 12.0
5	448	−59, 950	7.5†	5.0, 10.0
6	741†	205, 1276	8.9†	4.9, 12.8
7	331	−280, 941	7.9†	3.7, 12.1

* $P<0.04$, significant linear trend (day 1–7); repeated measures ANOVA.
† $P<0.02$ (ONS *v.* snack intake).

Pleasantness (81 *v.* 85 mm) and satisfaction (75 *v.* 79 mm) ratings for ONS and snacks respectively were not significantly different and did not change significantly during the post-operative period.

The present trial in hip fracture patients suggests that liquid multi-nutrient supplements are a more effective means of supplying energy and protein than isoenergetic food snacks in the early (7 d) post-operative period. Their impact on appetite, voluntary and total intake (macro- and micronutrients) and patient outcome remains to be assessed.

Acknowledgements: BAPEN Research Fellowship (R.J.S.), Southampton University Hospitals NHS Trust Research and Development, Wellcome Trust Clinical Research Facility, Southampton, Nutricia, UK.

Stratton RJ, Green CJ & Elia M (2003) *Disease-Related Malnutrition: An Evidence-Based Approach to Treatment.* Wallingford, UK: CABI Publishing.

Deprivation linked to malnutrition risk using the Malnutrition Universal Screening Tool ('MUST') in hospital. By R.J. STRATTON, C.L. KING, Y. TENG and M. ELIA, *Institute of Human Nutrition, School of Medicine, University of Southampton, UK, SO16 6YD*

Despite health inequalities and malnutrition being common in the UK (Department of Health 2001; Stratton *et al.* 2003), there has been little investigation of the association between poverty and deprivation and malnutrition in hospital patients. The present study aimed to assess whether malnutrition risk is related to the deprivation of the locality (geographic ward) patients are admitted from.

Malnutrition risk was assessed using the Malnutrition Universal Screening Tool ('MUST') and clinical outcome (mortality, length of hospital stay) recorded in 1000 consecutive admissions (age 71 (SD 19) years; BMI 25.6 (SD 5.4) kg/m^2) to medical (n 255), surgical (n 224), elderly (n 247) and orthopaedic (n 274) specialties. Malnutrition risk was related to the Index of Multiple Deprivation 2000 (IMD) (Department of Environment, Transport and the Regions, 2000) and its six component indices (see Table). Both the IMD and its six component indices are ranked from 1 (most deprived) to 8414 (least deprived) for each geographic ward (of which there are 8414) in England. The median IMD rank for this group was 3890 (601–8375). For simplicity, for this analysis, they were also categorised into quartiles of rank (quartile 1 (least deprived) to quartile 4, most deprived).

Patients with medium and high malnutrition risk (42%; n 420), who had poorer outcome in hospital (increased mortality (P=0.009), longer hospital stay (P=0.0005)) than low-risk patients, were admitted from areas with significantly greater deprivation (lower ranks) (IMD 3731 *v.* 3946; P=0.019). The prevalence of malnutrition risk increased significantly from 38% in the least deprived quartile to 49% in the most deprived quartile (odds ratio 1.59 (95% CI 1.11, 2.28)). The Table, which is based on a binary logistic regression model using quartiles of deprivation, shows that risk of malnutrition rose significantly with increasing quartile of deprivation (IMD) and with some of the component indices of deprivation (health deprivation and disability, income, employment).

	Malnutrition risk*		
Deprivation index	Odds ratio	95% CI	P value
IMD	1.144	1.021, 1.282	0.020
Housing	1.103	0.985, 1.236	0.091
Health deprivation and disability	1.128	1.006, 1.263	0.039
Income	1.145	1.021, 1.284	0.021
Employment	1.158	1.033, 1.297	0.012
Education, skills, training	1.065	0.949, 1.198	0.283
Geographical access to services	0.920	0.822, 1.028	0.141

* Binary logistic regression, adjusted for age and sex. Results represent the odds of malnutrition risk (medium+high *v.* low risk) for each increasing quartile of deprivation.

The present study highlights that hospitalised patients with malnutrition have poorer clinical outcome and are more likely to live in deprived geographic localities. Effective clinical and public health strategies are needed to tackle inequalities in deprivation that are associated with malnutrition and adverse clinical outcome.

Acknowledgements: Southampton University Hospitals NHS Trust R&D.

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What is the cost of a minor surgical complication to the health service? By M. JAMES and E. STOKES, *Centre for Health Planning and Management, Keele University, Keele, Staffordshire, UK, ST5 5BG*

Routine tasks associated with minor surgical complications contribute a small but frequent and substantial cost to the health service. The cost for a minor surgical complication is not readily available in the health service literature. We have previously shown that the provision of oral nutritional supplements (ONS) reduces the number of minor complications in moderate to major gastrointestinal surgery patients (Smedley *et al.* 2004). This two-phase prospective randomised controlled trial investigated the costs and effects of ONS administered pre- and post-operatively to patients undergoing elective moderate to major lower gastrointestinal surgery. It ran at three centres in the UK, between October 1998 and March 2001. The study compared patients receiving no supplements with those receiving nutritional support pre- and/or post-operatively. Nutritional support comprised *ad libitum* Fortisip (Nutricia, Zoetermeer, The Netherlands), a drink containing 6.3 kJ (1.5 kcal) and 0.05 g protein per ml. Given the information collected as part of the study, it was possible to explore the cost of a minor surgical complication.

Total health service costs were collected from pre-admission until 4 weeks post-discharge for each patient in the trial. The number of major and minor complications (as defined by Buzby *et al*. 1988) were recorded per patient over the same time period. Minor complications are conditions such as urinary tract infections and small wound or chest infections. Patients with any major complications or more than one minor complication were excluded from this analysis. All patient groups were considered together for this analysis. Average total costs were calculated for those with no minor complications and compared with those with one minor complication. It is assumed that the difference between these figures is the average cost of one minor complication.

Of 152 patients analysed in the study, twenty-two patients were excluded from this analysis. The Table below shows the average costs with and without a minor complication. The average cost of one minor complication is therefore £161.

	One minor complication (n 43)	No minor complications (n 87)
Average total costs (£)	2224	2063

While several assumptions have been made in arriving at this figure, it does provide a benchmark for managers in terms of the savings that can be realised from reducing complications. Minor complications are common following surgery. Although £161 is a relatively low cost, any intervention that reduces minor surgical complications, such as the provision of ONS, has the potential to realise cost savings. Further studies that seek to quantify the routine tasks associated with minor surgical complications, and hence their costs, are necessary to validate this finding.

Buzby GP, Knox LS, Crosby LO, Eisenberg JM, Haakenson CM, McNeal GE, Page CP, Peterson OL, Reinhardt GF & Williford WO (1988) *American Journal of Clinical Nutrition* **47**, 366–381.
Smedley F, Bowling T, James M, Stokes E, Goodger C, O'Connor O, Oldale C, Jones P & Silk D (2004) *British Journal of Surgery* **91**, 983–990.

Nutritional supplementation and hip fracture patients – implications for future research trials. By A. ASHWORTH, *Department of Nutrition and Dietetics, Torbay Hospital, Torquay, UK, TQ2 7AA*

Oral nutritional supplements (ONS) can offer significant benefits for fracture neck of femur patients, of whom up to 50% are at risk of malnutrition (Stratton *et al.* 2003). However, successive Cochrane reviews have concluded that the evidence for ONS is still very weak and that further research trials are required (Avenell & Handoll, 2005).

A pilot study was designed to compare the nutritional intake of orthopaedic patients supplemented with snacks or ONS. The present study had the approval of the local research ethics committee. Patients with a fractured neck of femur were recruited over a 10-week period. The initial exclusion criteria were: inability to provide informed consent; a short post-operative stay <7 d; other medical conditions; a low Malnutrition Universal Screening Tool (MUST) score. All patients who consented were screened for risk of malnutrition using the MUST. Patients of medium and high risk were randomly allocated to one of two groups; group 1 were offered two ONS daily (2510 kJ (600 kcal)/d); group 2 were offered ordinary snacks (2092–2510 kJ (500–600 kcal)/d). A dietetic assistant (DA) was recruited to assess the patients using the MUST, offer snacks or ONS and monitor food intake in order to assess both macro- and micronutrient intake. Over the 10-week study period ninety-five patients were assessed; however, only four patients were eligible for recruitment (see Table).

Reason for non-recruitment	Number of patients (*n*)
Low risk of malnutrition (MUST)	29
Confused or demented	23
Admitted to other ward not in study	11
Missed by DA due to annual leave or absence	14
Declined consent	4
Other medical condition	8
Other	2
Total number of non-eligible patients	91

The exclusion of confused patients is particularly relevant, as a correlation has been shown between cognitively impaired patients and risk of malnutrition (Ponzer *et al.* 1999). A second application to include confused patients was successfully made to the local research ethics committee, but there was insufficient study time remaining to influence recruitment. The DA found the MUST difficult to use due to practical issues of obtaining weights and heights in this population. Alternative measurements (i.e. ulna length and mid-upper arm circumference) were required to determine step 1 of the MUST, the BMI score.

Avenell & Handoll (2005) have recommended that future research trials in this area should be large, well powered and seek to be as inclusive of the patient population as possible. Trials should also stratify allocation of ONS and/or hospital diet according to nutritional status. The present pilot study highlights three main issues that should be considered to fulfil these recommendations:

(a) The importance of sufficient resources to maximise patient recruitment;
(b) The importance of including patients with cognitive impairment when applying for ethical approval;
(c) Alternative measurements may be required to determine step 1 of the MUST.

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Percutaneous endoscopic gastrostomy: an audit on the impact of a nutrition team on mortality rates. By S. NAIR, R. BADRELDIN, S. JOWETT and N.P. THOMPSON, *Department of Gastroenterology, Freeman Hospital, Newcastle upon Tyne, UK, NE7 7DN*

Percutaneous endoscopic gastrostomy (PEG) is the accepted method for long-term enteral nutrition (Stroud *et al.* 2003). This invasive procedure carries risk and is often performed in patients with significant co-morbidities. Previous studies have found an immediate mortality of 1% and 30 d mortality rate of up to 30% (Sanders *et al.* 2002). A recent confidential UK audit suggests concern in outcome of patients having a PEG insertion (National Confidential Enquiry into Patient Outcomes and Deaths, 2004). Nutrition teams may be useful to ensure appropriate case selection. The nutrition team comprises a gastroenterologist, nutrition nurse specialist and dietitian. The present audit assesses the 7 d and 30 d mortality of patients undergoing PEG insertion before and after implementation of the nutrition team.

Data were collected from the patient records of all patients undergoing PEG insertion in the Freeman Hospital (Newcastle upon Tyne, UK) over a 1-year period from March 1997 and a 2-year period, following introduction of the nutrition team, from March 2003. Indications for PEG were documented and mortality rates at 7 d and 30 d recorded. We performed χ^2 analyses.

The notes of fifty-two of the sixty-eight identified patients from the pre-implementation group and thirty-three of the thirty-five from the post-implementation group were retrieved and audited. Substantially fewer procedures were performed following introduction of the nutrition team with an annual rate of 17.5 compared with 68. In the 1997–8 group the main indications were cerebrovascularaccidents (CVA) 44%, ear, nose and throat (ENT) 21%, neuromuscular disorders 12% and others 23%. The 2003–5 group comprised CVA 70%, ENT 9%, neuromuscular disorders 3% and others 18%. No patients had a PEG inserted for end-stage dementia. Antibiotic prophylaxis was not routine in 1997–8; however, all patients received antibiotics in 2003–5.

The 7 d mortality was 6/52 (12%) in the pre-implementation group compared with 1/33 (3%) in the post-implementation group (NS). The 30 d mortality was 17/52 (33%) compared with 3/33 (9%) ($P \leq 0.025$).

Improved patient selection by the introduction of a nutrition team has led to a decrease in the number of procedures performed, increased use of antibiotic prophylaxis and a significant reduction in the 30 d mortality.

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Stroud M, Duncan H & Nightingale J (2003) *Gut* **52**, 1–12.

A local nutritional screening tool compared with the Malnutrition Universal Screening Tool (MUST). By K. GERASIMIDIS, P. DRONGITIS, L. MURRAY and R.F. MCKEE, *Glasgow Royal Infirmary, UK, G31 2ER*

It is widely acknowledged that many hospital patients are malnourished and BAPEN has developed the Malnutrition Universal Screening Tool (MUST) for use in identifying such patients. Quality Improvement Scotland has published standards for Food, Fluid and Nutritional Care in Scottish Hospitals and nutritional screening of all patients is mandatory. Our trust has been using a locally developed nutritional screening tool based on the Birmingham Heartlands Tool for some years. We were reluctant to abandon what was seen locally as good practice but this local tool had never been validated. The present study compares our local screening tool to the MUST in a group of hospital patients.

Two raters interviewed independently 202 patients (male *n* 112; female *n* 90; median age 64 (range 18–95) years) from a variety of acute hospitals and specialties (medicine, general surgery, orthopaedics, plastic surgery, oncology, geriatrics, rheumatology, gastroenterology, nephrology) in Glasgow, UK. Each investigator used a single tool with each patient, using each tool by turn. Investigators were not aware of each other's assessments.

Patients were assessed as at high risk (MUST score ≥2, 23.8%; local tool score ≥10, 34.2%), at moderate risk (MUST score 1, 18.3%; local tool score 6–9.9, 26.2%) or at low risk of malnutrition (MUST score 0, 57.9%; local tool score 0–5.9, 39.6%). The difference between the tools was greatest in surgery and in oncology.

Using the MUST as the gold standard, we calculated a sensitivity of 95.3% and a specificity of 64.9% for the local tool and the agreement between the two tools using κ-statistics was good (κ 0.57).

A further study in forty other patients who were interviewed by both assessors separately using the local tool evaluated its inter-rater reliability at substantial levels (κ 0.69).

Our local nutritional screening tool has been demonstrated to be very sensitive and reliable in identifying patients at risk of malnutrition in comparison with the extremely well-validated MUST tool. Further studies are needed to compare the local tool with more extensive dietetic assessment and to establish whether specificity requires to be improved.

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The impact of percutaneous endoscopic gastrostomy (PEG) feeding upon quality of life in adults. By A.M. BROTHERTON, J. ABBOTT and P. AGGETT, *University of Central Lancashire, Preston, UK, PR1 2HE*

The provision of enteral feeding via the placement of a tube continues to increase both in hospital and community with an estimated 20 000 individuals tube feeding at home (Elia *et al.* 2001). Very little work has been reported which formally measures the quality of life (QoL) of patients receiving PEG feeding. There are no known QoL assessment tools that have been developed and validated specifically for tube-fed patients. This may be due to the methodological difficulties in measuring disease- or condition-specific health-related QoL (Abbott *et al.* 1977; Abbott & Gee, 2003). The aim of the present study was to understand how the provision of enteral nutrition via a PEG impacts on the QoL of adult patients, from both the patients' and carers' perspectives by exploring the concerns and difficulties relating to PEG feeding and QoL.

A semi-structured interview approach was developed, containing both open and closed questions, to obtain participants' views and concerns of living with a PEG. The present study was a cross-sectional qualitative design employing purposive sampling. Thirty-four semi-structured interviews were conducted in total (fifteen adult patients and nineteen carers). Patients were excluded if they had been on continuous enteral feeding for less than 4 weeks. The patients' demographic (age and sex) details and feeding regimens were recorded. The interviews were transcribed and the dialogues for the questions analysed for each subgroup.

Of the patients, 87% were happy with their feeding regimens and no patients were experiencing difficulties administering the feed. Difficulties experienced by patients included vomiting (20%), diarrhoea (13%), infection of the PEG site (33%) and leakage (60%) and similar difficulties were reported by carers. Of the patients interviewed, 80% reported having an acceptable QoL compared with only 37% of carers providing 'by proxy' responses. Patients reported diverse responses to the impact of feeding on their daily and social lives ranging from the PEG feeding being totally disruptive to the PEG having no impact at all. Patients also reported experiencing a wide range of feelings towards the PEG feeding including feelings of depression, anger, frustration, relief and fear.

These data informed the development of a preliminary QoL assessment tool for PEG feeding which involved item generation, item reduction, response-scale generation and pre-testing for acceptability, feasibility and sensibility, and formatting the questionnaire. A research proposal has been developed to fully validate the preliminary PEG QoL tool for use in clinical practice.

The delivery of patient-centred care within PEG feeding should be based on appropriate patient selection, decision making and the setting of treatment goals, together with an evaluation of the patient's experience.

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Derived anthropometric indices – which should be used to assess nutritional status in children?

By H. McCARTHY, *Department of Nutrition and Dietetics, Central Manchester and Manchester Children's University Hospitals, Charlestown Road, Blackley, Manchester, UK, M9 7AA*

The use of anthropometric measurements as a means to quantify nutritional status in the individual is routine practice. In 1972, Waterlow proposed a classification system for protein–energy malnutrition in terms of % expected weight for height (wasting) and % expected height for age (stunting). Various authors have amended the calculation of these indices of undernutrition; three calculations have been identified from the literature (Waterlow, 1972; Moy *et al.* 1990; Hendrikse *et al.* 1997). In recent years the development of BMI reference ranges for children has led to this measure becoming more prevalent as a means of defining nutritional status, particularly in research studies (Cole *et al.* 1995; Prentice, 1998). The reliability of the calculation of these measures has been questioned (Poustie *et al.* 2000; Warner, 2000).

The purpose of the present study was to identify the level to which these calculations demonstrated agreement. Measurements of weight and height were obtained from 419 subjects (51% male, 49% female). The mean age of the group was 9.3 (SD 3.9) years (2.0–16.9 years). Three methods of calculating % weight for height (% wt for ht) were used, along with % BMI for age. Data were analysed using Spearman's rho, (ρ; non-parametric correlation).

	% Wt for ht (1)	% Wt for ht (2)	% Wt for ht (3)
%BMI for age	ρ=0.753	ρ=0.934	ρ=0.878
% Wt for ht (1)	N/A	ρ=0.905	ρ=0.424
% Wt for ht (2)	N/A	N/A	ρ=0.711

All correlations are significant at P<0.01 (two-tailed).

This demonstrates that the largest degree of correlation is between % BMI for age and the second version of the % weight for height (2) calculation. However, there is a large degree of correlation between all the derived indices, with the exception of % weight for height calculations 1 and 3. This suggests that of the other calculations, no one is preferable in clinical practice over the other methods. The deciding factors as to which of these calculations is the most appropriate for use is likely to depend on ease of calculation and degree of error in calculating. These are heavily influenced by the skill and experience of the user.

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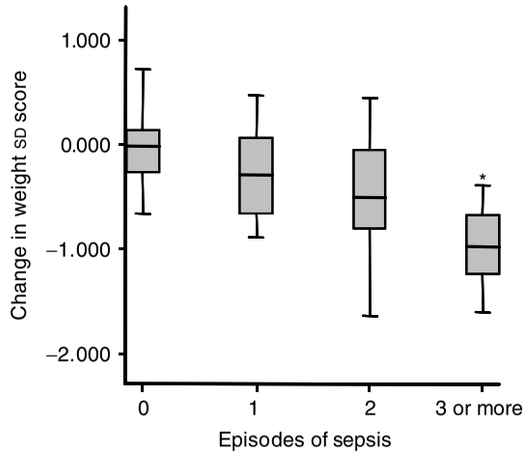
Growth of surgical neonates requiring parenteral nutrition is blunted by sepsis.

By E.G. P. ONG[1], S. EATON[1], A. PIERRO[1] and THE BAPS MULTICENTRE RESEARCH GROUP[2], [1]*Institute of Child Health, London, UK and* [2]*British Association of Paediatric Surgeons, London, UK*

Energy expenditure does not change during sepsis in infants. However, the energy required for tissue repair has been speculated to be diverted from growth. Our aim was to study the effect of sepsis on weight gain in surgical neonates less than 3 months old requiring parenteral nutrition (PN).

One hundred and two surgical neonates on PN were studied prospectively in a multi-centre randomised controlled trial. Age, sex, birth weight and gestational age were used to calculate weight SD scores using the revised British Growth Reference (1996). Weekly weights, energy intake (EI) and number of septic episodes were recorded during PN, and data were expressed as mean and SEM and compared by *t* tests or ANOVA with post-test for linear trend.

Forty-seven (46%) neonates had more than one septic episode. Eighteen (38%) of these neonates were blood-culture positive. Age, sex and birth weight were similar between septic and non-septic neonates ($P>0.05$). Septic neonates had a significantly lower gestational age (35.4 (SEM 0.4) weeks) than non-septic neonates (36.6 (SEM 0.4) weeks; $P<0.05$). Non-septic neonates grew along birth percentiles. There was a significant progressive decrease in SD score with number of episodes of sepsis (See Figure; $P=0.0002$), so that for each episode of sepsis, 0.14 weight SD score were lost. This did not appear to be due to lower EI, as septic neonates received significantly higher EI (360 (SEM 13) kJ/kg per d) than non-septic patients (326 (SEM 8) kJ/kg per d; $P<0.05$). In addition, septic neonates showed no significant difference in EI between septic (335 (SEM 21) kJ/kg per d) and non-septic (372 (SEM 17) kJ/kg per d) time periods or in percentage of energy from lipids (27 (SEM 2) *v.* 30 (SEM 2) %).



Despite significantly higher energy intake, sepsis has a negative effect on energy utilisation for growth. This supports the hypothesis of diversion of energy from growth to tissue repair and inflammatory response during sepsis in neonates.

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Use of multi-frequency electric impedance tomography (EIT) removes the need to add sodium to enteral feed when measuring gastric emptying. By C.T. SOULSBY[1], A. ROMSAUEROVA[2], R. YERWORTH[2], L. HORESH[2], D.F. EVANS[1], D. HOLDER[2] and J. POWELL-TUCK[2], [1]*Adult and Paediatric Gastroenterology, Bart's and The London School of Medicine, London and* [2]*Department of Medical Physics, University College London, London*

In previous studies (Soulsby *et al.* 2002) we have used a single frequency electric impedance tomography (EIT) system (Sheffield Mark I, 50 kHz; Sheffield, UK) to measure gastric emptying of enteral feed. Because the conductivity of enteral feed is similar to that of stomach tissue it was necessary to add 1 g Na/100 ml feed (17 mmol) to increase conductivity and create sufficient contrast to allow feed to be visualised. The aim of the present study was to investigate whether using a multi-frequency EIT system (UCLH Mark II; London, UK) to extend the range of measurement frequencies would allow feed to be imaged without addition of Na.

Three subjects attended following an overnight fast. The test meals were 0.9% saline, a highly conductive test meal and enteral feed (Nutrison Standard, Nutricia), which has low conductivity. Subjects drank the 400 ml of each of the test meals orally, and then each test meal was aspirated via the nasogastric tube. EIT images were taken using the UCLH Mark II which has thirty recording frequencies ranging from 2 kHz to 1.6 MHz. Using the image when the stomach was most full, the ratio of the signal within the region of interest (ROI) to the noise in the rest of the image the signal : noise ratio (SNR) was calculated. Test meal conductivity pre- and post-gastric placement was measured on a Hewlett Packard impedance analyser (Hewlett Parkard).

It was possible to image standard enteral feed without adding Na using the multi-frequency system. The frequencies with the highest SNR are shown in the Table.

	0.9% Saline	Enteral feed
Conductivity (per Sm^{-1})	1.67	0.56
Frequencies where SNR was highest (kHz)	64.0, 256.0, 322.5, 1290.2	2.0, 3.2, 4.0, 5.0, 6.4, 8.0, 10.1, 12.7
Mean SNR for best frequencies	4.73	4.06
Mean SNR for all frequencies	4.12	3.32

The higher the SNR, the better the image; thus the best frequencies for imaging enteral feed were those with the highest SNR. The measurement conditions that created this clear image were when the difference between stomach and test meal conductivity was greatest. The test meals had a constant conductivity whatever the measurement frequency. The conductivity of living tissue, such as stomach muscle, varies with frequency because at low frequencies current cannot pass through cell membranes but at higher frequencies it can. The range of stomach muscle conductivity is 0.5–0.75 Sm^{-1} (Gabriel & Gabriel, 2002) at frequencies from 2 Hz to 4 MHz. The use of the multi-frequency EIT system allowed enteral feed to be imaged because at the lower measurement frequencies there was sufficient contrast between stomach and feed conductivity.

Gabriel C & Gabriel S (2002) *Compilation of the Dielectric Properties of Body Tissues at RF and Microwave Frequencies.* www.brooks.af.mil/AFRL/HED/hedr/reports/dielectric/home.html
Soulsby CYE, Evans DF & Powell-Tuck J (2002) *Clinical Nutrition* **21**, 48.

Does introducing enteral tube feeding guidelines in an intensive therapy unit help patients meet their nutritional requirements? By J.L. McKINLAY and E.S. Y. WOOD, *Department of Nutrition and Dietetics, Aberdeen Royal Infirmary, Foresterhill, Aberdeen, UK, AB25 2ZN*

Intensive care patients are the most critically ill patients in hospitals, and often depend on artificial nutritional support by enteral tube feeding (ETF) to meet their nutritional requirements. Feeding ITU patients nasogastrically (NG) can be difficult because of delayed gastric emptying and the risk of aspiration pneumonia. Nutritional needs should be recognised early if they are to be met quickly and safely and NG feeds should be commenced at a reasonable rate and progressed promptly until full feeding is established.

Before December 2003 there was no consistent practice regarding ETF in our ITU and we were unable to find an ETF guideline for ITU. We conducted a literature search, reviewed local protocols and developed a guideline for our ITU. We conducted an audit of current practice against the guideline on all patients admitted to Aberdeen Royal Infirmary ITU in a 4 week period between January and February 2003 who required standard ETF (*n* 21). A teaching package was created and the guidelines were introduced in December 2003. A subsequent audit was carried out in a 6 week period between May and June 2005 (*n* 21) to establish if practice had improved.

The tables below demonstrate that post-guideline introduction, more patients met a higher percentage of the guidelines and as a result more patients met higher percentages of their calculated energy requirements as assessed by dietitians using the Schofield formula (Schofield, 1985). We concluded that introducing ETF guidelines on our ITU helped patients to better meet their energy requirements.

Table 1

% Guideline Met	Pre Guideline 2003	Post Guideline 2005
100%	3/21	3/21
>80%	9/21	19/21
>60%	13/21	20/21

Table 2

% Schofield Met	2003	2005
100%	0/21	2/21
>80%	3/21	6/21
>69%	7/21	15/21
<20%	4/21	0/21

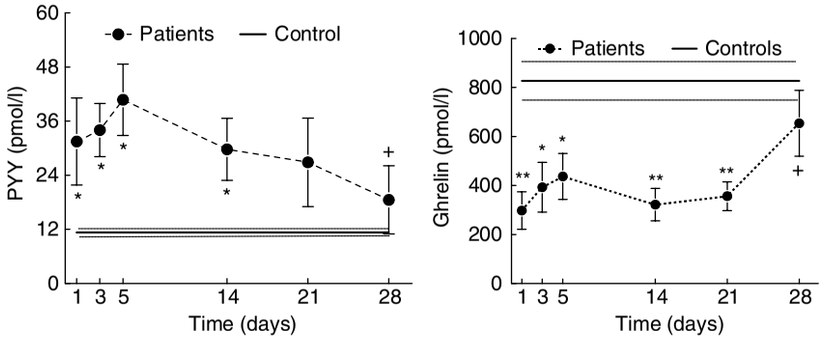
Schofield WN (1985) *Human Nutrition Clinical Nutrition* **44**, 1–19.

Role of gut hormones in acutely ill patients. By M. NEMATY[1], J.E. O'FLYNN[2], L. WANDRAG[2], A.E. BRYNES[1], S. BRETT[3] and G.S. FROST[1], [1]*Nutrition and Dietetic Research Group,* [2]*Nutrition and Dietetics, and* [3]*Division of Surgery, Anaesthetics and Intensive Care, Imperial College London, Hammersmith Hospitals NHS Trust, Du Cane Road, London, UK, W12 0HS*

The nutritional status in patients in the intensive care unit (ICU) appears to decline not only during their stay in the ICU but after discharge from the ICU. The deterioration in nutritional status during and after ICU management is not fully understood. Gut-released peptides, such as ghrelin and peptide YY (PYY) that regulate the initiation and termination of meals (Batterham *et al.* 2002; Cummings *et al.* 2002), could play a role in the altered eating behaviour of sick in-patients. The aim of the present study was to assess the pattern of ghrelin and PYY during the stay of ICU patients in hospital.

Eight patients aged 60 (SEM 4.7) years (BMI 28.1 (SEM 1.7) kg/m^2) admitted to the ICU underwent fasting blood sample collections on days 1, 3, 5, 14, 21, and 28 of stay or date of discharge home. Changes in appetite, biochemical and anthropometric markers of nutritional status were recorded. Three fasting blood samples at least 2 d apart were collected from the thirty-six age- and BMI-matched healthy volunteers (54.3 (SEM 2.9) years, P=0.3; BMI 25.8 (SEM 0.8) kg/m^2, P=0.2). The results of the ghrelin and PYY assays from control subjects (little day to day variation) were grouped together as a pseudo normal range of mean ± SEM. Column chromatography was performed and confirmed specific ghrelin- and PYY-like immunoreactivity.

As compared with healthy subjects, ICU patients exhibited a significantly lower level of ghrelin (day 1 297 (SEM 76.3) *v.* 823.4 (SEM 88.3) pmol/l; P<0.001) during their stay in the ICU and afterwards with a trend to rise to the normal level during the last 3 weeks of stay. Conversely ICU patients showed a significantly higher level of PYY (day 1 31.5 (SEM 9.6) *v.* 11.2 (SEM 1.6) pmol/l; P<0.05) throughout their stay in the ICU and ward with a downward trend to the normal level during the last 3 weeks of their stay. Energy intake was associated positively with percentage increase in ghrelin (from week 1 to-week 4) (r 0.9; P=0.048 (one-tailed); n 4) and negatively with percentage decrease in PYY (r −0.6; P>0.05; n 5).



* P<0.5; ** P<0.001; +P<0.5 v. d 1 for ghrelin and d 3 and 5 for PYY.

Results from our study show high levels of PYY and low levels of ghrelin compared to healthy controls. There may be a relationship between the level of these gut hormones and energy intake.

Batterham RL, Cowley MA, Small CJ, Herzog H, Cohen MA, Dakin CL, Wren AM, Brynes AE, Low MJ, Ghatei MA, Cone RD & Bloom SR (2002) *Nature* **418**, 650–654.
Cummings DE, Weigle DS, Frayo RS, Breen PA, Ma MK, Dellinger EP & Purnell JQ (2002) *New England Journal of Medicine* **346**, 1623–1630.

Macronutrient infusions have differential effects on ghrelin and peptide YY levels but do not acutely affect hunger and satiation in parenterally fed patients. By C.D. R. MURRAY[1], C. GOUVEIA[2], C. LE ROUX[3], A.V. EMMANUEL[1] and S. GABE[1], [1]*St Mark's Hospital, Watford Road, Harrow, UK, HA1 3UJ,* [2]*Imperial College, South Kensington Campus, London, UK, SW7 2AZ and* [3]*The Hammersmith Hospital, Du Cane Road, London, UK, W12 0HS*

Patients receiving parenteral nutrition (PN) often feel hungry despite adequate replacement of energy, and it is not clear whether this is associated in part due to differing response in the levels of peptides which have been implicated in the control of appetite and satiation. Ghrelin is an orexigenic peptide predominantly released from the stomach which may have a role in meal initiation with levels peaking preprandially and falling postprandially. Peptide YY (PYY) is an anorexigenic peptide released from the enteroendocrine L-cells of the distal gut with levels increasing postprandially, probably playing a role as a satiety factor. The present study investigates the effects of different intravenous macronutrients on ghrelin and PYY levels and whether any changes in these levels are associated with symptoms of hunger or satiation.

Six fasted medically stable patients (four males and two females; aged 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 either carbohydrate (10% dextrose), fat (10% Intralipid) or mixed protein and carbohydrate PN. Blood was sampled at baseline, 30, 60 and 120 min for glucose, insulin, PYY and ghrelin levels. Subjective assessments of appetite, hunger and satiety were assessed throughout each infusion with standardised description-anchored visual analogue scores. Changes in glucose, insulin, ghrelin and PYY levels, differences in treatment effects on these peptides and any associations between changes in peptide and glucose levels were assessed using linear regression analysis. Visual analogue scores over time were assessed by ANOVA.

Baseline ghrelin levels were 994.4 (SEM 249.2) pmol/l. Intravenous carbohydrate, and protein and carbohydrate infusions significantly decreased ghrelin levels (−22 (SEM 3.3) % and −22.7 (SEM 6.6) % respectively; P<0.001; 120 min) whereas lipid infusion had no effect on baseline ghrelin levels (+3.9 (SEM 12) %, P>0.05). Blood glucose (P=0.04), but not insulin level (P=0.08), was associated with the fall in ghrelin levels during dextrose infusion only. Baseline PYY levels were 18.9 (SEM 5) pmol/l. Lipid and dextrose infusion led to a significant decrease in PYY levels (−21.1 (SEM 7) % and −20.4 (SEM 9) %; P=0.004 and P=0.03 respectively; 120 min), which was associated during lipid infusion only with insulin levels (P=0.04). None of the infusions acutely affected subjective symptoms of hunger or satiety (P>0.05).

Intravenous macronutrients affect peptide levels associated with hunger and satiation differentially but do not acutely affect appetite and satiation. Blood glucose level appears to play a role in decrease in ghrelin levels during dextrose infusion only, suggesting that postprandial fall in ghrelin is mediated by hyperglycaemia only outside the physiological range. In contrast to oral macronutrients, intravenous dextrose and lipid decrease PYY levels, suggesting that the mechanisms involved in postprandial release do not involve absorption of nutrients.

Long-term subcutaneous fluid infusion in the management of intestinal failure – experience from two tertiary referral centres. By D.A. J. LLOYD[1], R.N. CUNLIFFE[2], A. POSTGATE[1], A. FORBES[1], T.E. BOWLING[2] and S.M. GABE[1], [1]*St Mark's Hospital, Watford Road, Harrow, UK, HA1 3UJ and* [2]*Clinical Nutrition Unit, Queen's Medical Centre, Derby Road, Nottingham, UK, NG7 2UH*

Subcutaneous fluid infusion is a technique usually associated with the treatment of dehydration in the elderly and terminally ill. Systematic review (Rochon *et al.* 1997) suggests that it is both safe and effective in this context. The technique has been described in the management of intestinal failure in only a single series of ten patients (Martinez-Riquelme *et al.* 2005). However, it has been used in other centres in patients able to absorb sufficient macronutrients but unable to maintain fluid or electrolyte balance.

Records from two tertiary referral centres were reviewed. In centre A, forty-two patients were treated with subcutaneous infusion of 0.9% saline ±Mg over a 10-year period. Sixteen of these (38%) required conversion to intravenous fluid administration (±electrolytes or macronutrients) within 3 months of starting and were judged to have failed treatment. Reasons for failure included intolerance (68%) due to discomfort, poor absorption or haematoma, dehydration (13%) and death from unrelated causes (6%). The remaining twenty-six patients (62%) were compared with twelve patients successfully treated in centre B.

Of the twenty-six patients successfully treated in centre A, twelve (46%) continued treatment for >12 months and four (15%) continued for >60 months. Median treatment duration was 10.5 (range 1–107) months. Treatment was discontinued due to dehydration (43%), corrective surgery (31%), no further requirement (13%) or death from unrelated causes (13%). A total of 20% of patients resumed exclusive enteral support, 15% required intravenous fluids ±electrolytes and 15% of patients required intravenous nutrition. Subcutaneous fluid infusion was ongoing in 38% of patients at the time of data collection. Median treatment length in centre B was 5 (range 2–46) months. Of the patients, 64% underwent surgical repair after a median of 3 (range 2–8) months and 84% were able to return to exclusive enteral support.

Logistic regression analysis was performed to investigate the effect of a range of variables including age, sex, BMI, diagnosis, small bowel length, gastrointestinal losses and infusion characteristics on likelihood of successful treatment. No statistically significant correlations were found. Of note, Mg infusion did not adversely affect outcome.

Subcutaneous fluid infusion is simple to perform and safe, especially when compared with long-term intravenous nutrition. Although not tolerated by all patients due to side effects such as discomfort, poor absorption and haematoma, in those successfully treated at both centres, adverse events were rare; four episodes of infusion site pain, two episodes of cellulitis and one episode of haematoma were recorded in over 24 000 d of treatment.

In conclusion, subcutaneous fluid infusion is a useful treatment modality in the management of patients with moderate intestinal failure both as a long-term measure to maintain fluid balance and as a bridge to definitive surgical treatment. It can be considered as a viable alternative to long-term intravenous fluid replacement and Mg supplementation in patients with high intestinal losses and overall negative fluid balance.

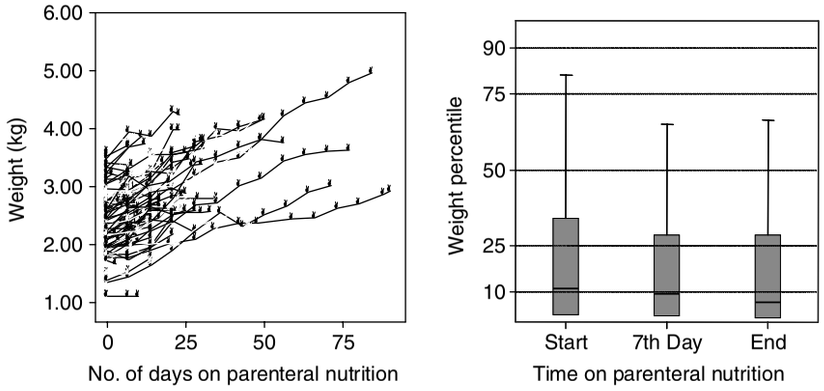
Martinez-Riquelme A, Rawlings J, Morley S, Kendall J, Hosking D & Allison S (2005) *Clinical Nutrition* **24**, 158–163.
Rochon PA, Gill SS, Litner J, Fischbach M, Goodison AJ & Gordon M (1997) *Journal of Gerontology* **52**A, M169–M176.

Are we underfeeding our surgical neonates on parenteral nutrition? By E.G. P. ONG[1], S. EATON[1], A. PIERRO[1] and *The BAPS Multicentre Research Group*[2], [1]*Institute of Child Health, London, UK and* [2]*British Association of Paediatric Surgeons, London, UK*

Adequate nutrition in surgical neonates is essential for tissue repair as well as normal growth and development. However, overfeeding can lead to excess hepatic lipogenesis, liver injury and increased respiratory load. Currently recommended total energy intake (EI) for the parenterally fed neonate is 418 kJ (100 kcal)/kg per d. Our aim was to examine adequacy of EI of surgical neonates (aged <3 months) on parenteral nutrition (PN) enrolled in a multi-centre randomised controlled trial.

Data were collected prospectively. Sex, gestational age and birth weight were used to calculate weight percentiles. Weight, parenteral and enteral intake were recorded at the start, at weekly intervals and at cessation of PN. EI (prescribed and actually given) was calculated. Results are given as mean and SEM, and were compared by *t* tests.

One hundred and two patients (fifty-three males, forty-nine females) of 36 (SEM 0.3) weeks gestation from thirteen hospitals were reviewed. Median time on PN was 16 (range 1–91) d. Although actual EI (339 (SEM 8) kJ (81.1 (SEM 2.0) kcal)/kg per d) was significantly less than prescribed (429 (SEM 11) kJ (102.5 (SEM 2.7) kcal)/kg per d; $P<0.01$), growth along birth percentiles was maintained (see Figs.).



Approximately 20% of prescribed EI is not received by the neonate. An EI of 335 kJ (80 kcal)/kg per d on PN is already adequate for growth along birth percentiles. Further studies are needed to demonstrate whether an additional 84 kJ (20 kcal)/kg per d would cause detrimental overfeeding or beneficial catch-up growth.

Is overweight and obesity a potential problem in the well HIV population? By N. BALACHANDER[1], M. PHILLPOT[2], S. MANDALIA[2] and C. GEISSLER[1], [1]*King's College London, 150 Stamford Street, London, UK, SE1 9NH and* [2]*Chelsea and Westminster NHS Trust, 369 Fulham Road, London, UK, SW10 9NH*

The initiation of highly active anti-retroviral therapy (HAART) in 1996 has increased the life span of HIV-infected individuals. UK treatment guidelines state therapy should be initiated when the CD4 count is between 200 and 300 cells/μl (Pozniak *et al.* 2003). HAART has now been associated with lipodystrophy syndrome, which is a combination of hyperlipidaemia, insulin resistance and fat redistribution syndrome. This may place HIV-infected individuals at even greater risk of diabetes, metabolic syndrome and CVD compared with the general population (Grinspoon & Carr, 2005).

An observational study was conducted in a London HIV clinic to identify the percentage of affected patients who are classed as overweight, obese or have an increased waist circumference (WC). Two hundred and one male HIV-infected patients were recruited consecutively between February and March 2005. Age, ethnicity, smoking status, weight-loss medication, and anthropometry were recorded from 159 patients on HAART and forty-two patients not treated with HAART. Serum lipid and glucose concentrations were obtained from patient records if available. No significant difference was found between the mean anthropometric measurements but there was a trend for a greater proportion of patients on HAART to have high BMI and WC values. Those on HAART had significantly higher levels of total cholesterol ($P<0.05$). There was also a trend for patients on HAART to have higher triacylglycerol and glucose levels.

	Number of patients on HAART		Number of patients off HAART	
	n	%	*n*	%
BMI 25–30 kg/m^2	33	20.8	5	11.9
BMI>30 kg/m^2	6	3.8	0	0
WC 94–102 cm	25	15.7	6	14.3
WC ≥102 cm	14	8.8	1	2.4
Total cholesterol>5 mmol/l	82*	54.3*	6	20.7
Triacylglycerols>1.69 mmol/l	95	62.9	15	51.7
Elevated glucose>6.1 mmol/l	34	22.8	3	9.7

Independent *t* test conducted on parametric data in patients 'on' and 'off' HAART. Significantly different from 'off' HAART: * $P<0.05$.
Mann–Whitney *U* test conducted on nonparametric data and a χ^2 test to examine the two distributions did not yield significant results.

In addition, 43.4% of HIV patients admitted to smoking, which is a well-known risk factor for CHD and stroke. This is greater than the percentage of male smokers (26%) in the general population (Petersen & Peto, 2004).

The present pilot study has shown that patients have the potential to develop the metabolic syndrome. As a result, health promotion events around exercise and diet to decrease the risks have been planned. Further studies could investigate blood pressure, which is a risk factor for metabolic syndrome and CVD.

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Petersen S & Peto V (2004) Smoking statistics. London: British Heart Foundation. http://www.heartstats.org/uploads/documents%5Csmoking2004.pdf
Pozniak A, Gazzard B, Anderson J, *et al.* (2003) *HIV Medicine* **4**, Suppl. 1, 1–41.

Experience of gastrostomy tubes placed within a head and neck unit between August 2003 and April 2005. By J.M. JEFFORD, L. COFFEY, P. WILLIAMSON, N. HYDE and P. NEILD, *St George's NHS Trust, Blackshaw Road, London, UK, SW17 OQT*

Patients with head and neck tumours often face significant problems with nutrition. This may occur as a result of the disease itself, or the treatment planned (i.e. surgery or radiotherapy; RT), and may necessitate placement of gastrostomy tubes for feeding. However, because of tight strictures, significant tumour bulk and risk of tumour seeding, it is sometimes necessary to use radiologically rather than endoscopically placed devices. Some studies (Neeff *et al.* 2003) have reported increased complications with the radiological approach. Further, in a recent National Confidential Enquiry into Patient Outcome and Death (2004) report it was suggested that 18% of gastrostomies were 'futile'. Thus we decided to analyse our experience at St George's Hospital, London, with the following aims: to report the number, and type of gastrostomies inserted; to assess the indications for insertion; and to record the complications, length of use and mortality associated with each approach. Data had been collected prospectively on all patients with head and neck tumours at St George's Hospital, who had gastrostomies inserted between August 2003 and April 2005.

Fifty-nine gastrostomies were inserted during this period, forty-four endoscopic (percutaneous endoscopic gastrostomy; PEG) and fifteen radiological (radiologically inserted gastrostomy; RIG).

	PEG (*n* 44)		RIG (*n* 15; 13 pigtail, 2 button)	
	n	%	*n*	%
Indications				
Dysphagia	20	45	15	100
Pre-operation or RT	24	55	0	0
Time used: average (d)	96		23	
range (d)	0–293		0–76	
Complications				
Peritonitis	0	0	2	13
Bleeding	0	0	1	7
Peristomal abscesses	4	10	2	13
Inadvertent removal	0	0	4	27
Total	4	10		50
30 d mortality	1	2	5	33

Pigtail RIGs were associated with less use, more complications and increased 30 d mortality. Interestingly, the button RIGs, albeit only two in this series, were in use for >70 d, and had no significant complications. This accords with published data (Funaki *et al.* 2000). Possible explanations for the increased morbidity and mortality in RIGs compared with PEGs in this group of patients include significant undernutrition at the time of insertion, late-stage disease and the design of gastrostomy device. The fact that 33% of patients with RIGs survived <2 weeks suggests that there may be a group of patients for whom gastrostomy insertion is inappropriate. These issues will be explored further as we also develop further experience with button RIGs.

Funaki B, Zaleski GX, Lorenz J, Menocci PB, Funaki AN, Rosenblum JD & Straus Leef JA (2000) *American Journal of Roentgenology* **175**, 375–379.
National Confidential Enquiry into Patient Outcome and Death (2004) *Scoping our practice. The 2004 Report of the National Confidential Enquiry into Patient Outcome and Death.* London: National Confidential Enquiry into Patient Outcome and Death.
Neef M, Crowder VL, McIvor NP, Chaplin JM & Morton RP (2003) *Australian and New Zealand Journal of Surgery* **73**, 590–593.

Percutaneous gastrostomy feeding in adult patients with cystic fibrosis: a 10-year experience. By E. MAHMOUDZADEH, S. LAL and A.K. WEBB, *Adult Cystic Fibrosis Unit, North West Lung Centre, Wythenshawe Hospital, Manchester, UK, M23 9LT*

Malnutrition is common in patients with cystic fibrosis and is associated with increased mortality (Kraemer *et al.* 1978). Improvements in nutritional status through supplemental feeding may lead to preservation of respiratory function (Williams *et al.* 1999).

The aim of the present study was to evaluate the impact of percutaneous gastrostomy (PEG) tube feeding on the nutritional status and respiratory function of adult patients with cystic fibrosis in a regional centre.

Pulmonary function, albumin, BMI, quality of life (QOL) scores and number of acute infective respiratory exacerbations of patients who received gastrostomy feeding between 1993 and 2003 were analysed before and for 1 year after PEG tube feeding. Data are expressed as means and standard deviations. Parametric data and non-parametric data were compared using paired *t* tests (with Bonferroni correction) and the Wilcoxon signed ranks test respectively.

Forty-three patients (mean age 27.7 (SD 8) years; twenty-five males) with severe malnutrition and lung disease underwent gastrostomy tube insertion. One patient required tube removal, 3 months after placement, due to persistent leakage. No other serious complications were reported. Within 1 year, one patient received a lung transplant and eleven patients died. In the remaining patients there was a significant increase in the mean BMI after 6 months of PEG feeding ($P<0.05$), which was not sustained at 12 months (see Table 1). There was no decline in lung function, albumin or QOL scores over the 1 year of PEG feeding. Patients with a low BMI (<18 kg/m^2) or poor pulmonary function (Forced Expiratory Volume in 1 second; FEV_1<30% predicted) at the time of PEG insertion suffered from a significant increase in acute infective respiratory exacerbations ($P<0.05$); those with a BMI>18 kg/m^2 or FEV_1>30% predicted did not (Table 2).

Table 1

	Pre-		3 months		6 months		12 months	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
BMI (kg/m^2)	17.8	1.9	18.1	1.8	18.4*	1.8	18.0	2.1
Albumin (g/l)	36.4	5.7	36.9	5.5	37.2	5.3	33.4	7.6
FEV_1 (% predicted)	32.3	16.3	30.0	15.6	29.1	15.7	30.3	16.6
Forced Vital Capacity; FVC (% predicted)	47.7	18.1	45.0	17.8	43.6	18.3	42.8	18.2
QOL score (/10)	6.34	1.7	6.44	2.0	6.85	1.8	6.03	1.5

* $P<0.05$ *v.* baseline.

Table 2

	1 Year pre-PEG		1 Year post-PEG	
	Mean	SD	Mean	SD
BMI<18 kg/m^2	4.30	3.2	9.89*	7.1
BMI>18 kg/m^2	6.33	4.6	7.71	7.1
FEV_1<30%	5.24	4.3	10.2*	7.7
FEV_1>30%	5.05	3.6	6.50	5.2

* $P<0.05$ *v.* baseline.

Gastrostomy tube feeding is well tolerated and associated with a stabilisation of nutritional status and respiratory function in adults with cystic fibrosis. Earlier gastrostomy feeding before severe malnourishment may lead to a reduction in infective exacerbations.

Kraemer R, Rudeberg A, Hadorn B & Rossi E (1978) *Acta Paediatrica Scandinavica* **67**, 33–37.
Williams SG, Ashworth F, McAlweenie A, Poole S, Hodson ME & Westaby D (1999) *Gut* **44**, 87–90.

Nutritional outcomes of total oesaphagogastric dissociation (TOGD): a 10-year review. By H. McCARTHY[1], R. LO PICCOLO[2] and A. MORABITO[2], [1]*Department of Nutrition and Dietetics,* [2]*Department of Paediatric Surgery, Central Manchester and Manchester Children's University Hospitals, Charlestown Road, Blackley, Manchester, UK, M9 7AA*

Malnutrition is a recognised consequence of gastro-oesophageal reflux (GOR) disease in children with neurological disability (Seddon & Khan, 2003). When dietary and medical interventions are ineffective in the management of GOR, surgical intervention, usually in the form of a fundoplication, is considered. In this patient group anti-reflux surgery carries with it a failure rate of 12–45% (Islam *et al.* 2004). In 1997 total oesophagogastric dissociation (TOGD) was described as an alternative option in children with neurological disability (Bianchi, 1997). As part of a 10-year retrospective review of patients who underwent a TOGD, pre-operative (pre-op) and post-operative (post-op) nutritional status was assessed.

A total of twenty-four children with neurodisability underwent TOGD; sixteen were 'primary' and ten had a 'rescue' procedure (for failed fundoplication). Weight at the time of surgery was recorded; subsequent weights were obtained for sixteen children from their local dietetic service. Nutritional status was defined using weight *Z*-scores; a *Z*-score of −2 SD was indicative of malnutrition as defined by the WHO (World Health Organization, 1995). There was an improvement in mean weight *Z*-score as demonstrated in the Table. Nutritional deterioration in two of the sixteen children related to complex social issues, rather than a recurrence of their GOR. Data were analysed using the Wilcoxon signed rank test (non-parametric paired data) with statistical significance demonstrated at $P\leq0.05$.

	Pre-op (*n* 16)		Post-op (*n* 16)		Pre-op (*n* 14)		Post-op (*n* 14)		Wilcoxon
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	signed rank
Weight *Z*-score (SD)	−2.32	−6.06, 1.45	−1.19	−6.32, 1.25	−2.53	−6.06, 1.45	−1.09	−4.19, 0.87	$P=0.005$
Weight *Z*-score ≤−2 SD	8/16		4/16		8/14		3/14		

It is clearly demonstrated that the majority of the children who underwent the TOGD were significantly malnourished at the time of surgery. This in itself carries a high morbidity. Following the surgery all children began to gain weight. Several of them are now receiving low energy intakes to maintain an appropriate weight gain. In addition there was no operative mortality and mean hospital stay was 10.9 d. Full gastrostomy feeding was established by the third to fifth day. Retching was shown to improve over time, resolving spontaneously by 12 months post-op. General health improvement was noticeable with weight gain; reduction in chest infections and hospitalisation episodes reduced significantly, resulting in an improvement in quality of life for the child and carers. Further comparisons with similar children undergoing fundoplication are now being considered.

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Bridle fixation of nasogastric tubes – the Addenbrooke's experience. By S. KARANTH, L. RUSSELL, N. TURNBULL, H. LAWRENCE, C. HAMES, J. BINNIE, S. COTTEE and J. WOODWARD, *Nutrition Support Team, Addenbrooke's Hospital, Hills Road, Cambridge, UK, CB2 2QQ*

Tube displacement is the 'Achilles' heel' of nasogastric (Ng) feeding, resulting in inadequate feed delivery or risk of aspiration due to partial dislodgement. Consequently, patients may be referred for alternative routes of feeding that incur significant additional risk in view of associated co-morbidity, or suffer the consequences of malnutrition.

A number of techniques have been used to secure Ng tubes. The simplest is a length of tape looped around the nasal septum and attached to the tube, thereby transferring any displacement force to fixed facial structures. This has been demonstrated to maintain position and ensure feed delivery (Popovitch *et al.* 1996), and in one small pilot study (Anderson *et al.* 2004) resulted in a 50% reduction of percutaneous endoscopic gastrostomy (PEG) requirements in dysphagic stroke patients. However, the technique applied (Anderson *et al.* 2004) was laborious, and uncomfortable for alert patients. A new method has been described that simplifies the placement of the Ng tube bridle – the 'AMT bridle' (Applied Medical Technology Inc. Cleveland, OH, USA). In the present paper we describe the initial experiences with this device in a teaching hospital unit.

Over a 7-month period (October 2004 to April 2005), sixty-one AMT bridles were placed in forty-three patients, most by nutrition nurse specialists. Patients were considered for a bridle if more than two Ng tubes were displaced within 48 h. Forty-seven bridles lasted more than 24 h (77%). Reasons for early failure included unsuccessful placement, removal at patient or family request, and gastrointestinal intolerance of feeding. A learning curve in placement is apparent with all eight unsuccessful placements occurring within the first twenty attempts. Since January 2005, all bridles have been placed successfully.

A wide variety of underlying conditions necessitated Ng feeding, of which thirteen (37%) were for cerebrovascular accident with dysphagia. Fixed Ng tubes were in place for 16.5 (range 2–47) d. Ten patients required more than one bridle, for various reasons including inadvertent removal, over-estimation of oral intake or tube slippage.

Fourteen patients died after a mean of 16.3 d feeding. Twenty-one patients survived to discharge (60%) after a mean of 16.8 d. Of these, fourteen resumed oral feeding, four underwent successful PEG placement and three were transferred with the fixed Ng tube in place. One patient is maintained at home with a bridle changed 6-weekly. Of the dysphagic stroke patients, eight survived longer than 2 weeks, of which only two required PEG placement.

One significant complication occurred, with overgrowth of granulation tissue in the anterior nostril.

In our experience, AMT bridle placement is a safe and effective method of securing the Ng tube in high-risk patients, the majority of whom survived to discharge. Given that no other route of feeding was available to these patients, this is likely to represent a significant survival advantage associated with this technique. Further modifications of the bridle are required to facilitate placement and prevent inadvertent tube displacement which can still occur.

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Guess my weight! An audit of hospital scales in ward areas. By L. RUSSELL, T. EDGEWAY, N. WOODRUFF, H. LAWRENCE, C. HAMES, S. COTTEE and J. WOODWARD, *Nutrition Support Team, Clinical Governance Department, Addenbrooke's Hospital, Box 201A, Hills Road, Cambridge, UK, CB2 2QQ*

Knowledge of a patient's weight is a fundamental requirement of appropriate nutrition support, constituting a key aspect of nutrition risk scores and often governing the appropriateness, the timing and the degree of intervention. In modern National Health Service hospitals, patients experience frequent ward moves and may be weighed on a number of different balances during their stay. It is essential therefore that the scales are accurate and the readings reproducible and transferable.

The present study was performed following a visit from the Trust Calibration and Service Contractor, responsible for the maintenance of scales on only certain wards. Over the course of a single morning, the majority of wards and acute areas in a single hospital trust were visited and weighing scales were inspected and tested with a standard weight (a member of the nutrition nursing team). Forty-three wards were visited and a total of seventy-two balances tested.

Six out of forty-three wards had no scales (14%).

Seven out of seventy-two scales were broken and unusable (10%).

Only forty-three out of sixty-five functioning scales recorded a weight within 0.5 kg of the mean (66%).

Two balances were extremely inaccurate reading +22% and +29% body weight respectively.

On two ward areas, different scales varied by more than 5% of body weight (7 and 22% respectively).

Twenty-two ward areas had received visits from the trust calibration contractor. There were two extreme outliers among these wards, and excluding these two scales, there was no difference between the mean weights recorded (54.84, 54.90 kg) nor the SD (0.81 *v.* 0.79 kg); $P=0.38$.

Clearly, inaccuracies are apparent in simple weight measurement in clinical areas and can be significant. The use of a calibration service appears to prevent statistical outliers but does not improve the variance in measurements, which produce 95% confidence limits of +/−1.5 kgs at the weight tested. Great care must be taken to ensure that the patient is weighed on the same scale wherever possible. As a result, measures that are being taken to improve the accuracy of scales in this trust include standardising manufacturers and models and regular maintenance of scales.

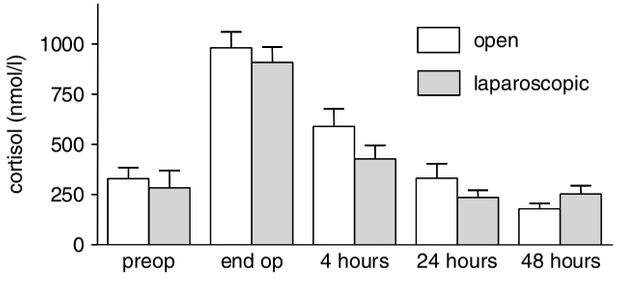
Endocrine response to laparoscopic compared with open surgery in children. By M. McHONEY, S. EATON, E.M. KIELY, D. DRAKE, A. PIERRO, *Institute of Child Health and Great Ormond Street Hospital, London, UK*

We performed a blind randomised controlled trial to assess differences in the endocrine response to laparoscopic and open surgery.

Thirty-five children undergoing Nissen fundoplication were randomised to laparoscopic (*n* 18) or open (*n* 17) surgery using minimisation for age, neurological status and surgeon. Intra-operative analgesia, post-operative analgesia and post-operative feeding were standardised. Blood samples were taken pre-operatively, immediately post-operatively, and at 4, 24 and 48 h post-operatively. Data are presented as difference (δ) from pre-operative values (mean and SEM).

Glucose rose (δ open 2.1 (SEM 0.6), δ laparoscopic 0.9 (SEM 0.5) mM) immediately after surgery in both groups ($P<0.05$), and subsequently returned to baseline. Insulin levels fell over time, reaching a nadir at 24 h (δ open −6.7 (SEM 2.7), δ laparoscopic −14.9 (SEM 3.8) mU/l), but this fall was only significant in the laparoscopic group ($P<0.001$). Insulin:glucose ratio fell in both groups, reaching a minimum at 24 h (δ open −1.3 (SEM 0.6), δ laparoscopic −2.8 (SEM 0.7)), but this fall was only significant in the laparoscopic group ($P<0.001$). There were no significant alterations from pre-operative values in lactate, adrenaline or noradrenaline. Cortisol levels rose immediately post-operatively in each group ($P<0.001$) and returned to baseline by 24 h (see Figure). There were no significant differences between open and laparoscopic groups with respect to post-operative levels of any of the above parameters.

Laparoscopic and open surgery in children induce a similar post-operative endocrine response. This randomised controlled trial does not support the concept that minimally invasive surgery is associated with a diminution of stress response compared with open surgery.



Percutaneous endoscopic gastrostomy activity at a district general hospital. How do we compare with national results? By M. WONG, S. TYE and D.S. ROWBOTHAM, *Queen Elizabeth Hospital NHS Trust, Stadium Road, Woolwich, London, UK, SE18 4QH*

Recent publication of the National Confidential Enquiry into Patient Outcome and Death (2004) report *Scoping our Practice* has highlighted areas of major concern regarding percutaneous endoscopic gastrostomy (PEG) procedures including patient selection, complications and mortality rates. In 19% of cases the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) advisors considered the PEG procedure to be futile. NCEPOD recommends that a multidisciplinary team should review all patients in whom PEG feeding is proposed.

In March 2004, our trust employed two senior gastrointestinal nurse specialists who developed, implemented and currently lead a pre-PEG assessment process incorporating multidisciplinary input. Data from this process are collected prospectively and audited. In view of the NCEPOD report, published in October 2004, we compared our own audit data with national results.

From March 2004 to May 2005 inclusive, seventy-eight patients were referred for PEG. Patient demography was comparable with the NCEPOD cohort (sex, age and co-morbidity). The main indication for PEG feeding was acute neurological disease (stroke or trauma) in 51.3%, also comparable with NCEPOD data. Following assessment fifty-four patients were accepted for PEG placement and twenty-four declined (inappropriate, clinically too unwell, patient refusal). Ongoing follow-up has identified thirteen deaths in the PEG group (24%). Mean survival for this subgroup was 51 (range 5–134) d after PEG insertion. Only one death (7.7%) occurred within 7 d of the PEG procedure (compared with 43% in the NCEPOD data).

In conclusion, the present audit shows that good results are not exclusive to tertiary centres of excellence. The Queen Elizabeth Hospital, a district general hospital, is performing favourably compared with available national data. The audit confirms that our current assessment and selection procedures for PEG requests, utilising the skill and experience of senior gastrointestinal nurse specialists, are appropriate and effective. We propose that all trusts utilise their available local expertise (nursing, medical, dietetic or any member of the nutrition team) to establish similar assessment processes for all PEG requests. This should ensure that patient selection is appropriate and may avoid unnecessary or futile PEG insertions.

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Home enteral feeding following oesophagogastrectomy for oesophageal carcinoma. By P.M. MURPHY[1], J. RAHAMIM[2], T. WHEATLEY[2] and S.J. LEWIS[3], *Departments of [1]Nutrition and Dietetics, [2]Surgery and [3]Gastroenterology, Plymouth Hospitals NHS Trust, Derriford, Plymouth, UK, PL6 8DH*

A high incidence of malnutrition and postoperative weight loss has been reported in patients with oesophageal carcinoma (Riccardi and Allen 1999, Daly *et al.* 2000). While jejunal feeding is frequently used to provide postoperative nutritional support it is rarely continued beyond the early postoperative stage. We examined the feasibility of continuing enteral feeding in this patient group following discharge and its effect on nutritional intake and body weight. Forty-four patients undergoing oesophagogastrectomy agreed to participate in the study. There were seven postoperative deaths. Six patients were withdrawn due to jejunostomy tube or feeding problems in hospital. Thirty-one patients (twenty-one males; ten females), median age 64 (range 37–83) years were discharged home with 500 ml Osmolite Plus (Abbott Nutrition, Maidenhead, UK) to be provided overnight via the jejunostomy tube. Patients were not malnourished pre-operatively. Median BMI was 27 (range 21–53) kg/m^2 and weight loss over the previous 3–6 months was 2 (0–20) %. At 4 weeks following hospital discharge the combination of oral intake and supplementary enteral feeding enabled 99 (range 41–162) % of estimated energy and 90 (range 44–144) % of estimated protein requirements to be met. Oral energy but not protein intake was higher (71% of requirements) compared with discharge (62% of requirements) suggesting that the supplementary feeding did not compromise daytime oral energy intake (P=0.02; 95% CI 0.63, 18.9). Body weight and BMI were lower 4 weeks following discharge (72 kg; 26 kg/m^2) compared with pre-operative (79 kg; 27 kg/m^2) despite supplementary feeding (P<0.0001). No major complications were found to be associated with enteral feeding. There were six minor complications (13%), represented by early tube displacement (n 3), tube blockage (n 1), tube leakage (n 1) and persistent diarrhoea (n 1).

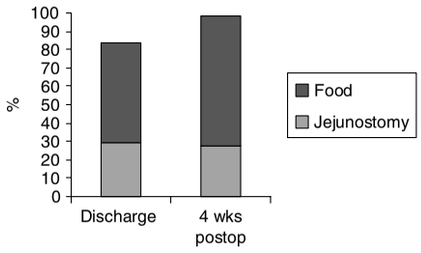


Fig. 1. Median percentage contribution of nutrient sources to energy intake.

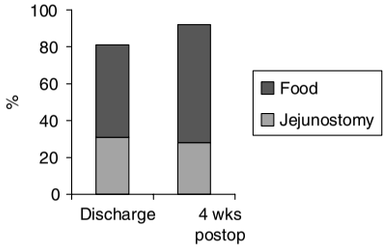


Fig. 2. Median percentage contribution of nutrient sources to protein intake.

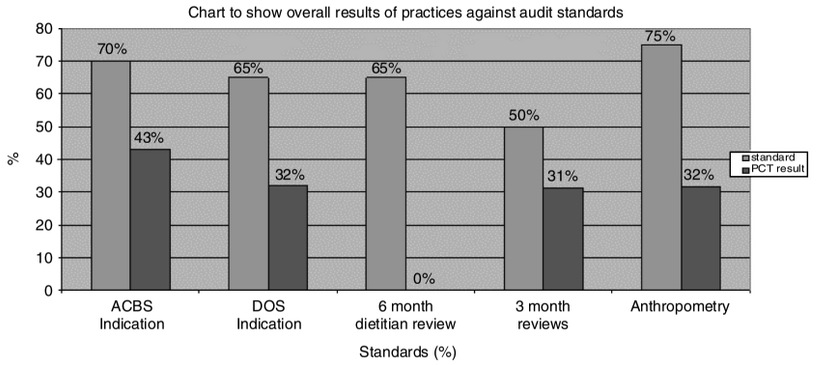
The present study suggests that home enteral feeding is safe and feasible in this patient group and can make a significant contribution to energy and protein requirements. Its effect on nutritional status and quality of life warrants further study before recommendations can be made.

Daly JM, Fry WA, Little AG, Winchester DP, McKee RF, Stewart AK and Fremgen, AM (2000) *Journal of the American College of Surgeons* **190**, 562–573.
Riccardi D and Allen K (1999) *Cancer Control* **6**, 64–72.

An audit of the prescribing of enteral sip feeds amongst general practitioner practices in Greenwich Teaching Primary Care Trust. By S.O. OLADIPO, *Pharmacy Team, Greenwich Teaching Primary Care Trust, 51–53 Burney Street, Greenwich, London, UK, SE10 8EX*

Malnutrition is an important public health problem in the UK (Malnutrition Advisory Group, 2000). Nutritional sip feeds have been shown to be of use in treating malnutrition (Stratton & Elia, 1999); in order to gain the maximal benefits from these products, however, there is need for careful monitoring by healthcare professionals both for reasons of improved patient care and financial effectiveness. This dietitian-led project was initiated as part of the pharmacy team action plan in an attempt to investigate appropriate prescription and usage of oral sip feeds in Greenwich. Within Greenwich Primary Care Trust (GPCT), the annual expense on these items was found to be 3 times the national average over the past 4 years. The objectives of the present audit were: to certify whether all patients on nutritional sip feeds have a clinical need for it by identifying inappropriate prescribing; to gain baseline data for trends in sip feeds prescription amongst general practitioner (GP) practices in GPCT; to investigate whether there is a system or guidelines in place for the prescription of sip feeds and methods for monitoring patients; to investigate patient understanding and compliance regarding the use of sip feeds.

Five audit standards & criteria were set to examine GP prescribing and monitoring of patients who were issued sip feeds over a 1-year period. Thirteen out of the fifty practices within GPCT were audited and a total of 215 patients' notes were examined.



Of the 215 patients, a small number was interviewed by the dietitian as a qualitative measure; this revealed a generally poor knowledge of the use of food in nutrition support and also the correct usage of sip feeds. A large proportion of these patients did not take the sip feeds regularly but gave them to family; friends; and even household pets. Some were noted to have no clinical need for them (i.e. not malnourished). Another striking finding was the hypoenergetic intake of elderly patients and their lack of willingness to increase energy using high fat foods for fear of hyperlipidemia or obesity. The overall results show that the practices audited are well below standards for complying with ACBS guidance for prescribing, patients are not being reviewed regularly whilst on sip feeds and those on long-term supplements are not referred to a dietitian. Weight and BMI, which are routine measures, are not being carried out. Improving nutritional status of patients has economic advantages to the primary care trust as well as health outcomes for the patient. It is therefore recommended that all staff involved in prescribing and/or recommending sip feeds in GPCT undergo practical training in the area of nutritional support, with a focus on the use of food and nutritional sip feeds, as well as screening for and monitoring those identified as malnourished. Following training and support, re-auditing is advised in approximately 9–12 months.

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Stratton RJ & Elia M (1999) *A Critical, Systematic Analysis of the Use of Oral Nutritional Supplements in the Community.*

The effectiveness of standard parenteral nutrition regimens in meeting calculated nutritional requirements. By S. ROBERTSON, C. GARVI, L. MURRAY, S. LEADBETTER and R.F. McKEE, *Glasgow Royal Infirmary, Glasgow, UK, G31 2ER*

The use of standard bags of parenteral nutrition rather than bags individually compounded for each patient is on the increase. We have examined the match of calculated nutrient requirements to our hospital's use of such bags in a two-phase audit.

In phase 1, two standard regimens were used in thirteen patients (three male, ten female; median age 37 years; range 42–78) with minimal assessment of requirements by the prescriber. A research dietitian assessed the patient's requirements without the knowledge of the prescriber and the N, energy, lipid and carbohydrate prescribed were compared with the calculated requirements using Wilcoxon signed rank tests. In phase 2 (twenty-nine patients; fourteen male, fifteen female; median age 53 years; range 27–79), the number of standard regimens was increased to three and the nutrition-support dietitian calculated requirements before prescription. Prescribed and calculated nutrients were compared similarly. Throughout the study diagnoses included inflammatory bowel disease, small bowel fistula and postoperative complications of gastrointestinal cancer surgery.

In phase 1 there was no significant difference between prescribed and calculated N. The amount of energy prescribed was significantly higher than the calculated requirements (P=0.03), mainly because of excess lipid. Nine of thirteen patients received prescriptions inappropriate in N and/or energy. In phase 2 there was no significant difference between prescribed and calculated N or energy. Seven of twenty-nine patients received prescriptions inappropriate in N and/or energy.

It is possible to achieve tolerable accuracy in parenteral nutrition prescribing using standard regimens. Formal calculation of requirements and increasing the number of regimens available will improve prescription accuracy.

Retrospective audit of peripheral parenteral nutrition via midlines: effect of omitting hydrocortisone and heparin in a new regimen. By L. BROWN, M. PATRICK, L. O'DELL, C. DAY, C. WHITE and A. COLE, *Derby Acute Hospitals NHS Trust, Derby City General Hospital, Uttoxeter Road, Derby, UK, DE22 3NE*

We have conducted a retrospective audit of the incidence of phlebitis and other complications of peripheral parenteral nutrition (PPN) administered by midline over the period 1 January 2001 to 31 December 2004. We have compared complications experienced following a change in formulation from one compounded with Aminoplex with additions of heparin (500 units/l) and 5 mg hydrocortisone/l (with additions group) to one compounded with Vamin (without additions group). Data for the present audit were collected prospectively by the nutrition nurse specialists on daily weekday ward rounds of in-patients having PPN.

Twenty-nine patients (median age 61 (range 24–81) years; 61% male) were treated using the with additions regimen for thirty-one patient episodes. Twenty-four patients (median age 59 (range 20–89) years; 69% male) were treated using the no additions regimen for thirty-two patient episodes. Indications for PPN included upper gastrointestinal malignancy (16%), inflammatory bowel disease (IBD; 11%), pancreatitis (13%), ileus post-operative (11%) and cystectomy (13%). Results comparing inserting practitioner, length of time fed and complications are shown in the Table. Overall, more complications were observed in our no additions group (P<0.001; χ^2 test).

		Additions group		No additions group	
		n	%	*n*	%
Line insertion	Registrar	28		11	
	Nurse specialist	1		16	
	Other	2		5	
Time fed	Median (d)	7		5	
	Range (d)	1–25		1–29	
Complications	Total	10	32	24	75
	Phlebitis	7	23	12	38
	Accidental removal	2	6	5	16
	Blocked line	0		3	9.3
	Extravasation	1	3	2	6
	Site infection	0		2	6

Our prospectively collected audit data has shown an increased complication rate with our current PPN practice. We suspect that this may be because of the lack of additions of heparin and hydrocortisone along with our change in formulation, but other factors may be involved such as the change in line insertion practice and changing patient populations administered PPN.

Percutaneous endoscopic gastrostomies are reservoirs of microbial contamination during nutritional treatment. By M. CAPLAN, L.T. TAN, P. JACKSON, J. BENDIG and A.G. LIM, *Epsom & St Helier NHS Trust, Epsom District General Hospital, Dorking Rd, Epsom, Surrey KT18 7EG*

Contamination of nutritional feeding systems constitutes a risk for weak and malnourished patients. Previous studies have examined the bacterial contamination of enteral feeding preparations and nasogastric tubes. No studies have evaluated the bacterial contamination of percutaneous endoscopic gastrostomies (PEG) *in vivo* (Bussy *et al*. 1992). We have prospectively studied the extent of contamination and the antibiotic susceptibility patterns in PEG feeding systems.

There were thirty consecutive patients (fourteen male; sixteen female) who were either hospital in-patients or in long-term residential or nursing care. The median age was 81.5 (range 44–92) years and all suffered significant dysphagia or malnutrition. The median time between initial PEG insertion and study time was 6 months. Samples of commercial feed and PEG wash samples were collected before and after overnight feeding. All samples were cultured and microbial counts and susceptibility patterns assessed.

Twenty-eight of the thirty (93.3%) feed samples collected after overnight feeding were contaminated. Two of the thirty (6.7%) feed samples taken before feeding were contaminated. Among the thirty PEG wash samples collected, twenty-six (86.7%) were contaminated. The organisms identified included enterobacteriae, staphylococci, candida, pseudomonas, citrobacter, lactobacillus and acinetobacter. The median concentration was 3.2×10^9 (range $1.2–8\times10^9$) colony-forming units/ml. Multi-antibiotic-resistant organisms (*Klebsiella pneumoniae*, *Escherichia coli*, *Acinetobacter baumanii* and *Staphylococcus aureus*) were identified in four patients.

We have found that sterile nutritional preparations become contaminated as they pass through PEG feeding systems. PEGs are likely to become infected at insertion or by hand transmission, as suggested by the large number of enterococci and Klebsiella found. In conclusion, PEG feeding systems are an important reservoir of micro-organisms including multi-antibiotic-resistant bacteria.

Bussy V, Marechal F & Nasca S (1992) *Journal of Parental and Enteral Nutrition* **16**, 552–557.

Stroke, dysphagia and percutaneous endoscopic gastrostomy: a retrospective analysis of patient outcomes. By J.A. MARSHALL and L.E. ROGERS, *Home Enteral Nutrition (HEN) Team, Lewisham Primary Care Trust, Elizabeth Blackwell House, Avonley Road, London, UK, SE14 5ER*

We present the results of a large multidisciplinary project tracking the clinical outcome of patients requiring percutaneous endoscopic gastrostomy (PEG) feeding post-stroke referred to a community home enteral nutrition (HEN) team. Data were collected retrospectively from the joint speech and language therapy and dietetic notes of all patients who were referred to the team over a 2-year period. Patients selected were those with a PEG due to a dysphagic stroke. The data generated were analysed for changes in swallowing and oral intake, and overall outcome.

There are little published data regarding the long-term outcome of dysphagic patients needing PEG feeding post-stroke; past publications have described single case studies (Rehman & Knox, 2000; Harper *et al.* 2001) or outcomes of larger patient cohorts (Wanklyn *et al.* 1995; James *et al.* 1998; Wijdicks & McMahon, 1999). No studies, however, have investigated the relationship between oral intake on discharge from hospital and survival.

A total of 136 patients were referred to the HEN team that met the criteria in 2003 and 2004. Of these, 61% were female and 39% were male. The mean age was 77 years and the mode average was 84 years. The mode average length of stay of patients from PEG placement to discharge from hospital was 1 week. On discharge, 75% of patients went to a nursing home and 25% to their own home.

The analysis period varied from 6 to 30 months from time of discharge from hospital. At the end of the analysis period, 48% of patients were alive (of which 5% had the PEG out), 3% had moved out of area and 49% had died.

On discharge from hospital, 66% of patients were not able to take any fluids orally, which then improved to 42% of patients still not taking fluids orally on last review. A similar trend was seen with diet, with 53% of patients not able to take any diet orally on discharge, improving to 27% still not able to take any diet orally on review.

Whether a patient was discharged from hospital able to take any fluids orally was a significant factor in determining their outcome. Of the patients who were totally nil-by-mouth on discharge from hospital, 59% died within the analysis period. In contrast, 35% of patients who were deemed able to take some fluids orally on discharge from hospital died. The same pattern was seen for patients able to take diet orally, although the significance level was less.

Although a large proportion of patients with PEG following a dysphagic stroke do not survive in the long term, a significant number of those who do show improvements with swallowing and make progress with their oral intake. These findings highlight the need for the continual review of swallowing status and nutritional requirements in patients following a dysphagic stroke by a multidisciplinary team.

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James A, Kapur K & Hawthorne AB (1998) *Age and Ageing* **27**, 671–676.
Rehman HU & Knox J (2000) *Dysphagia* **15**, 48.
Wanklyn P, Cox N & Belfield P (1995) *Age and Ageing* **24**, 510–514.
Wijdicks EF & McMahon MM (1999) *Cerebrovascular Diseases* **9**, 109–111.

Preventing malnutrition in elderly hospitalised patients by using food as treatment. By T. McDOUGALL[1], J. HANNAH[1], S. BARANIDHARAN[1] and R. WATSON[2], [1]*Departments of Nutrition and Dietetics and* [2]*School of Nursing, Hull and East Yorkshire Hospitals NHS Trust, Castle Hill Hospital, Castle Road, Cottingham, East Yorkshire, UK, HU16 5JQ*

The aim of the present study was to examine the effect of improving the nutrient content of hospital food and implementing some of the key targets of the government 'Better Hospital Food' (BHF) project on the nutritional status of elderly patients. There is increasing awareness of the importance of food as treatment in the hospitalised patient (British Association for Parenteral and Enteral Nutrition, 1999). Various studies have demonstrated that reducing portion sizes, increasing the energy density and increasing nutritional intake by 1700–2500 kJ (400–600 kcal)/d can improve nutritional consumption and weight in older patients (Olin, 1996; Gall, 1997; Stephen, 1997).

The study was case-controlled with a total of thirty-nine general medical patients of both sexes from six comparable wards. Twenty-three patients were allocated to an intervention group and sixteen to a control. The intervention group was provided with cooked breakfast, buffet lunch, frequent snacks and a tailored evening menu for the ward. The control group received the standard hospital meal provision. Body weight, mid-upper-arm circumference (MUAC), grip strength and food intake were measured for an average of 3 weeks in both groups.

The results showed statistically significant differences in the percentage of people who showed weight change ($P<0.01$) between the two groups. Of the patients in the intervention group, 74% gained weight (mean=0.5 kg) compared with only 31% in the control group (mean=0.3 kg). In addition, 56% of the control group lost weight (mean=1.1 kg) compared with 21% of the intervention group (mean=0.7 kg). There were no significant differences found for grip strength between the two groups. There was an increase in MUAC and nutritional intake but this was not found to be statistically significant. Use of nutritional supplements showed a significant reduction of 52% off-setting any expenditure due to changes in food provision. It appears that increasing the nutritional density of the hospital diet and adopting BHF standards can prevent weight loss and promote weight gain in elderly patients without any significant cost. Further work is still required to ascertain the role of protecting patients' meal times on this outcome. The present study supports findings from previous studies and demonstrates the clinical benefits to older patients of food as treatment.

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Stephen AD, Beigg CL, Elliot ET, Macdonald IA, Allison SP (1998) *The Proceedings of the Nutrition Society* **57**, 89A.

A re-audit of the effect of 'nil by mouth' instructions on patient behaviour. By C.A. BEST, J.E. KIMBLE and H.M. GORDON, *The Department of Gastroenterology and Nutrition, The Royal Hampshire County Hospital, Winchester, UK, SO22 5DG*

A previous 'nil by mouth' audit demonstrated that individuals were fasting inappropriately when attending for endoscopy and radiological investigations, some with symptoms of dehydration or hypoglycaemia (Best *et al.* 2004).

Subsequent recommendations were made to revise the written instructions provided to patients before their procedure, with specific direction on the duration of the 'nil by mouth' period and when they could safely eat and drink following their procedure. The present audit examined whether the recommendations of the earlier audit had been implemented and whether the duration of fasting was now both appropriate, and also asymptomatic. It was also decided to explore the information provided to in-patients awaiting a surgical procedure.

The study population comprised of forty-three patients, twenty-three attending for gastro-intestinal radiological procedures, fourteen for upper gastrointestinal endoscopy (all out-patients) and six in-patients awaiting a surgical procedure. All out-patients had been given clear written instructions, with their appointment. The information provided to endoscopic patients had been revised in line with recommendations but no updating had occurred in instructions provided to radiological patients. In-patients were provided with no written information.

Patients were then interviewed at the time of their procedure on their understanding of:

(1) the time that they had been asked to fast from;
(2) their actual times of last eating and drinking;
(3) whether they experienced any symptoms of hypoglycaemia or dehydration (hungry, thirsty, tired, headache, light-headed);
(4) when they could safely commence eating and drinking following their procedure.

	Instructed fasting time (h)		Actual time since eating (h)		Actual time drinking (h)	
	Median	Range	Median	Range	Median	Range
Ward-based Patients	12	12–72	12	12–72	12	12–72
Endoscopy patients	6	4–24	6	4–24	6	0–12
Medical-imaging Patients	6	3–23	6	3–36	6	0–36

Symptoms of dehydration were reported in twenty-five (58%) of all patients, nineteen (76%) of which were in the radiological group, four (16%) in the in-patient group, whilst 71% of endoscopy patients were aware when they could eat and drink following their procedure in comparison with only 48% of radiological patients and 0% of in-patients.

The re-audit shows that 'nil by mouth' instructions are now being followed in the endoscopy patients, but changes are still required in both the in-patient and radiological groups to optimise patient safety and comfort.

Best C, Wolstenholme S, Kimble J, Hitchings H & Gordon H (2004) *Nursing Times* **100**, 32–34.

Comparison of the Scottish Home Parenteral Nutrition Managed Clinical Network clinical standards for home parenteral nutrition and patients' experiences. By J.P. BAXTER[1] and R.F. McKEE[2], *The Scottish Home Parenteral Nutrition Managed Clinical Network, [1]Ninewells Hospital and Medical School, Dundee, UK, DD1 9SY and [2]Department of Surgery, Glasgow Royal Infirmary, Glasgow, UK, G31 2ER*

Measurement of patient satisfaction is an important dimension of healthcare, useful in assessing patterns of communication such as provision of information and involving patients in decision making. In 2002, the Scottish Home Parenteral Nutrition (HPN) Managed Clinical Network developed a quality assurance framework to allow audit of practice and outcomes and provide a basis for improving quality of care. This patient-centred audit assessed the network standards according to the patients.

A questionnaire containing forty questions was designed and distributed to HPN patients by post for self-completion.

Fifty-six questionnaires were distributed and forty-two returned (75%). Forty-two replies were returned; four (10%) by patients who had received HPN for <1 year; sixteen for 1–5 years (38%), eleven (28%) for more than 5 years and eleven (28%) for more than 10 years. Home delivery service was provided by a home-care company to twenty-six (62%), hospital pharmacy to fifteen (36%) and one 'other'. Four (10%) found the home-care arrangements 'unsatisfactory', five (12%) 'satisfactory' and thirty-three (78%) felt it was either 'good' or 'excellent'. Thirty-seven questions related to individual standards – nutrition team, communication, education and learning, discharge planning and follow-up. In thirty-four out of thirty-seven (92%), the respondents agreed that the standards were met, while three out of thirty-seven (8%) disagreed.

The present audit is the first patient-centred audit to be undertaken by the network. A very high response rate was encouraging. The majority of respondents had HPN for more than 1 year (90%) and so we feel they have had sufficient time to comment on their experiences. All standards were achieved. However, further data gathered showed that twenty out of forty-two (47%) felt that when they are admitted to hospital, ward staff does not have sufficient HPN knowledge. Fourteen out of forty-two (33%) felt they have to travel too far to clinic appointments and nine out of forty-two (21%) think that this travel represents a financial burden. As equity of access is a fundamental aim of managed clinical networking, this requires further investigation.

Malondialdehyde in plasma and exhaled breath condensate collected from ventilated infants. By F. MORINI, W. MULLER, A. JAFFÈ, M.J. PETERS, A. GOLDMAN, A. PIERRO and S. EATON, *Paediatric Surgery Unit and Critical Care Group, Portex Unit, Institute of Child Health, London, UK*

Malondialdehyde (MDA) is a product of lipid peroxidation and is considered a marker of oxygen free radical damage. The aim of the present study was to attempt to measure MDA in exhaled breath condensate (EBC) collected from ventilated infants and to use it as a marker of oxidative stress in the lungs of these patients.

MDA concentration was determined by HPLC in plasma and in EBC collected from seventeen ventilated infants with humidification. In eleven infants, blood was taken at the same time as EBC collection. Fraction of inspired O_2 (FiO_2) and FiO_2 multiplied by mean airway pressure (MAP) were recorded at the time of each plasma and/or EBC collection to estimate oxidative stress to the lungs, and correlated with MDA concentration.

The detection limit for breath condensate MDA was 0.0015 μmol/l. MDA was measurable in breath condensate in thirteen patients, but was below the detection limit in four patients. Median MDA concentration was 0.004 (range 0–0.022) μmol/l in EBC.

Median MDA plasma concentration was 0.375 (range 0.054–5.171) μmol/l in plasma. Plasma MDA concentration was significantly correlated with both FiO_2 (r^2 0.22; P=0.008) and FiO_2×MAP (r^2 0.22; P=0.007). Although we found a significant correlation between the concentration of MDA in plasma and in EBC (r^2 0.32; P<0.03), EBC MDA concentration did not correlate with either FiO_2 (r^2 0.0003; P=0.937) or FiO_2×MAP (r^2 0.01; P=0.637).

The present results suggest that MDA concentration in plasma correlates with oxidative stress of the lungs of ventilated infants. MDA can be measured in EBC collected from ventilated infants and correlates with MDA concentration in plasma.

Prospective 3-month audit of gastrostomy insertion in the Northern region. By S. WHITE, A. TORRANCE and K. MATTHEWSON, *Gastroenterology and Dietetics Departments, Newcastle-upon-Tyne Hospitals Trust, Newcastle-upon-Tyne, UK, NE1 4LP on behalf of the Northern Nutrition Network*

Gastrostomy insertion audit data are available from many individual units, both district general hospitals and tertiary referral centres, but there is little information giving the overall picture of practice in any large region supplied by many hospitals. The Northern Nutrition Network is a multidisciplinary group of individuals with an interest in nutrition representing sixteen different northern region hospitals who meet on a regular basis to promote standards of nutrition. The group performed a prospective audit of gastrostomy insertion in all seventeen hospitals using a standardised proforma. One individual from each hospital took personal responsibility for ensuring completion and return of the completed proformas. After the audit period a further examination of each endoscopy department records was made to identify any possible missed cases.

Gastrostomy insertions were audited between 1 December 2003 and 29 February 2004. During this period 157 gastrostomies were inserted (hospital range 1–26), of which 131 were inserted endoscopically and twenty-six radiologically. All hospitals undertook endoscopic gastrostomies and six both endoscopic and radiological gastrostomies. The reasons for the choice of technique were not requested on the proforma. Median patient age at insertion was 71 years (range 9 months to 92 years). The indications were neurological dysphagia in ninety-five (61%), an obstructing oral or upper gastrointestinal lesion in thirty-one (20%), learning disability or mental illness in seven (4%), poor nutritional state or general debility in seven (4%) and other indications in seventeen (11%). A total of 6% of insertions were for patients who had previously been gastrostomy-fed and then had a gastrostomy-free interval. Pre-procedure assessment involved a doctor in 68%, a specialist nurse in 34%, a dietitian in 46% and a speech and language therapist in 38% of cases. Gastrostomy insertion was successful in 97% of cases. A consultant was present at 87% of insertions and a nurse acted as assistant for endoscopic procedures in thirteen of the sixteen hospitals. Prophylactic antibiotics were used for 78% of insertions. Complications included wound sepsis in eighteen, chest infections in eight, mechanical tube problems in four and re-feeding syndrome in one. The overall number of wound infections was too small to correlate with the non-use of antibiotic prophylaxis. The 7 d and 28 d mortality rates were 4% (*n* 7) and 16% (*n* 25) respectively. Of the seven patients dying within 7 d of the procedure, three had developed chest sepsis and three had unspecified general deterioration leading to their death. There was a dedicated gastrostomy follow-up service in thirteen of the sixteen hospitals.

These data provide a snapshot of gastrostomy insertion practice in the Northern region. It could be used for the development of audit standards and to support the case for service development. Because the data were collected prospectively and continuously over a 3-month period from all units within this region, it is likely to give a more accurate picture of practice nationwide than would data from a single large specialised unit.

Management of nasogastric tube feeding in a district general hospital with particular reference to the British Society of Gastroenterology Guidelines. By J. GASEM, M. MURTHY and E. ROCHE, *Macclesfield Hospital, Macclesfield, UK*

In 2003 the British Society of Gastroenterology (BSG) published guidelines on the management of enteral feeding (British Society of Gastroenterology, 2003).

Our aim was to assess whether the recommendations of the BSG guidelines on nasogastric (NG) tube feeding are being followed.

A retrospective audit was undertaken in 2004 over a 6-month period, involving sixty patients ranging from age 18 to 98 years. The following data were recorded:

indication for insertion;
documentation of placement;
documentation of tube position post-insertion;
documentation of tube position before each feed;
documentation of feeding position, i.e. >30° propped;
referral to dietitian;
fluid balance, glucose and electrolytes monitoring;
complication rate and type;
outcome.

The indications for NG tube feeding were as follows: stroke (47%), poor oral nutrition (19%) and ventilated patients (34%). Only 40% of the patients had documentation of NG tube insertion in the case notes. The initial NG tube placement position was checked in 51% of the patients and only 20% had their feeding position documented. Only 2% had their NG tube position checked before each feed. Of the patients, 97% had a dietitian review. Fluid balance, electrolyte and glucose monitoring were documented in 73, 89 and 17% of the patients respectively. The overall NG tube-related complication rate was 57.6%. The majority of these were blockage and/or displacement of the tube requiring replacement. The overall feeding-related complication rate was 50.8%. The majority of these were aspiration (25%) and/or re-feeding syndrome (20%). By the end of the audit period 28% of patients resumed oral feeding, 46% died, 3% had percutaneous endoscopic gastrostomy tube insertion and 2% were discharged on long-term NG tube feeding.

We concluded that the BSG guidelines were poorly followed in this group of patients in a district general hospital setting. There was poor compliance with the guidelines.

British Society of Gastroenterology (2003) *British Society of Gastroenterology Guidelines.*

The impact of a specialist nurse on outcome of percutaneous endoscopic gastrostomy feeding – completing the audit cycle. By M. ALLEN, E. ROCHE and P. FOSTER, *Macclesfield District General Hospital, Macclesfield, Cheshire, UK, SK10 1QJ*

An audit of percutaneous endoscopic gastrostomy (PEG) feeding between 1998 and 2001 identified increasing demand for the procedure (69%) and a 30 d mortality of 25%. The mortality at 7 d was 10%. During this period patients were referred by clinicians in all specialties to a single gastroenterologist who provided the technical expertise. There was no systematic attempt to vet the requests. These results raised concerns about patient selection and the appropriateness of the procedure.

A specialist nurse was appointed to systematise the assessment of patients being considered for PEG feeding. The role involved coordinating speech and language, dietetic and medical assessments. A second audit was performed in 2004.

A total of 121 patients were referred for consideration of PEG feeding and eighty-six (71%) were accepted. The main reasons for not accepting the remaining thirty-five patients were: deterioration or frailty (45%); poor respiratory condition (34%); advanced dementia (14%). The mortality in this group is shown in Table 1.

Table 1

Mortality at	
7 d	14%
2 weeks	34%
4 weeks	76%

The high rate of early mortality seen among patients not accepted for PEG feeding suggests that these patients were being referred when nutritional support would be unlikely to have improved outcome.

The mortality in patients who received a PEG tube in the two different audit periods is shown in Table 2.

Table 2

Mortality at	1998–2001 (*n* 140 patients)	2001–2004 (*n* 82 patients)
7 d	10%	4%
30 d	25%	21%
1 year	58%	51%

All the 7 d mortality observed between 2001 and 2004 occurred in the first year and overall there was a reduction in this early mortality between the two audit periods.

We conclude that a specialist nurse with responsibility for the assessment of patients referred for PEG feeding can improve patient selection and reduce the numbers of patients undergoing the procedure inappropriately.

The use of the Malnutrition Universal Screening Tool (MUST) in liver clinics. By B.S. HÖROLDT[1], S.C. COOPER[1], J. NEUBERGER[1] and J. JOHNSON[2], [1]*Liver Unit and* [2]*Department of Dietetics, University Hospital (Queen Elizabeth) Birmingham NHS Foundation Trust, Birmingham, UK*

The Malnutrition Universal Screening Tool (MUST), having been validated, has shown much versatility in the National Health Service since its launch at the BAPEN 2003 meeting. The University Hospital Foundation Trust in Birmingham (UHB) is rolling the MUST out through all its departments, superseding other tools. The liver unit deals with a wide spectrum of disease severity, ranging from asymptomic patients to those with fulminant liver failure, and liver transplantation. Liver patients often face nutritional challenges in a different manner to other patients (ref OC 46).

The MUST was introduced to the medical hepatology clinic at UHB to assess its usefulness in this patient group. In the first week, the original MUST tool was used with subsequent review of all patients' notes to assess whether any liver patients at risk had been missed and which features these patients exhibited. During the second week the MUST was adapted, utilising the 'missed features' by adding three observations or questions:

(1) Is the patient jaundiced?
(2) Is there significant fluid overload?
(3) Requirement for admission due to severity of liver disease.

Fluid retention is a marker of advanced liver disease and the weight gain from fluid masks loss of lean tissue. Hepatocellular jaundice leads to maldigestion of fat-soluble vitamins, and reduced cutaneous vitamin D synthesis. Patients' notes were reviewed once more to observe for failure of the adapted tool.

During the first week the MUST identified twelve (of 180) patients at risk of malnutrition (five medium; seven high risk). By scoring one point each for gross fluid retention, significant jaundice and the need for admission twenty-six patients at risk of malnutrition were identified (sixteen medium risk, ten high risk). During the second week, twenty-one (of 150) at-risk patients were identified (eleven medium; ten high risk); the original MUST tool would have identified only seven patients. Notes review did not identify any further patients. Significant weight loss was found in 6.5 and 2.7% respectively during the first and second week. Five patients in both weeks required admission, mainly for paracentesis. Seven patients over the 2 weeks were found to be jaundiced, whereas nineteen patients had obvious fluid retention, mainly ascites. A large proportion of patients with significant obesity (in the absence of fluid overload) were also identified.

BMI (kg/m^2)	Week 1	Week 2	Comment
<18.5	1.1%	1.3%	Poor protein energy status likely
18.5–20	1.7%	1.3%	Poor protein energy status possible
20.1–25	20.6%	15.9%	
25.1–30	37.2%	41.1%	Increased risk of complications associated with chronic overweight
30.1–35	26.7%	15.9%	Moderate risk of obesity-related complications
>35	11.7%	32.5%	High risk of obesity-related complications

The MUST also highlights patients with increased BMI – in the context of liver disease obesity is an important problem in several patient groups; for example, non-alcoholic fatty liver disease, hepatitis C and post-transplant patients.

By adapting the MUST in this way, we have identified significantly more patients to be at risk of malnutrition than using the original MUST (Fischer exact test 0.0247). We acknowledge that by adapting MUST stage 3; we will be generating more referrals for nutritional intervention by special trained dietitians.

Cooper SC, Höroldt BS, Ryder L, Neuberger JM & Johnson J (2006) *Proceedings of the Nutrition Society* **65**, 23A.

Adaptation of the Malnutrition Universal Screening Tool (MUST) enables improved identification of liver in-patients at nutritional risk. By S.C. COOPER[1], B.S. HÖROLDT[1], L. RYDER[2], J.M. NEUBERGER[1] and J. JOHNSON[2], [1]*Liver Unit and* [2]*Department of Dietetics, University Hospital (Queen Elizabeth) Birmingham NHS Foundation Trust, Vincent Drive, Edgbaston, Birmingham, UK, B15 2TH*

The MUST is being phased in across the departments in the University Hospitals Birmingham NHS Foundation Trust. We have recognised on the liver unit that hepatology patients (medical) are often nutritionally challenged (ref OC 45). This may go unrecognised by the standard version of the MUST, as our in-patient population are often jaundiced (leading to fat-soluble vitamin malabsorption and impaired cutaneous vitamin D synthesis), have lean tissue weight loss masked by fluid overload (ascites and peripheral oedema), suffer with nausea or vomiting and diarrhoea or steatorrhoea and encephalopathy, leading to confusion and reduced intake. We aimed to identify, by adding up to four simple questions (scoring 1 each: jaundiced, ascites or oedema, nausea, vomiting, diarrhoea or steatorrhoea, and encephalopathy), how many more patients at risk of malnutrition would be identified.

Nineteen patients were assessed by the liver unit dietitians, and also by the ward nursing staff. Ten patients had additional points for jaundice, seventeen were fluid overloaded, eleven had nausea, vomiting, diarrhoea or steatorrhoea, and six were encephalopathic. The scoring system and action of the MUST is retained. The Table indicates the number of patient requiring action advised by the score for the MUST, and then for each liver additional question.

Action	MUST	MUST+fluid overload	MUST+jaundice and fluid overload	MUST+all four liver additions
Refer	7	11	15	18
Observe	4	8	4	1
Nil	8	0	0	0

We believe that by adapting the MUST, we will better identify patients during the screening process. Clearly, by asking all four questions, the screening tool is being saturated, and is no longer discriminatory. Fluid overload is the most important to add, as this indicates decompensation of liver disease, and also potential masking of lean body mass. The level at which jaundice should count is yet to be defined, but if clinically detected as part of the screening tool, it may be deemed to be valid. We aim to validate the elements of the scoring system.

Höroldt BS, Cooper SC, Neuberger J & Johnson J (2006) *Proceedings of the Nutrition Society* **65**, 22A.

Comparison of the Angus Nutritional Screening Tool with the Malnutrition Universal Screening Tool (MUST). By C. McKENZIE[1], C. AITKEN[2] and F. LYON[2], [1]*Nutrition Standards Project, Royal Dundee Liff Hospital, UK, DD2 5NF and* [2]*Stracathro Hospital, near Brechin, UK, DD9 7QA*

The MUST has been developed to allow accurate nutritional screening of patients. Quality Improvement Scotland (2003) suggests that the MUST would be an appropriate tool to use. Currently there are a variety of nutritional screening tools across NHS Tayside; therefore it is vital to standardise the process by determining the suitability of the MUST for use with the elderly population. The MUST was to be compared with the current tool in terms of outcome, referral rates and compared with subjective global assessment (SGA). The views of the staff on completion of the tool were to be examined.

All patients on a medicine for the elderly ward were included. Staff were trained on how to undertake the MUST, and then completed the MUST and the current Angus tool. The following day, two dietitians undertook the MUST and SGA. The patients were then screened again, 4 weeks later. Thirteen patients were recruited, with twenty-four sets of data being collected.

	Angus tool		Dietetic MUST		Nurse MUST	
Outcome	*n*	%	*n*	%	*n*	%
Low	6	25	12	50	13	54
Medium or needs monitoring	17	71	4	17	4	17
High	1	4	8	33	7	29

It is evident that the current tool places 71 % of patients into the needs-monitoring category. The dietitians and nurses were able to score patients into similar categories, with more patients being placed in the low- or high-risk category than the current tool. Referral rates could increase from one patient to seven to eight patients.

		Low risk		Medium risk		High risk	
SGA		*n*	%	*n*	%	*n*	%
Well nourished (*n* 13)	Dietitian	10	77	3	32	0	0
	Nurse	9	70	2	25	2	15
Moderately malnourished (*n* 6)	Dietitian	2	33	1	17	3	20
	Nurse	3	50	1	17	2	33
Severely malnourished (*n* 5)	Dietitian	0	0	0	0	5	100
	Nurse	1	20	1	20	3	60

The dietitians were able to categorise the well-nourished patients as either low or medium risk and all the severely malnourished as high risk. The nurses categorised two well-nourished patients as high risk, who were being enterally fed and two severely malnourished were classed as low or medium risk. The moderately malnourished patients were placed in a variety of categories. The MUST was deemed quick and easy to use by the nursing and dietetic staff. It is evident that when launching the MUST, training is vital to ensure accurate nutritional screening and hence nutritional risk. The MUST is deemed more accurate than the current tool in place.

Quality Improvement Scotland (2003) *Food, Fluid and Nutritional Care in Hospitals.* Edinburgh: QIS.

Assessing the nutritional status of children and adolescents attending a special needs secondary school. By H. McCARTHY[1] and J. CHEETHAM[2], [1]*Department of Nutrition and Dietetics, Central Manchester and Manchester Children's University Hospital NHS Trust, Hospital Road, Pendlebury, Manchester, UK, M27 4HA and* [2]*Food and Consumer Technology, Manchester Metropolitan University, Old Hall Lane, Fallowfield, Manchester, UK*

The clinical and financial implications of undernutrition have long been recognised (Leonard-Jones, 1992; Green, 1999). In recent years the chronic implications of overnutrition (obesity) in childhood have become more apparent (Lobstein *et al.* 2004). Children and adolescents with neurological disabilities are particularly at risk of malnutrition (in terms of both over- and undernutrition), for a number of reasons. This group of individuals already have complex health needs, and poor nutritional status can complicate the management of their condition.

As part of a 'health needs assessment' of young individuals attending a special needs secondary school, nutritional status was assessed based on anthropometric data and a feeding skills questionnaire. The present paper reports the results of the anthropometric data only. Weight and height or length was recorded and checked by two observers. These data were plotted onto the appropriate UK90, or disease-specific growth charts. BMI and percentage weight-for-height were calculated for each young individual. Cut-offs for under- and overnutrition were agreed before data analysis.

A total of sixty-four young individuals aged 12 to 20 years were assessed. The mean age was 15.41 years. The group consisted of thirty-nine males (60.9%) and twenty-five females (39.1%). The young individuals had a variety of diagnoses recorded. Of the sixty-four young individuals assessed, twenty-two (34.4%) were classified as severe learning disabled, and a further fourteen (21.9%) were classified as having cerebral palsy. The Table shows the results of the anthropometric assessment.

	Undernutrition		At risk of undernutrition		Acceptable		Overweight		Obese	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Weight for age (*n* 64)	23	36	8	13	23	36	6	9	4	6
% Weight-for-height (*n* 64)	21	33	11	17	15	23	3	5	14	22
BMI centile (*n* 64)	11	17	11	17	24	38	7	11	11	17
% BMI for age (*n* 63)	10	16	13	21	19	30	3	5	18	29

From the anthropometry alone it can be demonstrated that the majority of young individuals within this group are falling outside of the acceptable limits, regardless of the method used. Currently there are limited data in the literature that specifically address the nutritional status and needs of this age group. Therefore it is not possible to compare these outcomes with other centres. Additionally these data are compared with standard UK90 growth data. The question should be asked whether these are the best standards for assessing this group of young individuals.

Green CJ (1999) *Clinical Nutrition* **18**, Suppl. 2, 2–28.
Leonard-Jones JE (1992) *King's Fund Report*. London: King's Fund Centre.
Lobstein T, Baur L & Uauy R (2004) *Obesity Reviews* **5**, Suppl. 1, 4–85.
Child Growth Foundation (1996) *Growth Charts.* London: Child Growth Foundation.

Audit of nutritional guidelines for head and neck cancer patients undergoing radiotherapy. By K. WOOD, *Specialist Oncology Dietitian, Royal Free Hospital, Pond Street, London, UK, NW3 2QG*

Head and neck cancer patients being treated with radiotherapy are at an increased risk of malnutrition due to the severe side effects; for example, mucositis, odynophagia and xerostomia, impacting on the ability to eat and drink (Lees, 1997). Effective dietetic management involves identifying those patients malnourished or at risk of becoming so and incorporating nutritional intervention into their treatment plan (Lees, 1997). The use of gastrostomy tubes in this patient group has been shown to be acceptable (Lees, 1997; Magne *et al.* 2001). By placing them prophylactically, the aim is to prevent a disruption to treatment and avoid an unnecessary admission for feeding. The present audit was carried out to determine if the implementation of locally produced nutritional guidelines improved the dietetic management of this patient group.

A prospective audit tool was used to collect data on thirty-two head and neck cancer patients undergoing radiotherapy. Data were collected weekly during the course of treatment and compared with data from previous audits. Weight change was the nutritional outcome measured.

More patients underwent combined treatment (radiotherapy post-operatively or with concurrent weekly chemotherapy) when compared with previous audits. However, introduction of the guidelines appeared to contribute to an improvement in dietetic management, as fewer patients lost weight over the course of radiotherapy and there were no admissions for feeding. The presence of a dietitian at the multidisciplinary head and neck clinic improved access and communication and this is also likely to have contributed to the improved management.

The Table compares mean weight change and weight range according to mode of treatment.

	2003			2001		
Mode of treatment	Weight change (%)	Range (%)	*n*	Weight change (%)	Range (%)	*n*
Single (radiotherapy alone)	−2	+7.1 to −8.75	12	−2	+2.5 to −10	9
Multiple	−0.65	+9.2 to −7.7	19	−3.6	+5.6 to −12	20
Surgery and radiotherapy	+0.5	+8.8 to −2.8	10	−3	+5.6 to −8	11
Chemoradiation	−1.8	+9.2 to −7.7	9	−4.5	0 to −12	8

Introduction of the guidelines led to an improvement in the nutritional management of this patient group. Implementation may be more likely if a dietitian is present at the combined head and neck clinic.

Lees J (1997) *European Journal of Cancer Care* **6**, 45–49.
Magne N, Marcy PY, Foa C, Falawee MN, Schneider M, Demard F & Bensadoun RJ (2001) *European Archives of Otorhinolaryngology* **258**, 89–92.

Parenteral nutrition in the north of England. By S.A. HEARNSHAW[1] and N.P. THOMPSON[2] on behalf of the Northern Nutrition Network, [1]*Department of Gastroenterology, Sunderland Royal Hospital, Kayll Road, Sunderland, Tyne and Wear, UK, SR4 7TP and* [2]*Department of Medicine, Freeman Hospital, Newcastle-upon-Tyne, UK, NE7 7DN*

Parenteral nutrition (PN) is widely used to prevent or treat malnutrition. Guidelines recommend it should only be used when the intestine is unavailable or if intestinal function is inadequate (Pennington *et al.* 1996). Peripheral venous access should be used for the majority of patients requiring short-term PN. There is no evidence of clinical benefit if PN is provided for 4 d or less (Korzenik *et al.* 1995; Pennington *et al.* 1996). The present study is a 3-month prospective study of fifteen hospitals in northeast England looking at PN use.

We collected data from all PN patients in the northern region over a 3-month period to establish:

(a) number and characteristics of PN patients;
(b) type and duration of feed;
(c) why PN was discontinued;
(d) complications rates, mortality and cause of death.

Questionnaire surveys were completed by a member of the Northern Nutrition Network in every hospital for all in-patients receiving PN from 1 February 2005 to 30 April 2005.

One hundred and ninety-three patients (one hundred and seven male; eighty-six female) received PN (median age 66 (range 20–90) years) for 1708 patient PN days. The median duration of PN was 7 (range 1–93) d with nine patients on long-term home PN. A total of fifty-six patients (29%) received PN for less than 4 d. Of the patients, 50% were on critical care units, 36% on surgical wards and 14% on medical or other wards; 81% received PN via a central vein. A total of thirty-four patients (18%) received individualised PN feed, 82% receiving ready-made bags. Thirty-two patients (17%) had no evidence of unavailable or non-functioning intestine; eleven on medical wards, nine on surgical wards and ten on critical care units (two not recorded). Eighty-five patients (63%) returned to full enteral feeding and five continued on PN long term (data not available on fourteen). Twenty-eight patients (14%) had complications of PN for which six had their PN discontinued. Three had complications within 4 d of PN starting. The commonest complication was line infection (twenty-four patients, 12%), with thirteen occurring on surgical wards, six on critical care units and five on medical or other wards. Thirty-eight patients died within 28 d of PN starting, twelve deaths occurring within the first 4 d. Four out of thirty-eight had complications of their PN but none died as a consequence. Ten out of thirty-eight had no clear indication for PN.

The present study shows that the majority of our patients receiving PN have a clear indication for PN, have no complications and return to enteral feeding. PN on a non-critical care unit carries a higher risk of complications, with medical or other wards having a one in three risk of line infection from PN. Short-term PN (<4 d) was commonly used post-operatively but did not confer a higher risk of death or complication. More information is required on those patients who received PN inappropriately and clearer guidelines may reduce this and minimise risk of complications and unnecessary costs.

Korzenik J & Fisher RL (1995) *Current Opinion in Gastroenterology* **11**, 174–178.
Pennington CR, Fawcett H, Macfie J, McWhirter J, Sizer T & Whitmey S (1996) *Current Perspectives on Parenteral Nutrition in Adults; Working Party Report*. Redditch, UK: BAPEN.

Survey of consultant medical staff to determine the need for a quality of life questionnaire specifically for patients receiving home parenteral nutrition. By J.P. BAXTER[1], P.M. FAYERS[2] and A.W. McKINLAY[3], [1]*The Scottish Home Parenteral Nutrition Managed Clinical Network, Ninewells Hospital and Medical School, Dundee, UK, DD1 9SY,* [2]*Department of Public Health, University of Aberdeen, Aberdeen, UK and* [3]*Department of Gastroenterology, Aberdeen Royal Infirmary, Aberdeen, UK, AB25 2ZN*

The quality of life (QoL) of patients receiving home parenteral nutrition (HPN) has been studied to a limited degree (Winkler, 2005). Most treatment programmes have a goal of improving QoL, but there are no validated, treatment-specific, patient-based instruments routinely used to assess this. The aim of the present study was to determine if QoL is routinely measured in this patient population and if clinicians managing these patients feel there would be benefit in developing such an instrument.

Contact details of consultants managing HPN patients were obtained from the British Artificial Nutrition Survey (BANS). A questionnaire was distributed to consultants in the UK managing more than one HPN patient.

Twenty-six questionnaires were distributed and eighteen returned (69%). A total of 397 (median 8.5; range 2–135) patients were managed by these consultants. The professions of the consultants were fourteen (78%) gastroenterologists, two (11%) gastrointestinal surgeons and two (11%) consultants in biochemical medicine. When asked of their aims of providing HPN the most frequent reported aims were to maintain or improve QoL, prevent death, and maintain or improve nutritional status. Sixteen out of eighteen (89%) agreed that it is important to assess QoL, two out of eleven (18%) were uncertain but none disagreed. Fourteen out of eighteen (78%) did not routinely measure QoL. Sixteen out of eighteen (89%) said they were unaware of an existing HPN-specific tool and one thought that 'there might be one'.

Seventeen out of eighteen (95%) felt that there is a need to develop an HPN-specific instrument, and would use it for regular monitoring (72%), for occasional assessment (22%) or research and clinical trials (11%).

We conclude that there is a perceived need to measure QoL in this patient population although no treatment-specific instrument exists. The development of such an instrument would potentially enhance the care of HPN patients when used for routine clinical monitoring and in research.

Winkler M (2005) *Journal of Parenteral and Enteral Nutrition* **29**, 162–170.

Longitudinal trends in quality of life after starting home parenteral nutrition: a randomised controlled study of telemedicine. By A. CHAMBERS[1], E. HENNESSY[2] and J. POWELL-TUCK[1], [1]*Institute of Cell and Molecular Science, Adult and Paediatric Gastroenterology and* [2]*Wolfson Institute of Preventive Medicine, Barts and the London School of Medicine and Dentistry, London, UK, E1 2AD*

Though several studies have defined quality of life cross-sectionally in patients on home parenteral nutrition (HPN), longitudinal studies over time are lacking. We have sought to define and quantify longitudinal changes in quality of life (QoL) at the time of first discharge home on HPN and over the first year. We compared results in patients in standard contact with a nutrition nurse specialist (NNS) by telephone, with results of those in contact via telemedicine in a randomised controlled trial.

Participants were recruited from nine UK HPN centres. Patients were randomised to receive telemedicine upon initial discharge or after 1 year. The SF36 was the principal instrument chosen to determine QoL throughout the year on three predetermined occasions. EQ5D and hospital anxiety and depression (HAD) scores were also recorded.

Thirty participants were recruited to the study from March 2001 to June 2003. In all domains, QoL scores were significantly lower than normative data at discharge. QoL scores significantly improved over the first 6 months in physical functioning, role-physical (RP), social functioning (SF), role-emotional (RE) domains, and mental component summary (MCS). At 6 months RE, MH and MCS were no longer significantly lower than normative data. There was no significant change in bodily pain (BP), general health, mental health (MH) and physical component summary.

Opiate use significantly reduced SF36 domains RP, BP, VT, SF, MH and MCS at 6 months and was associated with more subsequent in-patient episodes and central line reinsertions.

Patients with an acute onset of intestinal failure had less pain and better general health scores at 6 months, and had fewer in-patient episodes after discharge than patients with a more chronic onset.

Telemedicine had no impact on the wellbeing or subsequent outcome.

Impact of the nutrition support team on catheter-related infection. By A.L. JUKES, A.B. HAWTHORNE, A.M. ABDOOLLA, S. HARWOOD and W.N. MAGAMBO, *Nutrition Support Team, University Hospital of Wales, Cardiff, UK, CF14 4XW*

Within 2 years of the introduction of the nutrition support team the usage of parenteral nutrition (PN) had been reduced by 70%. This reduction has been sustained as previously reported (Jukes *et al.* 2004). The aim of the present review was to determine the effect of redefining the role of the nutrition nurse, and the introduction of designated ward areas in medicine and surgery. To quantify the incidence of catheter-related infection (CRI), data were collected over a 12-month period (February 2004 to January 2005) and compared with that previously collected over a 5-month period (June 2003 to November 2003).

In 2003, there were twenty-three central lines used for PN in thirteen patients (eight tunneled; fifteen multi-lumen), in general surgery and medicine. PN was stopped and the line removed due to suspected CRI in fourteen lines (61%). Microbiology results suggest there were six (26%) proven and eight (35%) suspected CRI in non-specialist areas. These data exclude peripheral lines and specialist areas (critical care, nephrology and haematology).

		Number of proven CRI		Number of suspected CRI	
Clinical ward areas	Number of central lines	*n*	%	*n*	%
Non-specialist 2003	23	6	26	8	35
Non-specialist 2004	52	11	21	7	13.5
Specialist 2004	97	3	3	8	8
Overall 2004	149	14	9	15	10

During the 12-month period, 151 PN referrals were received (67% of which received PN). There were 101 episodes of PN in ninety-one patients. All but one episode was within a designated or specialist area.

A total of 170 lines were used for PN: 149 central lines (*n* 34 tunnelled; *n* 114 multi-lumen; *n* 1 Peripherally inserted Central Catheter (PICC)) and twenty-one peripheral lines. PN was stopped and the line removed due to suspected CRI in twenty-five of 149 lines (17%). Microbiology results suggest there were fourteen proven (9%) and fifteen (10%) suspected CRI in central PN lines. Higher incidences of CRI were seen in surgery and critical care where 58% of PN and 68% of lines were used. The overall number of central lines removed due to suspected CRI was reduced from 61% to 17%. The actual incidence of proven CRI has reduced from 26% to 21% in non-specialist areas and overall to 9%. The incidence of suspected CRI has reduced from 35% to 13.5% in non-specialist areas, and overall to 10%.

Although there are limitations in the data comparison, there appears to have been a considerable reduction in CRI, as a result of designated PN ward areas and redefining of the nutrition nurse role.

Jukes AL, Hawthorne AB, Wright JB, Abdoolla AM & Harwood SJ (2004) *Proceedings of the Nutrition Society* **64**, 11A.

A survey of home enteral tube feeding (HETF) practice across the UK. By J. PARKES[1], L. PETTIFER[1] and T. BOWLING[2], [1]*Department of Dietetics and* [2]*Gastroenterology, Queens Medical Centre, Nottingham, UK, NG7 2UH*

Recent British Artificial Nutrition Survey data indicate nearly 17 000 adults are enterally tube-fed in the community in the UK. There are, however, no data on how feed is actually administered.

A questionnaire was devised and sent to 228 dietetic departments in acute hospital trusts in the UK enquiring about home enteral tube feeding (HETF) practice.

The number of questionnaires returned was sixty-six (29%). A further eleven (5%) dietitians responded but were unable to complete the questionnaire because of lack of data collection.

The median number of patients looked after by HETF dietitians was sixty (range 6–147). Of the patients, 74% were pump-fed only, 23% by bolus only and 3% by a combination of the two. Of the dietitians, 88% fed most of their patients by pump, and 10% mainly by bolus. The reasons for such practice are in the Table.

Reason	Pump (%)	Bolus (%)
Carer preference	18	8
Nursing home preference	13	8
Patient preference	20	17
Patient was discharged from hospital on the method	11	4
Most practical way of meeting requirements	18	21
Encourages oral intake	8	13
More physiological method	1	8
Clinical reasons	9	17
Other	1	4

For pump-fed patients, 98% of dietitians used pre-filled, ready-to-hang packs as their first choice of feed presentation, usually because there was less risk of microbial contamination. Only three dietitians used glass for some of their patients. Rates of diet infusion ranged from <50 to >200 ml/h, with the majority between 50 and 150 ml/h. Risk of aspiration and minimisation of pump time were the main reasons cited for low and high rates respectively. A typical dietitian would feed 54% of patients overnight, 33% during the day, 8% intermittently and 4% over 20–24 h. Overnight feeding was mainly chosen to encourage oral intake and allow pump freedom during the day; daytime feeding when there were concerns regarding the patients' position during feeding; intermittent feeding was usually patient preference; and prolonged 20–24 h feeding was mainly for those intolerant of feeds over shorter periods.

For bolus feeding, 80% of respondents used 200–220 ml, with delivery time ranging from 6 s to 30 min. Of these respondents, 60% used gravity syringe feeding alone; reasons cited were that it caused less gastrointestinal upset (30%), patient or carer preference (30%) and local policy (20%). The remainder used the plunger to deliver feed via the syringe. Of the dietitians, 68% used tetrapaks as their main choice of presentation, mostly because of the ease of use and convenience of the volume (200–220 ml). Thirteen percent routinely used a range of presentations, depending on product. One dietitian reported using glass for all of their bolus-fed patients for 'historical reasons', despite being aware of the microbial contamination risks involved.

The small number of respondents made it difficult to draw conclusions, but we are able to say that there is a lot of variation in HETF practice in many areas. We suspect this variability would have been even more obvious with a higher response rate.

As a result of the present study and comments made by many of the dietitians, there is a clear need for more rigorous data collection, preferably with a standardised database. There is also a need for the establishment of an interest group for HETF dietitians to facilitate communication and sharing of best practice and audit etc and to minimise the feelings of professional isolation that many feel.

Home parenteral nutrition (HPN) patients – a constantly changing group. By J.P. BAXTER[1] and R.F. McKEE[2], on behalf of the Scottish Home Parenteral Nutrition Managed Clinical Network, [1]*East Block, Ninewells Hospital, Dundee, UK, DD1 9SY and* [2]*Department of Surgery, Glasgow Royal Infirmary, Glasgow, UK, G31 2ER*

Many previous publications about home parenteral nutrition (HPN) have described groups of patients who are managed by a single specialist centre (Williams *et al.* 1994; Messing *et al.* 1999). These reports have given the impression of a relatively stable population of long-term HPN patients. The Scottish Home Parenteral Nutrition Network has been active for 5 years and provides a unique picture of HPN throughout the population of Scotland. Our impression has been of a continually changing group of patients across the country. Our data collection now enables analysis of this group over 5 years.

All HPN centres in Scotland have been collecting data prospectively since January 2000. Data collection was initially paper-based on standard proformas but is now changing to electronic data collection. Data are collated by the network manager and her clerical assistant.

From January 2000 to December 2004, 125 patients (*n* 80 female, *n* 45 male; median age 48 (range 16–79) years) were treated. Indications for HPN included short gut (sixty-nine), fistula (eleven), malabsorption (seven), and obstruction (five). Underlying diseases included Crohn's disease (forty-six), ischaemia (twenty-two), malignancy (ten), motility disorders (thirteen), and radiation enteritis (five). Median time on HPN was 967 (range 9–6442) d.

Each year between twelve and twenty patients started HPN and between eleven and twenty patients stopped HPN. The number of patients on HPN at some time during a year varied from sixty-two to eighty.

A total of sixty-one patients stopped HPN over this period. Twenty-eight patients died. Four patients recovered from their illness. In four patients the bowel adapted sufficiently for them to stop HPN. Six patients had surgery which enabled them to stop HPN. In eight patients HPN was withdrawn.

Only thirty-one patients who had HPN in 2000 were still on HPN at the end of 2004. This group of long-term HPN patients were significantly younger, more likely to be female and to suffer from Crohn's disease or motility disorders than the group of twenty-nine patients who stopped HPN after less than 1 year. However, there were a similar number of patients with gut ischaemia in each group.

The HPN population over a well-defined geographical area such as Scotland is less stable than has been obvious in previous publications from single specialist centres. The constantly changing nature of the HPN population emphasises the need for well-organised, equitable provision for this service throughout the UK.

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