SPECIAL REPORTS

Provision of gastrointestinal endoscopy and related services for a district general hospital

Working Party of the Clinical Services Committee of the British Society of Gastroenterology

This is a shortened version of a report prepared to inform health service managers of the needs for gastrointestinal endoscopy. Despite the cost effective nature of endoscopy, both for diagnosis and for treatment, endoscopy units in Britain tend to be small, understaffed, and poorly financed compared with those in other highly developed countries. This situation has arisen because the greatly increased capability of endoscopy, with the consequent need for expansion of services, has come at a time of financial stringency.

Now that gastrointestinal endoscopy contributes a major clinical service, arrangements for its provision as a service department with adequate trained staff, proper facilities, and a realistic budget need to be formalised. The current introduction of new budgetary arrangements, based on clinical contracts, is an opportune moment to define the benefits of endoscopy, its requirements, and its cost.

The analysis in this report shows that the likely expansion of endoscopic services means that full use must be made of trained consultants in more than one discipline, particularly gastroenterology, surgery, and radiology, supplemented by clinical assistant, hospital practitioner, or staff specialist sessions. Dedicated, highly trained nursing staff are needed and a new post of endoscopy department assistant is proposed.

Although this report deals mainly with developments in Britain, it is hoped that it may also be of use to those who plan endoscopy services in other countries.

How many need endoscopy?

Predicting clinical requirements for endoscopy depends not only on a knowledge of the incidence, prevalence, and natural history of gastrointestinal diseases in the community but also on behaviour patterns. Some people consult their doctor readily and others with reluctance; similarly, doctors vary widely in their clinical practice. The proportion of patients investigated by endoscopy rather than radiology is increasing (Fig 1), and some therapeutic endoscopic techniques are replacing surgical procedures (Figs 2A and B).

The estimates of likely workload are presented in terms of 100 000 of the population and of a district general hospital assumed to be serving a population of 250 000.

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UPPER GASTROINTESTINAL ENDOSCOPY

Dyspepsia is common in the community and a postal survey has shown that over one third of the adult population experiences 'indigestion' in a six month period, though only about one in four of these people consults a doctor. Gastrointestinal disorders account for about 10% of all consultations with general practitioners and about half of these are for dyspepsia.[1] The annual consultation rate in three large general practices for new episodes of dyspepsia was found to vary between 0·7 and 2·7% of the population. An endoscopic survey of all such patients in one practice showed that about one third had a peptic ulcer or scar, and one third had some other lesion; only 1–2% had a carcinoma.[2]

The need for accurate diagnosis in the management of upper gastrointestinal dyspepsia is now greater than hitherto because specific and potent drug treatments are now available for the treatment of reflux oesophagitis, peptic ulcer, and gastritis. Many patients with dyspepsia consult their doctor because of fear of cancer or other serious abnormality[3] and for them an examination which shows no abnormality is justified for reassurance; often nothing more needs to be done. A survey among such patients has shown an appreciable fall in general practitioner consultation and prescription rates after normal or minimal findings; negative endoscopic reports thus have a positive outcome.[4] Not every patient with dyspepsia could or should have endoscopy. Discrimination is needed in selecting

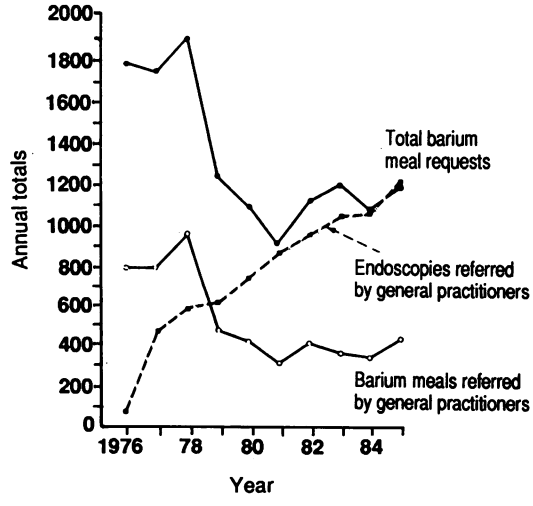

Figure 1: Effect of open access endoscopy service on barium meal requests in the Gloucester Health District (from Gear and Wilkinson[10]).

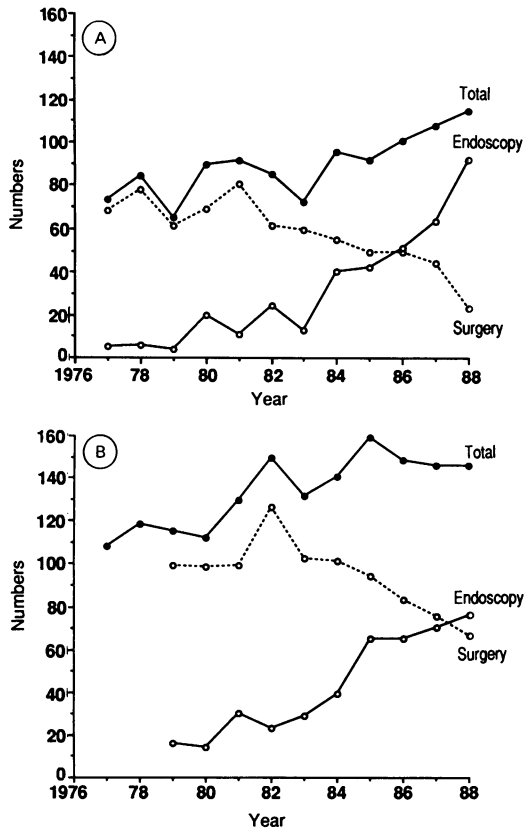

Figure 2: (A) Gloucester (population 306 000); (B) Portsmouth (population 533 000). Trends in therapeutic ERCP and surgery (exploration of common bile duct, pancreatectomy, or bypass) for treatment of obstructive jaundice.

those with potentially serious disease and those for whom endoscopy has a major influence in deciding on treatment. The need for endoscopy in acute upper gastrointestinal bleeding is unquestioned. Many surveys of dyspepsia have shown that dangerous disease is unlikely under the age of about 45 years.[5 6] There is a tendency now to recommend a short course of treatment as the first step for most younger patients with a recent onset of dyspepsia,[7-9] and endoscopy for those with recurrent trouble, those with warning symptoms such as weight loss, or older patients with recent onset of symptoms.

In an endoscopy unit (Fig 3) which has offered open access to general practitioners for some years[10] the total number of upper gastrointestinal endoscopies is now about 1000 per 100 000 of the population annually. Surveys in other National Health Service regions show considerable variation between hospitals. In 1988 the average for all hospitals in the North West Thames region was 658 examinations per 100 000 population annually (J Calam, personal communication). In the Trent region the number averaged 763 per 100 000 in 1986 and the number had doubled between 1981 and 1986[11]; in Leicester the number was over 700 per 100 000 in 1986.[5] The demand from general practitioners when offered an open access service has varied from about 250–400 per 100 000 of the population annually,[5 10 12-14] to which must be added referrals from within the hospital. In 1981 population based rates for upper gastrointestinal endoscopy in 13 areas across the United States[15] averaged one to two procedures per 100 people over the age of 65 years (range 0·9–1·5). These figures suggest that the rising trend in demand will continue until about 1 in 100 of the population (2500 examinations in a district general hospital) will need upper gastrointestinal endoscopy each year. Any fall in numbers due to more discrimination in selection is likely to be outweighed by increased use of the service by general practitioners and a trend towards increased use of endoscopy rather than x ray as the primary investigation. Up to 1 in 10 of these procedures is likely to entail some form of treatment.

BILIARY AND PANCREATIC ENDOSCOPY: ENDOSCOPIC RETROGRADE CHOLANGIO-PANCREATOGRAPHY (ERCP)

Gall stones and jaundice are common clinical problems. Cancer of the pancreas is increasing in incidence and can be difficult to diagnose. The use of ERCP is rising (Fig 4) because it enables obstructive jaundice due to gall stones or malignant stricture to be treated without operation.

An epidemiological study suggests that about 50 diagnostic or therapeutic ERCP examinations are needed per 100 000 of the population (125 in a district general hospital each year.[16]

Most of the therapeutic procedures are performed in older patients, for whom operation is contraindicated, and among those over 65 the need for ERCP is estimated to be 200 per 100 000 annually. Figures from well established units show that the number of ERCPs is rising towards this population estimate whereas the number of operations for obstructive jaundice is tending to fall (Fig 2A and B).

LOWER GASTROINTESTINAL ENDOSCOPY: FLEXIBLE SIGMOIDOSCOPY AND COLONOSCOPY

Flexible sigmoidoscopy is likely to become a

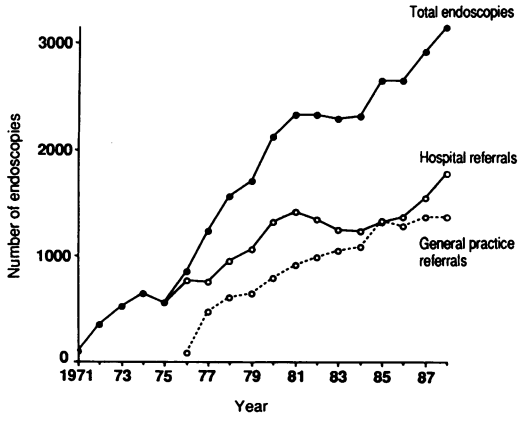

Figure 3: Upper gastrointestinal endoscopy in the Gloucester Health District (total population 305 000).

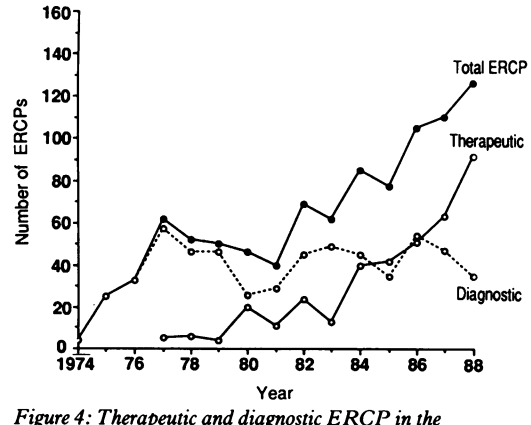

Figure 4: Therapeutic and diagnostic ERCP in the Gloucester Health District (total population 305 000).

routine initial examination for all patients with rectal bleeding. In one health district with an open access flexible sigmoidoscopy service, just under 200 examinations per 100 000 of the population were performed in 1987 and 1988.

An estimate of clinical need in 1987 gave a figure of 160 colonoscopies per 100 000 of the population annually.[17] Figures for the Gloucester Health District show a steady rise; in 1988 the rate for colonoscopy was 162 and for flexible sigmoidoscopy 174 per 100 000. In the Trent[11] and North West Thames regions the average rates for colonoscopy were 89 and 109 in 1986 and 1988 respectively (J Calam, personal communication). It is likely that all these figures underestimate the need because of two current changes in practice. Firstly, endoscopy is tending to replace barium enema; secondly, surveillance examinations for colorectal cancer are likely to increase.

Flexible endoscopy is gaining popularity over radiology because it is sensitive, immediate biopsy or polypectomy can be performed, and it avoids the considerable irradiation exposure associated with barium enema.[18] This trend has been held back in Britain by lack of resources compared with Western Europe and America. If a shift is likely it is pertinent to assess the demand for barium enema. Annual rates per 100 000 of the population have been 474 in Bristol,[19] 336–540 in 11 centres in the South West region (N Dent, personal communication), and 325–340 in Gloucester before the advent of flexible endoscopy. A pronounced swing from barium enema towards colonoscopy would thus greatly increase the endoscopic workload.

The total rate for flexible sigmoidoscopy, colonoscopy, and barium enema was 631 per 100 000 in the Gloucester Health District in 1988. The rate for the same examinations in the Manchester South District in the same year was 1329 (D F Martin, personal communication). Allowing for duplication of examinations, which it is hoped can be greatly reduced in the future, the present need for large bowel investigation is greater than 300 per 100 000 of the population annually, and may be twice this figure.

An estimate of the possible impact of surveillance for colorectal cancer is provided by the controlled study being undertaken in Nottingham[20] where about half of a large population aged 50–74 years participated in faecal occult blood testing. Further investigation by endoscopy was indicated in 2·3% of the population who completed the test; a cancer or adenomatous polyp was found in about half of these people. If the study shows that screening by faecal occult blood, followed by appropriate investigation and treatment of those with positive results, does reduce cancer mortality, extending a similar programme to the whole population will greatly increase the need for endoscopy. There are already good indications for surveillance in three other high risk groups, those with a previous polyp or carcinoma, those with a strong family history of bowel cancer, and some patients with longstanding ulcerative colitis.

These figures suggest that at least 200 flexible sigmoidoscopies and 200 colonoscopies per 100 000 of the population will be needed annually and that a district general hospital should plan for 500 of each. It is possible that there will be a shift from sigmoidoscopy towards colonoscopy, despite the fact it is technically more difficult and time consuming, because it provides a complete examination of the colon.

Forecasts for the future

All previous forecasts[21,22] have underestimated the future need for endoscopy. The present estimates may need to be increased as the potential of endoscopy for diagnosis, treatment, and cancer surveillance is more widely appreciated, as instrument design improves, and as new techniques become possible.

An average half day list allows for about eight upper gastrointestinal endoscopies, or eight flexible sigmoidoscopies, or four ERCPs, or four colonoscopies. These estimates are approximate and depend on the ratio of diagnostic to therapeutic procedures, and the staff and facilities available, remembering that patients have to be prepared before, and allowed time to recover after, examination and that instruments have to be cleaned and disinfected between patients.

For a district general hospital serving 250 000 people, the requirements given indicate a need for about 500 half day sessions annually.

Professional standards in endoscopy

STAFF QUALIFICATIONS, ROLE, AND TRAINING

Introduction

High standards of patient care, avoidance of complications, accuracy in diagnosis, appropriate therapeutic manoeuvres, and cost effective use of equipment depend on an endoscopy service being provided by skilled professionals.

With the increased demand for endoscopy, and its extension into treatment, a wide range of specialist skills is needed. This is of particular importance as greater numbers of elderly and seriously ill patients are submitted to endoscopy with increased risk of complications. There are also potentially serious hazards to endoscopy staff themselves which can be avoided or reduced by proper professional training. It is no longer acceptable for endoscopy to be performed by untrained medical staff, assisted by part time helpers with no experience.

Formal training is essential for all endoscopy unit staff, medical, nursing, and ancillary. Specific recommendations have been made by the BSG for training.[23] Continuing education is also essential.

Medical staff

Gastrointestinal endoscopy may be performed by different medical personnel with special interest and training in the techniques, including physicians (usually gastroenterologists), surgeons, radiologists, general practitioners, hospital practitioners, and staff specialists. Every endoscopic technique is an acquired skill which must be learnt by a combination of study,

observation, and performance.

The BSG is formalising criteria for the training of endoscopists in different areas of diagnostic and therapeutic endoscopy. An endoscopist should undergo a defined apprenticeship phase under close supervision and attend a formal teaching course, including the principles of safety and care of instruments, before training in an aspect of gastrointestinal endoscopy is regarded as complete. It is recommended that consultants and others performing endoscopy should normally have a professional commitment to two or more endoscopy sessions weekly so as to acquire and maintain proficiency.

Nursing staff

The BSG Report in 1987 on the staffing of endoscopy units[23] highlighted the greatest perceived deficiency as being lack of nursing staff.

The specific role of the nurse is the care of the patient before, during, and after the procedure.[24] On arrival the patient should be assessed by a trained nurse who will seek to reduce anxiety about the forthcoming procedure by explanation and discussion, will note current medication and drug allergies, and inquire about relevant social factors affecting the return home. During endoscopy a nurse assists with the administration of drugs, maintains the patient in a comfortable position, monitors vital signs, administers oxygen if needed, looks after the mouth guard, aspirates the pharynx as necessary, and provides constant reassurance and encouragement to the patient who is usually sedated but not unconscious. After the procedure a nurse supervises recovery until the gag reflex returns and the patient is awake. Written instruction about medicines may be needed as sedatives can cause amnesia. The patient is either discharged to the care of an escort (with a warning not to drive or take alcohol for 24 hours after a sedative), or returned to the ward with written post-procedure information.

Nurses employed in endoscopy units should undergo relevant specialised training, and the nurse in charge of an endoscopy unit requires training to a higher level to ensure high standards and efficiency in the use, maintenance, and disinfection of the complicated equipment and accessories. There is an English National Board short course in nursing for gastrointestinal endoscopy and related procedures (ENB 906). Courses are also organised in association with the BSG. Adequate funds should be made available for this essential training.

Nurse managers may need reminding of the clinical skills and technical expertise needed and should not view endoscopic procedures as 'simple' outpatient activities. Currently many endoscopy units use part time nursing staff. Some such posts may lend themselves to part time or job sharing arrangements. These staff, however, will still be required to show the appropriate specialist nursing skills and such posts should be graded to reflect this specialisation.

Nursing staff also have a major part to play in managing the endoscopy unit, including budgetary control, arranging instrument maintenance contracts and repairs, ordering supplies, supervising secretarial staff, answering queries, overseeing correct data entry, labelling and transmitting specimens and reports, and ensuring that appointments and rebookings are correctly made. All trained and experienced nurses also have an important responsibility for teaching.

Ancillary staff

Much of the work in an endoscopy unit is technical or administrative. Endoscopic equipment is complex, expensive, and difficult to disinfect. It is recommended that two people should assist with every endoscopy, a nurse to care for the patient and an assistant to help with the use of instruments and accessories. There is scope in the endoscopy unit for one or more assistants whose particular role would be the care, disinfection, and use of instruments, and other duties of a technical nature. We recommend that a career post of Endoscopy Department Assistant should be created with a basic training similar to an Operating Department Assistant but with further specialist training in endoscopy. This new grade should receive an appropriate professional qualification.

There is a useful role for care assistants in the simpler but time consuming aspects of patient care.

Every unit requires an experienced medical secretary (HCO or Administrative Assistant Grade) capable of a central role in unit administration and day case management. The secretary should be familiar with the use of a computer for data entry, patient administration, and word-processing.

PATIENT CARE AND SAFETY

Patients undergoing endoscopy are usually apprehensive. An explanatory leaflet provided at the time the appointment is made gives reassurance and should include a contact telephone number enabling any queries to be made to knowledgeable secretarial or nursing staff. Handling of day case or short stay patients (and their relatives) before, during, and after invasive procedures such as endoscopy requires planning, a proper environment, and a skilled team able to combine human kindness with the necessary technical efficiency.

The team must be able to manage in safety very sick patients requiring endoscopy and simultaneous resuscitation who would otherwise be in intensive care or operating theatre facilities. The unit should be properly equipped to cope with the inevitable major hazards and complications (bleeding, cardiac arrest, etc) resulting from management of poor risk patients or endoscopic therapeutic procedures such as coagulation of bleeding sites or removal of large polyps.

The majority of patients in the United Kingdom prefer to have endoscopy under sedation. Even when intravenous dosages are adjusted to individual needs there is a risk of unexpected reactions and cardiorespiratory

complications. Increasing emphasis is likely on the need to monitor selected patients during prolonged procedures using measurements such as blood oxygen concentrations. Some patients, such as those with a heart valve prosthesis, require antibiotic prophylaxis before examination; others have allergies, ailments, or current treatment which conflicts with routine endoscopic management and medication.

There is a risk of cross infection as a result of endoscopy, including documented reports of bacterial infection and a potential risk of viral transmission including hepatitis and the AIDS virus (HIV). The BSG and instrument manufacturers have therefore issued detailed recommendations on the cleaning and disinfection of instruments and accessories.[25] This essential routine before and after each session, and between examinations, is complicated and time consuming. Endoscopy should not be performed on a haphazard basis or in outpatient or other facilities not equipped and staffed to maintain the necessary hygienic standards.

STAFF SAFETY

Staff as well as patients are at risk of infection, especially blood borne infections such as viral hepatitis or HIV. All endoscopy staff should be offered hepatitis B vaccination. To avoid contact with blood or body fluids, staff should wear disposable outer garments and gloves; goggles or glasses should be worn if eye splashes are likely. Routine precautions should be adopted for handling sharp instruments or accessories and for the disposal of suction waste, contaminated linen, and needles.

Endoscopy staff, especially those who clean instruments, are exposed to sensitisation by the disinfectants used. Closed systems for disinfection, adequate bench top ventilation, and change/showering facilities are all important. A suitable area, outside the endoscopy room, should be provided for staff relaxation and refreshment.

EQUIPMENT CARE

The care, maintenance, and use of endoscopes and the many accessories requires a high level of technical competence among medical and nursing staff, comparable with that in the operating theatre. Endoscopy personnel should be selected as being interested in technical aspects, and then so trained and sufficiently exposed to the available range of equipment and techniques as to be familiar with them during both routine and emergency circumstances.

RECORD-KEEPING AND AUDIT

Efficient arrangements are needed for bookings and a waiting list, with appropriate arrangements for individual patients, transmission of specimens and reports, and organisation of follow up. Direct data entry by the endoscopist at the time of examination ensures accuracy of clinical audit, including patient details, efficacy of procedures undertaken, complication rates, and instrument costings. All this is feasible with a dedicated endoscopy microcomputer system, preferably linked to the hospital patient administration system. Input terminals and print out facilities should be available in the secretarial/reception and nursing area(s) as well as in or near to each endoscopy room.

Nursing and medical staff require sessional time for audit and administration, and they need regular meetings within the unit and with related departments such as histology and *x* ray.

The endoscopy unit: planning, staffing, equipment, and finance

PLANNING

Requirement for every district general hospital

For efficiency and safety every district general hospital needs a purpose designed endoscopy unit. The design must be sufficiently versatile to handle a wide range of patients and procedures without stress or disruption, such as when emergency patients arrive during a routine list.

Day care management of new patients, many without previous documentation, requires ample reception, waiting, and interview/consultation facilities for patients and their relatives. Offices and change and rest areas are needed for administrative, nursing, and medical staff. There must be separate store rooms for equipment, clean utility and cleaning material etc, a collection area for blood and other specimens, and a small laboratory for other gastrointestinal tests. Facilities must include a comfortable area adjacent to toilets for oral or enema bowel preparation for colonoscopy. Good ventilation is essential in the working and waiting areas of the unit.

Each room requires careful planning and adequate space. Many of the facilities are similar to those found in accommodation for adult acute day patients for which the Department of Health has published a Health Building Note (No 38). The following paragraphs describe requirements in general terms. In practice, units vary widely in design according to local circumstances. A description of several units[26] and a detailed plan for a specific unit have been published.[27]

Situation

A district general hospital endoscopy unit carries a heavy load of day care patients (3000+ patients annually) arriving and being collected by relatives or by ambulance because of the sedation and recovery period usually entailed. The unit should be conveniently situated adjacent to day care facilities unless these are fully provided within the endoscopy unit.

Many inpatients are examined, some of whom are so ill that they have to be moved to the unit in their bed. Easy access to the wards is thus needed. Occasional patients will need to be transferred to the operating theatre.

Endoscopy rooms

Two endoscopy rooms are needed to provide 10 sessions of routine endoscopy since, for staff efficiency and social convenience of patients,

simultaneous lists will often operate at peak periods. A third procedure room is necessary for other non-endoscopic gastrointestinal tests, and for flexibility in accepting emergencies and additional referrals, such as outpatient flexible sigmoidoscopies, without interrupting routine lists. The extra room will also allow for likely future increases in referral loads. If equipped with a closed circuit television monitor this room is useful for teaching without disrupting routine work. Extra facilities (and staff) are needed if flexible bronchoscopy sessions or other procedures are to be hosted in the endoscopy unit. Larger district general hospitals, special centres, and teaching hospitals may require a fourth room because of additional referrals or the need for teaching.

Cleaning, disinfection, and storage of instruments

A central cleaning/disinfection area must be provided adjacent to the endoscopy rooms. The Department of Health has laid down standards for endoscope cleaning rooms in operating departments (HB notes 26.4.42) which state that the space should accommodate a two sink drainer long enough for an extended endoscope and adjacent automated endoscope washing/disinfecting apparatus. Toxic vapours produced during the cleansing and disinfecting process should immediately be removed by extract ventilation at bench level to the outside air, thus excluding all possibility of inhalation. Instruments need to be stored by hanging vertically, and sterile packs of loosely coiled accessories need drawers.

Special requirements for ERCP

Any unit offering ERCP should have the potential to undertake the full range of therapeutic procedures because investigation and treatment are usually combined at one examination. ERCP is the most complex and potentially dangerous endoscopic procedure, though it has great therapeutic potential. It requires close collaboration between an endoscopist and an interventional radiologist, both with special experience of the technique and of working together. The endoscopist needs a wide range of equipment and accessories, the radiologist needs high quality screening facilities.

It is estimated that the population served by the average district general hospital will require about 125 ERCPs each year.[16] Two or three examinations each week are not enough to maintain and develop the necessary experience, nor to justify the equipment and accessories needed. For this reason two adjacent district general hospitals might consider pooling their resources to provide ERCP at only one hospital, though staff might come from both.

For a combined catchment area of 500 000, at least two ERCP sessions will be required each week. Some specialised units may require four or more sessions weekly.

Adequate provision must be made in the radiology budget for the staff and use of resources needed for ERCP.

Radiological facilities

Some endoscopic procedures, other than ERCP, such as oesophageal dilatation and intubation, small bowel tube studies, and some colonoscopies, require *x* ray facilities or are more safely performed with radiological control. In an average district general hospital these procedures may amount to around two sessions of radiology per week. When an ERCP service is provided at least two further radiological sessions are needed using high quality equipment.

Gastrointestinal endoscopy and radiology services are complementary; their relative indications constantly change with new technology, so for these reasons endoscopy units are ideally sited adjacent to departments of radiology to encourage close professional working relationships and efficient cost effective staffing, patient management, and scheduling.

Where endoscopies are regularly performed in the department of radiology it is desirable for one screening room to be modified for endoscopic use. It should contain suitable equipment to enable predisinfection cleaning of endoscopes. There should be storage facilities for endoscopes, cleaning equipment, light source, diathermy, drugs, oxygen, and suction. Cupboards and drawers are needed for small items such as histology pots, dressings, mouth guards, syringes etc. An endoscopy trolley should also be sited in the department. If the endoscopy unit is some way from the department of radiology a disinfection room must be provided in the radiology department.

When there is a need for several combined endoscopic and radiological sessions weekly, and the department of radiology cannot be used, the provision of a fluoroscopy room in the endoscopy unit should be considered. In the district general hospitals where ERCP is not performed and the department of radiology is not regularly used by the endoscopists, a satisfactory alternative is to provide the endoscopy unit with a C-arm image intensifier (perhaps shared with another department such as the operating theatre) which should have a freeze frame or memory facility to reduce radiation dose. This can be used for procedures such as oesophageal dilatation and intubation when indicated.

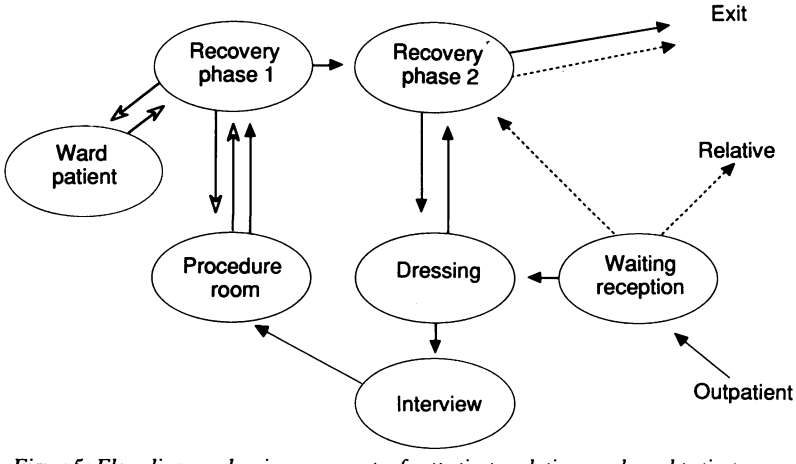

Figure 5: Flow diagram showing movements of outpatients, relatives, and ward patients within the endoscopy unit.

Patient flows

The design of the endoscopy unit should reflect patient flow. Most patients are examined on an outpatient basis. They should report to a reception area and be conducted into a pleasant waiting area with their accompanying friends or relatives. The waiting area should be adjacent to a dressing room with toilets and an interview room. From here they are conducted into the endoscopy room where usually they are sedated and the procedure performed. After the examination patients are wheeled on the examination trolley into a recovery area which should be divided into two sections; one suitable for patients recovering on trolleys and a second contiguous area to which patients are moved for second stage recovery in an armchair where they can receive refreshment. There should be separate access doors to the waiting area so that friends or relations may assist with second phase recovery and receive information from the medical staff about the procedure which has been undertaken and instruction for further patient management. There should be access from the stage two recovery area to the dressing room. It is desirable for patient flow to be arranged so that patients about to undergo endoscopy do not come into close contact with those who have just undergone the procedure.

Patients from the wards, some of whom are very ill, should enter and leave the unit separately from outpatients and can conveniently wait in their bed or on a trolley in the recovery area before endoscopy. After endoscopy the patients return to the recovery area before returning to the ward.

Functional planning of individual endoscopy units will vary, but should take into account the different needs of day cases, inpatients, and staff welfare in addition to efficient endoscopy practice and administration. The necessary components of a unit would consist of two endoscopy rooms and a third procedure room; large areas needed would be for relatives, reception preparation, and recovery of patients; specially designed and sited cleaning, disinfection, and storage areas for instruments; staff and administration accommodation; store and specimen collection points; all laid out to facilitate patient flow and efficient working.

STAFFING

The 1987 BSG report on the Staffing of Endoscopy Units[23] gave factual advice on the deficiences in current provisions and made reasoned recommendations for the future. The present report translates recommendations into the needs for an individual district general hospital endoscopy unit (serving a population of 250 000), the requirements of smaller or larger hospitals being marginally different.

Medical staff

A district general hospital endoscopy service will be consultant led. Specially trained clinical assistant or staff specialist grade endoscopists will supplement the work of consultants. The basic predicted requirements for a district general hospital include six sessions weekly of upper gastrointestinal endoscopy (6–10 patients per session), two sessions of colonoscopy (4–5 per session), and two or more sessions of flexible sigmoidoscopy (6–10 session). One or two consultant sessions will be needed for administration, audit, correspondence, meetings, and efficient running of the unit. Thus 10, and in larger units 12–14, sessions of medical time are required for a district general hospital unit, at least six of which should be consultant sessions.

Three or more consultants (physicians, surgeons, and perhaps a radiologist) will be needed to provide this service with cover to the unit throughout the week and an on call rota for nights, weekends and public holidays. No consultant concerned in endoscopy should give less than a two session commitment, which will be included in the job description of new appointments having a gastrointestinal interest.

Clinical assistant, hospital practitioner, and staff grade endoscopists will provide the additional sessions needed to provide the total of at least 10 sessions predicted, as well as covering extra demands including surveillance examinations, open access services, and running the basic lists when the consultant is not available. One or two clinical assistants/hospital practitioners/staff endoscopists should be part of a district general hospital endoscopy unit team, each with two (or more) sessions, including attendance at meetings, as part of a longterm tenured professional commitment to endoscopy.

An ERCP service will need two to three endoscopic consultant sessions weekly and a corresponding number of radiological sessions. These sessions might come from the staff of two hospitals.

Nursing staff

The demanding requirements for specialist endoscopy nurses have been referred to above. A two room endoscopy unit cannot function at peak periods without five trained nurses. At least one nurse, and possibly two depending on the technical help available, is needed in each endoscopy room; another qualified nurse should be responsible for patient preparation and explanation of the procedure and another should supervise recovery unlesss this is supervised by a nurse in a neighbouring day care unit. Extra trained staff will be needed if emergencies, bronchoscopies, or ERCPs are to be undertaken in another room. Six staff must be employed to provide five on site, allowing for 20% sick, study, or annual leave. Time must be allocated to the sister in charge for administration and management.

The senior nurse carries management responsibilities equivalent to a ward sister, cares for a defined caseload of at least 3000 patients annually (most of whom receive sedation and require nursing supervision), and is concerned in the continual assessment and development of standards of care. Sister status at grade G is thus fully justified. In some larger and more specialised units the sister not only fulfils all these roles for a larger staff and greater caseload, but also prepares and implements postbasic nursing

training programmes for staff from other units and provides clinical advice for and liaison with staff outside the unit. In these circumstances sister status at grade H is appropriate.

By making maximum use of non-nursing personnel including technician assistants (see below) and realising the opportunity in a mainly day care service of job sharing, part time, and flexitime rostering of nurses, the endoscopy unit should be able to work efficiently with realistic numbers of trained nursing staff. Even so, a district general hospital providing 10 sessions of routine endoscopy, mainly using one room at a time, but using a second room for emergencies or flexible sigmoidoscopies, needs a sister (G grade), a senior staff nurse (F grade), and four nurses (E-D grades) to ensure four nurses on duty most of the time and five at times of greatest activity. For larger units, and those undertaking ERCP or a bronchoscopy commitment, extra endoscopy trained nurses will be needed and back up arrangements could still be required – for example, from operating theatre or day ward personnel – at times of emergency.

Technical staff

The 1987 report[23] recognised the possibility of a technical (non-nurse) endoscopy assistant grade. No training schedule for endoscopy technicians exists and such posts are not recognised. The role of such a technician has already been described and we recommend that steps are taken forthwith to create these posts.

Ancillary and voluntary staff

There is a useful role for care assistants or voluntary workers in helping with simpler but time consuming aspects of day care, including welcoming patients, help with changing and preparation for endoscopy, looking after the needs of relatives, and providing refreshments or company in the aftercare ward.

A dedicated porter is needed to transport patients from and to the wards. Full domestic services are required for cleaning of the unit.

Secretarial staff

Less than half the units surveyed in the 1987 report had a secretary to undertake some of the administrative load and release the sister in charge to the nursing role for which she is trained. Every unit requires an experienced medical secretary (HCO or Administrative Assistant grade) capable of a central role in unit administration and day case management.

GASTROINTESTINAL MEASUREMENT LABORATORY

Reference has already been made to the desirability of combining other gastrointestinal investigations with endoscopy. Examples of such tests involving intubation include the measurement of gastric and pancreatic secretion, intubation tests for obtaining biopsy specimens from the small intestine, longterm recording devices for detecting reflux of acid from the stomach into the oesophagus, observation on movements and pressures in the gut, and study of the anal reflexes and pelvic floor muscles. Other tests, such as measurement of hydrogen liberated from the gut into the breath, do not need passage of a tube but are also now part of routine gastrointestinal practice.

These non-endoscopic tests would best be performed by a physiological measurement technician with special training in gastroenterology. Steps are being taken to create such posts. Only units offering a comprehensive investigative service for several hospitals would need a full time technician. It is likely that in other hospitals technicians trained in at least two specialities will work in more than one hospital department.

IMPLICATIONS FOR THE USE OF CLINICAL RESOURCES

Open access endoscopy

The costs to the hospital of increased work in the endoscopy department have to be set against potential benefits to the patient and other services. An advantage is that outpatient consultations are reduced.

For the patient open access endoscopy saves the waiting period and time taken from other activities for a visit to the outpatient department of a hospital. The waiting period for endoscopy should be short and the general practitioner can then decide on further management.

The general practitioner welcomes open access upper gastrointestinal endoscopy because it enables him or her to manage the patient personally without referring for a specialist consultation. Surveys have shown that the proportions of different diagnoses among patients referred from general practitioners and from hospital departments are similar.[12 14]

Open access endoscopy to general practitioners should be provided by all endoscopy units. An educational programme, however, is needed so that the procedures are performed for accepted clinical indications and scrutiny of requests by unit staff may be helpful.

Bronchoscopy

The requirements for flexible bronchoscopy are similar to those for gastrointestinal endoscopy, and these examinations may be efficiently managed by endoscopy unit nursing and ancillary staff. Cooperation with respiratory medicine clinicians in hosting bronchoscopy sessions in the unit may be mutally advantageous, providing that the unit's size and budgetary and staffing levels are adjusted accordingly.

Radiology

The relative merits of endoscopy and radiology are finely balanced[28] but there is a trend, developing slowly in Britain and more rapidly in some other countries, for endoscopy to be performed as the first examination rather than barium meal or barium enema. Local circumstances dictate the balance between endoscopy and radiology in many hospitals.[29] Where

possible, however, the performance of both types of investigation for one patient should be avoided. It is for this reason that endoscopy is increasingly used, as doubtful radiological findings often have to be checked by endoscopy, whereas the converse is rarely the case.[30 31] Endoscopy has the further advantage that irradiation exposure is avoided or minimised. The close interrelation between endoscopy services and the *x* ray department has been emphasised. Cooperative attitudes, including cross referrals, case consultations, meetings, and audit should ensure good practice with the avoidance of unnecessary duplicated examinations. When endoscopic procedures are performed regularly in the *x* ray department nurses working there may wish to receive endoscopic training.

Pathology
Endoscopies result in many diagnostic specimens (histopathological, bacteriological etc). Liaison with pathologists is desirable, including regular meetings to review case material. The service load from endoscopy should be recognised by appropriate organisation and staffing in the histopathology department. Budgetary implications are considered below.

Operating theatres
Surgeons should be encouraged to perform routine endoscopies in the endoscopy unit during sessional commitments, rather than adding sporadic endoscopies to operating lists. There should, however, be close working relations with operating theatre personnel who will have responsibility for some endoscopic procedures performed during operation or on an emergency basis. An operating theatre will require access to a gastroscope and colonoscope, equipment to maintain and disinfect them, and accessories for emergency or peroperative use. Where the theatre suite is at a distance from the endoscopy unit additional instruments will be required. Surgeons, theatre nurses, and operating department assistants require training in the care of these instruments in the same way as endoscopy unit staff.

CAPITAL COSTS

Building
Building costs depend on local factors and no estimate is possible. Facilities for radiological screening are needed by all units and those offering ERCP need access to a specially equipped *x* ray screening room. Radiological facilities should be taken into account when estimating capital costs.

Equipment
Constant improvements are taking place in the design of endoscopes. Hitherto, flexible endoscopes have depended on bundles of fine glass fibres for transmission of an image. Video endoscopes are now produced in which a high resolution image is detected by a chip at the tip of the instrument, analogous to a small television camera, and transferred electronically to video screen and recorder. The operator no longer has to look through the instrument which keeps the risk of body fluid contamination away from the face, can stand erect and use the control at waist level which is less fatiguing, and can pay attention not only to the screen but also to events in the endoscopy room. Storage of the image on video tape or video disc, with production of video prints for the report will soon be as important in documenting the results of endoscopy, and maintaining standards, as *x* ray films are in radiological examination. Such records can be used for discussion with the patient or relatives and for teaching. Fibre endoscopes remain convenient for use outside the endoscopy unit because of their mobility.

Most units build up equipment over many years but adequate initial outlay is essential. Since a diagnostic gastroscopy may take only 5–10 minutes, but instrument cleaning/disinfection takes 15 minutes or more, it is necessary to have three up to date routine endoscopes for a gastroscopy list, with another (older) instrument available as back up to cover repair periods. Additional large channel 'therapeutic' and small diameter paediatric instruments are needed for special circumstances. Similarly, the basic 'set' of two colonoscopes or ERCP instruments must be supported by further (older) back up instruments and also by therapeutic and paediatric versions. Each room needs equipping with supporting apparatus – for example, electrosurgical unit, instrument trolley, washing machine. Some units require laser equipment for destruction of tumour tissue and control of bleeding. A mobile C-arm fluoroscopy unit should be provided in units remote from *x* ray facilities.

The endoscopy rooms and nursing and reception areas each need micro-computer database input and print out facilities. Because flexible endoscopes are expensive (£8000–14 000 each) gastrointestinal endoscopy has wrongly been considered to be a costly technique. A day case endoscopy procedure may often replace major surgery yet can be costed in the £100–400 range. The capital costs of all the equipment and accessories for an endoscopy unit using two rooms full time and sharing the use of an *x* ray room for ERCP is about £450 000 at 1990 prices.

REVENUE COSTS

Equipment repair, replacement, and depreciation
Endoscopes are liable to mechanical or electrical failure or damage, and repairs are expensive. After initial capital outlay all the major equipment of the unit requires a maintenance and replacement budget. The life of an endoscope is usually four or more years; replacements are needed because of deterioration with use, and also because of constant improvements in design. In calculating procedure costs it is assumed that an instrument will be replaced once its depreciated value is less than the cost of a major repair to keep it functioning.

Staff costs
A procedure cost can be calculated on the basis of the time taken to perform a procedure and the minimum staff necessary.

Ancillary items and disposables
These costs include drugs, syringes, accessories such as biopsy forceps or snares, disposables such as prostheses, sterilising fluids, and similar items. Many endoscopic accessories are reusable but others are recommended for single use. Disposable items for special therapeutic procedures – for example, biliary balloon catheters or disposable sphincterotomes – are expensive, but their use replaces surgery and shortens inpatient stay.

Recovery unit
This is the cost of providing adequate reception and recovery facilities for 'day cases.' These costs may be wholly attributable to a unit with integral facilities or may be a share of the cost of a multidisciplinary day unit.

Hospital overhead charges
Components attributable to the unit include such expenses as administration, cleaning, lighting, and heating, rates, and capital depreciation on the building.

PROCEDURE AND UNIT OVERHEAD COSTS
Taking into account all the items enumerated a procedure cost can be calculated. Such calculations for the Freeman Hospital, Newcastle in 1990 gave the following estimates (figures rounded).

Diagnostic upper gastrointestinal endoscopy	£65
Therapeutic upper gastrointestinal endoscopy (oesophageal stenting)	£130
Diagnostic colonoscopy	£110
Therapeutic colonoscopy (polypectomy)	£170
Diagnostic ERCP	£120*
Therapeutic ERCP	£365*

*Plus radiology costs

The Unit overhead variable costs included in these figures represent the difference between the sum of the total individual procedure costs based on equipment, staff time, and disposable items and the annual cost of running the unit. Their size reflects the 'efficiency' of the unit as it includes such elements as unused staff time.

ANNUAL BUDGET
Endoscopy has developed rapidly since the early 1970s. Its development has been hindered by the lack of a proper budget because endoscopy units have not been regarded as service departments. This paper shows the large clinical workload; the major medical staff implications which cross departmental borders such as medicine, surgery, and radiology; the need for a specially trained nursing establishment; the essential role played by secretarial staff backed by computer facilities; and the capital and revenue costs. In future, endoscopy units need a properly costed budget as a service department, analogous to radiology departments which also undertake both diagnostic and therapeutic procedures using specialised equipment.

Summary
(1) The number of endoscopic examinations performed is rising. Epidemiological data and the workload of well developed units show that annual requirements per head of population are approaching:

Upper gastrointestinal	1 in 100
Flexible sigmoidoscopy	1 in 500
Colonoscopy	1 in 500
ERCP	1 in 2000

(2) Open access endoscopy to general practitioners is desirable and increasingly sought. For a district general hospital serving a population of 250 000, this workload entails about 3500 procedures annually, performed during 10 half day routine sessions plus emergency work.

(3) High standards of training and experience are needed by all staff, who must work in purpose built accommodation designed to promote efficient and safe practice.

(4) The endoscopy unit should be adjacent to day care facilities and near the *x* ray department. There should be easy access to wards.

(5) An endoscopy unit needs at least two endoscopy rooms; a fully ventilated cleaning/disinfection area; rooms for patient reception, preparation, and recovery; and accommodation for administration, storage, and staff amenities.

(6) The service should be consultant based. At least 10 clinical sessions are required, made up of six or more consultant sessions and two to four clinical assistant, hospital practitioner, or staff specialist sessions. Each consultant should be expected to commit at least two sessions weekly to endoscopy. Extra consultant sessions may be needed to provide an efficient service.

(7) A specially trained nursing sister (grade G or H) and five other endoscopy nurses are needed to care for the patients; their work may be supplemented by care assistants.

(8) A new post of endoscopy department assistant (analogous to an operating department assistant) is proposed to maintain and prepare instruments, and to give technical assistance during procedures.

(9) A full time secretary should be employed. Records, appointments, and audit should be computer based.

(10) ERCP needs the collaboration of an interventional radiologist working with high quality *x* ray equipment in a specially prepared radiology screening room. This facility may need to serve more than one hospital.

(11) A gastrointestinal measurement laboratory can conveniently be combined with the endoscopy unit. In some hospitals one or more gastrointestinal measurement technicians may staff this laboratory.

(12) An endoscopy unit is a service department

analogous to a radiology department. It needs an annual budget.

The Working Party was set up by the Clinical Services Committee of the British Society of Gastroenterology. Members were: Professor J E Lennard-Jones, Chairman; Dr C B Williams, Endoscopy Vice-President 1989; Dr A Axon, Endoscopy Vice President 1990; Mrs P Bottrill, Chairman, Endoscopy Associates; Mrs J Wicks, Secretary, Endoscopy Associates; Dr R Jones, Chairman, Primary Care Society; Mr M W L Gear, Endoscopy Committee and Surgical Section; Mr C Venables, Surgical Section; Mr A Watson, Surgical and Oesophageal Sections; Dr D Martin, Radiology Section; Dr N Dent, Public Health; Miss C Manson, observer, Advisor in Nursing Practice, Royal College of Nursing; Dr N Melia, observer, Senior Medical Officer, Department of Health.

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