Management of artificial nutrition in East Anglia: a community study

ABSTRACT—In the Cambridge health district the growth of artificial nutritional support was prospectively assessed over a five-year period (1988–93). The aim of this study was to investigate the variation in the prevalence of enteral tube feeding (ETF) and parenteral nutrition (PN) in hospital and at home and to assess the organisation. There was a fourfold variability in the prevalence of artificial nutritional support in the eight districts. The prevalence of home artificial nutrition doubled between 1988 and 1993, whilst that in hospital increased to a smaller extent (31%). Overall standards of care are not keeping pace with the demand for artificial nutritional support. Only half the districts had nutrition teams, and only one had a specialist nutrition sister. Policies about ETF and PN in hospital and at home were judged to be variable in quality. About one in five patients (or carers) at home experienced problems related to organisation of nutrition support services. General practitioners were also frequently uncertain about their role in managing patients on artificial nutrition at home. Home ETF is a rapidly growing form of home care therapy in East Anglia; in 1992–93 it was quantitatively as important as ETF in hospital. Improvements in organisation are recommended.

Artificial nutritional support in the form of parenteral nutrition (PN) and enteral tube feeding (ETF) is routinely used in general hospitals to support patients who are unable to eat or to digest and absorb sufficient nutrients to maintain an adequate nutritional status and body function [1]. Its use has also increasingly extended into the community. However, there is a surprising lack of information about the prevalence and standards of practice of artificial nutrition support in different health districts in Britain. The only detailed prospective study of artificial nutritional support in a British health district was carried out in the Cambridge health district between October 1988 and October 1989 [2]. The study reported the prevalence, indications and outcome of home artificial nutrition (about 60% of that in hospital), and identified a number of problems with the organisation and clinical management of patients. To extend these observations, a prospective survey was carried out in East Anglia between 1992 and 1993 to assess differences in the prevalence and practice of artificial nutritional support between the eight health districts within East Anglia. Longitudinal measurements in the Cambridge health district over five years (1988–93) were undertaken to identify potential areas of growth and development that may be of value to health managers and planners. In addition, the study aimed to assess if organisational standards of care were adequate [3,4]. Separate aspects of this survey, particularly detailed aspects of home enteral tube feeding (HETF), are presented elsewhere [5].

Methods

The main study was conducted in East Anglia (population 2.08 million, 10,200 hospital beds with an occupancy of 83%) between November 1992 and November 1993. At the beginning of the study all general practices in East Anglia were sent a letter requesting them to identify patients on HETF or home parenteral nutrition (HPN).

Senior dietetic representatives from each of the eight East Anglian districts were asked to organise data collection in their district and transmit the data to an overall coordinator based in Cambridge. The aims of the study were:

- To assess the overall organisation of the hospitals including number of beds by specialty, the presence of nutrition teams, and policies relating to nutritional support, using a standardised questionnaire.
- To record the number and type of patients receiving parenteral and enteral feeding both in and out of hospital on four specified days (4 November 1992, 3 February 1993, 5 May 1993 and 4 August 1993). Additional information about the volume of tube feeds and sip feeds purchased by hospitals during the period of the study was also sought.
- To undertake home visits to provide organisational and practical information about HETF and HPN.

The project coordinator visited each centre, instructing the dietitians and maintaining uniformity in data collection. Separate information about patients on home artificial nutrition was collected prospectively by the ‘nutrition team’ of the Cambridge health district between 1988 and 1993, and used to test the hypothesis that the demand for nutritional support at home was growing more rapidly than in hospital.
The study was approved by the local ethical committee and patients gave their informed consent.

Results

The East Anglian region

At the time of the study East Anglia was one of 14 health regions in England and Wales, and consisted of the following eight health districts: Cambridge, Norwich, Ipswich, Great Yarmouth, Huntingdon, Peterborough, King’s Lynn and Bury St Edmunds. There were 61 hospitals in the region, with one major acute hospital in each district (and much smaller supporting acute hospital(s) in some districts). The acute hospitals accounted for 60% (5,970) of the total number of beds (10,157) which, on average, were occupied 83% of the time.

General practitioners’ questionnaire

Of the 294 questionnaires sent to general practitioners (GPs) 187 (64%) were returned. Analysis revealed that 25% of practices had patients on home nutritional support at the beginning of the study period. The GPs identified eightfold more patients on ETF than PN. Twelve (15%) of the patients identified by GPs were not reported by our hospital contact. These ‘extra’ patients (six adults, six children) comprised a child with short bowel syndrome who was managed by a London hospital, and 11 patients on HETF with similar diagnoses to the other patients on HETF (e.g. cystic fibrosis, cerebral palsy, cerebrovascular accident (CVA), motor neurone disease).

Only 10–15% of GPs regarded themselves as actively involved in and primarily responsible for the nutritional management of their patients. About a quarter of them admitted to problems in providing adequate care, including the lack of replacement tubes for HETF (which they were unable to prescribe), uncertainties about clinical responsibility in relation to feeding, and some clinical problems related to feeding, such as control of bowel disturbance and failure to thrive. The GPs confirmed that they were primarily responsible for prescribing feeds, but 15% thought they were also prescribing the feeding equipment, and 29% thought they had done so in the past.

Prevalence of artificial nutritional support

On the four audit days a mean of 146 (range, 127–155) patients were receiving artificial nutrition in hospital, 19% of whom were neonatal. ETF was three times more prevalent than parenteral feeding (Table 1). During the year there was no progressive change in the number of patients receiving ETF and PN or in the choice of therapy.

The prevalence of ETF at home (all neonatal patients) was almost as high as that in hospital. During

| Table 1. Prevalence of artificial nutritional support in East Anglia (mean of four audits)* |
|---------------------------------------------|-----------------|-----------------|
| Enteral tube feeding (ETF)                  | 22              | 88              |
| Parenteral feeding (PN)                     | 3               | 27              |
| ETF + PN                                    | 3               | 3               |
| Total                                       | 28              | 118             |

* These figures do not include the small number of patients on home artificial nutrition resident outside East Anglia but managed by health professionals working within East Anglia. The figures on home nutritional support based on the results obtained by hospital workers also do not include the ‘extra’ patients identified by GPs.

† This corresponds to a prevalence of 1.76% of occupied hospital beds or 1.44% of total beds, distributed between ETF, PN and PN + ETF in the ratio of 75:21:4, respectively.
the year there was a progressive increase in the number of patients receiving ETF in the community. On the four audit days the number of patients on HETF was 90, 107, 114 and 128. By August 1993 there were more patients receiving ETF at home \( (n = 128) \) than in hospital \( (n = 116) \).

In the Cambridge health district the prevalence and annual incidence of HETF has doubled between 1988 and 1993 (Fig 1). The corresponding changes in hospital during the same period were less marked (Table 2). More patients received PN in hospital than at home.

The mean quantity of feed used for ETF on each of the audit days was 107 litres, and that used for sip feeding was estimated to be at least 70 litres (an underestimate because nurses may provide sip feeds without involving dietetic staff). This volume of supplementary feed corresponds to an intake of one carton (200 ml) per day by 338 patients or three cartons (600 ml) per day by 115 patients.

**Regional variation in artificial nutritional support**

Figure 2 shows that the prevalence of ETF between districts (hospital alone, and hospital plus home) varied by a factor of 4. This variation is significantly related \( (r = 0.90; p < 0.001) \) to the number of dietitians in acute hospitals per 100,000 population, and to the number of dietitians per 1,000 occupied acute beds within each district. Furthermore, there was a relationship between the amount of ETF and PN in hospital (per 100,000 population, all districts; \( r = 0.80; p < 0.01 \)).

There was no relationship between the amount of artificial feeding within the hospitals of each district (ETF, PN or ETF + PN) and either the population of the districts or the distribution of acute hospital beds between different specialties.

**Nutrition teams**

Four of the eight East Anglian districts claimed to have a ‘nutrition team’, which was always based in the major acute hospital of the district. The composition of the

| Table 2. Prevalence (number of patients per day) of enteral tube feeding and parenteral nutrition in the hospitals of the Cambridge health district, 1988–89 and 1992–93 |
|---------------------------------------------------------------|
| Enteral tube feeding (ETF) | 25 | 29 |
| Parenteral nutrition (PN) | 11 | 14 |
| ETF + PN | — | 4 |
| Total | 36 | 47 |

* Based on data collected by Wilcock et al [2].  
† This study.

The graph shows the relationship between the number of dietitians in acute hospitals (per 100,000 population) and the prevalence of enteral tube feeding (ETF) in hospital alone \( (r = 0.82; y = 2.13 + 0.54x) \) and hospital and home \( (r = 0.89; y = 3.7 + 7.48x) \). Each point represents the result from one health district. For clarity, the relationship with the prevalence of ETF in the community \( (r = 0.91; y = 1.57 + 3.61x) \) is not indicated on the graph.

**Written policies**

Written policies for PN were obtained from four districts, and five for enteral feeding, though one hospital refused to supply its policy on the basis of being an independent trust. Those that were available were distributed to the general wards. The policies for both ETF and PN were judged to be variable both in quality and quantity. For example, the policy for ETF in one hospital involved only the nursing procedures for peri-operative management of gastrostomy, whereas three districts had much more general and comprehensive information about ETF. Similarly for PN, the information ranged from a one-page summary to a book dealing with organisation, procedures and management of problems. One district outlined the procedures necessary for starting PN but gave no information about the potential complications and how to deal with them if they arose. Another district provided information only about changing intravenous feeding lines.

Written policies for home nutritional support were available from only three districts, and only one had information dealing with all important aspects of
nutritional support in hospital and at home. This district had the only specialist nutrition nurse in the region.

Which hospitals carry out enteral tube feeding and parenteral nutrition?

All the PN was carried out in acute hospitals. In only three districts was ETF performed outside the acute hospitals; in these districts, 94% was still carried out in acute hospitals (mean of four audits). The dietetic cover for non-acute hospitals was provided either by the dietitians based in the acute hospitals of the districts, or by the community dietetic service. Long-stay hospitals were generally reluctant to start or accept patients on ETF.

Indications for artificial nutritional support

**Hospital**—The commonest indications for ETF in hospital were prematurity associated with poor sucking plus poor swallowing reflex (27.4%), CVA (15.0%), trauma with (8.3%) and without head injury (2.9%), malignancy (8.1%), neurological disease (11.0%), congenital defects (6.7%) and transplantation (1.7%); 75% of all patients had a swallowing-related problem, and 38% of those on ETF were considered by the dietitians to be malnourished, and ETF was used to improve their nutritional status; 25% had surgery during their hospital stay but only about 17% were fed pre-operatively. Most ETF in hospital was carried out in paediatric, medical and geriatric wards (Table 4).

The commonest indications for PN in hospital concerned the various complications of abdominal surgery (19.2%), gastrointestinal disease including oesophageal cancer (15.0%), prematurity (12.5%), liver and bone marrow transplantation (12.5%) and malignancy both within (10.0%) and outside the gastrointestinal tract (10.8%); 42% were considered by the dietitians to be malnourished and PN was used to improve nutritional status; 75% of patients had surgery during their hospital stay, and of these one in six received PN pre-operatively. Most PN in hospital was carried out in general surgical wards, intensive care units and paediatric wards (Table 4).

**Community**—Most adult patients receiving HETF had swallowing difficulties as a result of neurological disease or obstruction. Most of the children received HETF because of failure to thrive from a heterogeneous group of conditions [5].

### Table 3. Health professionals involved in the artificial nutritional support in the eight health districts in East Anglia

| Districts claiming to have a nutrition team | Districts with no nutrition team |
|--------------------------------------------|---------------------------------|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
| ---|---|---|---|---|---|---|---|
| Pharmacist | +P | +P | +P | +P | +P | +P | +P |
| Dietitian | +(P&E) | +(P&E) | +(P&E) | +(P&E) | +(P&E) | +(P&E) | +(P&E) |
| Chemical pathologist |  |  |  |  |  |  |  |
| Nutrition sister | +(P&E) |  |  |  |  |  |  |
| Clinician | +(P&E) |  |  |  |  |  |  |
| Anaesthetist |  |  |  |  |  |  |  |
| Speech therapist |  |  |  |  |  |  |  |
| Infection control nurse |  |  |  |  |  |  |  |

Involved in: P = parenteral; E = enteral tube feeding

### Table 4. Distribution of enteral tube feeding and parenteral feeding (%) by specialties in acute hospitals

| Specialty | % of total no. of beds | Enteral tube feeding | Parenteral nutrition |
|-----------|------------------------|----------------------|----------------------|
| Paediatrics (including neonates)* | 7.8 | 40.2 | 20.5 |
| General medicine (including gastroenterology) | 14.1 | 12.4 | 7.7 |
| General surgery | 10.8 | 8.6 | 35.9 |
| Geriatrics | 18.9 | 12.9 | 0.9 |
| Intensive care (adult)† | 0.8 | 6.6 | 23.1 |
| Neurosurgery | 1.7 | 10.0 | — |
| Haematology | 6.8 | — | 5.1 |
| Others‡ | 45.1 | 9.3 | 6.8 |

* Includes paediatric intensive care.
† Includes high dependency unit.
‡ Includes a variety of wards not using nutritional support (eg rheumatology, dermatology, nephrology, gynaecology, ophthalmology, maternity, dialysis) or using it occasionally (eg orthopaedics, thoracic medicine, psychiatry, cardiology, ENT).
The diagnoses of patients on HPN were Crohn’s disease (2), desmoid tumour of bowel with Gardner’s syndrome (1), Behcet’s disease plus Crohn’s disease (1), and short bowel syndrome following volvulus of the bowel (2).

Artificial nutritional support in hospital and at home involves patients with a wide age range, but especially young children and elderly patients (Fig 3).

Patient questionnaire for home enteral tube feeding and home parenteral nutrition

Of a total of 234 patients on HETF identified by our hospital contacts, 126 (54%) were interviewed. Of the 13 patients on HPN, 12 were trained to do it in Cambridge. All five who were interviewed felt confident following their training but one would have welcomed more information. All patients on HPN had telephone numbers to ring in case of emergency, and all had been given follow-up arrangements. Only one patient experienced difficulties in obtaining feeds and equipment. In contrast, about one in five patients on HETF complained of inadequate training, no follow-up arrangements, no telephone contacts for emergency use, and difficulties in obtaining feeding equipment. Detailed information about patients on HETF, including complications, is described elsewhere [5].

Discussion

We have documented a rapid growth in the use of home artificial nutrition (doubling over five years), so that by the end of 1995 the prevalence of HETF in East Anglia was greater than ETF in hospital. Furthermore, the figures for HETF are underestimates since 10–15% of patients reported by GPs were not identified by hospital reporters. Similar growth rates in HETF (ca. 20% per year) have been reported in the USA [4–6].

It is important to note that the above figures do not include patients receiving artificial nutrition supplements. In the community, such data are difficult to obtain but the volume of prescribable supplements is estimated to be three times that used for HETF [7]. This amount would involve ten times as many patients as those on HETF, assuming the daily intake of supplement per patient to be 25–35% of that used in ETF. There is also a large and uncertain purchase of non-prescribable supplements which is not included in the above estimates.

This study also demonstrated a fourfold variability in the prevalence of artificial nutritional support in different districts (hospital, and hospital and home), which cannot be explained by differences in population size (Fig 2), by the variability in the number of hospital beds per 100,000, or by the distribution of beds between major specialties involved in ETF and PN (surgery, medicine, paediatrics, geriatrics, intensive care) which shows no major differences between districts.

It is possible that the prevalence of ETF depends on the number of available dietitians with appropriate knowledge and expertise, who can adequately advise, help initiate and manage ETF both in hospital and at home. This is consistent with the good correlation between the number of dietitians in acute hospitals (where virtually all ETF in the district is initiated) and the prevalence of ETF. However, the relationship does not prove causality, and further enquiries into the underlying reasons should be undertaken [5].

![Fig 3. Age distribution of patients receiving parenteral nutrition (PN) in hospital (right) and enteral tube feeding (ETF) in hospital (middle) and at home (left) (N: neonatal (0–1 month); shaded bars: male; open bars: female)](image)
There are more than 18 times as many patients on HETF as on HPN. As it is generally simpler, it is reasonable to suggest that HETF should, in general, be supervised and managed by district general hospitals in conjunction with the GP, and that HPN should, in general, be supervised by a specialist regional centre in conjunction with the GP [4]. However, since PN in adults (feed and accessory equipment) costs ten times as much as ETF, adequate finances should be made available to such centres. GPs should be encouraged to become actively involved in managing patients on home nutritional support, especially HETF, which involved one in three general practices at the start of our study.

Several aspects of care seemed unsatisfactory on the basis of information obtained from GPs and some of the patients. The legislation at the time of the study allowed GPs to prescribe feeds but not the equipment to deliver the feed into the patient. However, as many as 30% of GPs thought they had prescribed administration sets and other accessory equipment, which suggests either that they were bypassing some of the legislative constraints or that they were confused about what they were allowed to prescribe. GPs also admitted uncertainties about their clinical responsibilities.

Multidisciplinary nutrition teams have repeatedly shown that they can improve the care and reduce complication rates of patients receiving artificial nutrition [3,6,7]. Unfortunately, many districts do not have a nutrition team; only four of the eight East Anglian districts (or less than 10% of hospitals) have them. Furthermore, the composition, role and practice of the nutrition team varied considerably from district to district. This partly reflects difficulties in establishing multidisciplinary teams in wards within hospitals organised to serve specific systems or organ-based diseases. However, the overall prevalence of ETF and PN in acute hospitals is equivalent to about 3% of the number of occupied beds, and as many as 6–12% of occupied beds if patients receiving artificial nutrition supplements are included in the calculations. This last figure is often higher than the percentage of beds allocated to specific specialties (eg gastroenterology, cardiology, rheumatology, ENT, ophthalmology, genitourinary medicine, etc).

In summary, PN and ETF are forms of therapy used to support a number of patients suffering from severe acute illness in hospital and from chronic illness in the community. Problems were identified with the organisational care of such patients, and appropriate resources should be made available to correct them and to plan for the likely continued growth of HETF. Uniform standards of care need to be established, especially in the community where the prevalence and growth rates of artificial nutritional support at the end of the study was greater than in hospital.

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References

1 Elia M. Artificial nutritional support in clinical practice in Britain. J R Coll Physicians Lond 1993;27:8–15.
2 Wilcock H, Armstrong J, Cottee S, Neale G, Elia M. Artificial nutrition in the Cambridge health district with particular reference to tube feeding. Health Trends 1992;23:93–100.
3 Lennard-Jones J (ed). A positive approach to nutrition as treatment. Report of the King’s Fund Centre. London: King’s Fund Centre, 1992.
4 Elia M (ed). Enteral and parenteral nutrition in the community. Report of the British Association of Parenteral and Enteral Nutrition (BAPEN). BAPEN, 1994.
5 Parker T, Neale G, Elia M. Home enteral tube feeding in East Anglia. Eur J Clin Nutr 1996; (in press).
6 Elia M. Home enteral nutrition: some general aspects and a comparison between the USA and Britain. Nutrition 1994; 10:1–9.
7 Silk DBA (ed). Organization of nutrition support in hospitals. Report of the British Association of Parenteral and Enteral Nutrition (BAPEN). Maidenhead: BAPEN, 1994.

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