normal subjects. In both patients with Hodgkin's disease localisation of radioactivity in lymph nodes thought clinically to be abnormal was neither increased nor clearly decreased in comparison with corresponding clinically normal nodes.

Clearance of radioactivity from the blood in the two subjects studied is shown in fig 3. In both cases there was an immediate loss of about half the radioactivity; radioactivity thereafter cleared more slowly down to about 25% at 12 hours. There was then a rise in activity of about 10%, followed by further much slower clearance.

Discussion

¹¹¹In has recently been developed as a label for granulocytes, lymphocytes, and platelets.¹⁻⁹ With this tracer the circulation and distribution of these cells can be followed in animals and man. The label appears to be incorporated in the cell cytoplasm in a stable manner. The capacity of ¹¹¹In-labelled lymphocytes to recirculate normally has been shown in the rat¹: the cells leave the blood, enter the lymphatic system, and can be recovered from the thoracic duct.

We chose to study human lymphocyte kinetics in patients with Hodgkin's disease because they are known to have abnormalities of lymphocyte function.¹⁰ We hoped that the distribution of labelled lymphocytes might give some index of the extent of clinical disease. In fact the patients with Hodgkin's disease and the normal subjects showed similar whole-body distributions of radioactivity. In all the subjects the early distribution in the liver showed low levels comparable to those seen in the rat. This suggests that the number of non-viable labelled cells was small. In the rat about half the activity is in the spleen but this figure later falls to 30%.¹ Activity in the blood is relatively low (1-2%). Our studies showed a consistent level of splenic activity and relatively higher blood levels. Lymphocyte kinetics in rat and man need not, however, be directly comparable, and the cells labelled in this study included other mononuclear cells, especially monocytes, which do not circulate through lymphatics and might have augmented the blood pool.

Radioactivity was first identified in lymph nodes between four and 18 hours. This parallels the observations in the rat.¹ The secondary rise in peripheral blood radioactivity that occurred in between 12 and 18 hours is presumably due to re-entry of labelled lymphocytes from the thoracic duct. In the rat the transit of T cells through lymphatic tissues takes about 18

hours, while B cells take considerably longer.¹¹ The secondary rises we saw may therefore have been due principally to the re-entry of T cells.

Comparable groups of lymph nodes were visible in all subjects, although the proportion of labelled cells that migrated into the lymphatic tissues varied from subject to subject. Migration into lymphoid tissues seemed to be highest in one of the patients with Hodgkin's disease. In neither of the patients was there any specific localisation of radioactivity in nodes thought clinically to be abnormal. In general we noted that not all lymph-node groups were visible: in the lower part of the body we saw inguinal and external iliac but not para-aortic nodes; in the upper body we saw mediastinal and cervical nodes but not axillary, internal mammary, or supraclavicular nodes. Some of this disparity may have been due to anatomical or technical factors—for example, different relative sizes and depths of nodes—but labelled lymphocytes may migrate preferentially to lymph nodes that are immunologically "active."

This preliminary study shows that the distribution and circulation of ¹¹¹In-labelled autologous lymphocytes can be visualised and measured in man. The use of this technique may have further clinical applications.

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CONDENSED REPORTS

Demand for patient care

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Summary

A study was performed to determine the extent to which patients of all types were receiving inappropriate levels

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of care. The needs of patients in acute and supporting hospitals, people in residential homes, and patients cared for at home were assessed. A sixth of the hospital in-patients did not need hospital care, while 5% of those in residential homes and 5% of those at home did need hospital services.

These findings indicate that a realistic provision of hospital beds would be 4 per 1000 population for all specialties except regional specialties, psychiatry, mental subnormality, obstetrics, and paediatrics. About a third of these beds need to be acute, while the rest may be in supporting or community hospitals. Thus the current provision of acute beds (2.0 to 2.5 per 1000 population) exceeds actual need.

Introduction

Between 1966-7 and 1973-4 inpatient costs doubled in teaching and non-teaching hospitals in Great Britain,¹ while the retail price index increased by only two-thirds.² The current cost of treating an inpatient averages £160 per week in provincial teaching hospitals and £150 per week in acute non-teaching hospitals. If present trends are maintained the overall average inpatient cost will be at least £300 per week before the end of the 1970s. Indeed, private patients requiring single rooms are already charged £300 per week in provincial teaching hospitals and £253 per week in acute non-teaching hospitals.³ Much of the increase in expenditure is attributable to rises in wages and salaries, which now account for four-fifths of the hospitals' revenue. Added to this is the increasing cost and volume of advanced medical apparatus necessary for modern diagnosis and treatment. A further factor is the expanding demand for health services. There is, however, some evidence in some areas that so far as hospital admissions are concerned demand has reached or will soon reach a peak and may even decline. The rate of hospital discharges and deaths in recent years has been smaller than would have been expected from the growth trend observed in the 1960s. Since health services must always remain primarily labour intensive rather than capital intensive a realistic assessment of the demand for patient care is clearly important. It is as undesirable to provide more elaborate care than is necessary as it is to maintain inadequate services. Health planning requires considerable acumen coupled with inspired guesswork.

In the past 20 years various studies⁴⁻¹⁰ have indicated that between a fifth and a third of patients in acute hospitals could be cared for in a less expensive institution or at home. This information may have had some impact on hospital planning but it seems to have had little effect on hospital practice because the proportion of patients judged to be in inappropriate beds shows little evidence of declining. No community study has been performed to show the total extent of the mismatch. An opportunity for such an exercise presented itself in a planning survey¹¹ undertaken jointly by the Northern Health and Social Services Board and Department of Health and Social Services in Northern Ireland. We summarise here the main findings and conclusions.

Scope of the survey

The board's area of about 1670 square miles includes most of County Antrim and parts of Counties Londonderry and Tyrone. It is bounded in the north and east by the sea and on the west by the Sperrin Mountains. Consequently the major lines of communication run in a north-south direction with a pivot on Belfast, the provincial capital. Some 80 000 of the population of 350 000 look to Belfast for their acute hospital services, so that about 300 000 people (including some patients from outside the area) are provided for in the 18 hospitals in the area. Seven hospitals are classified as general or acute hospitals and 11 are chronic sick, geriatric, and general practitioner hospitals. The location and the number of available beds are shown in the accompanying map. Most of the acute hospitals are reasonably well equipped but some of the hospitals for the chronically sick are poor and, if retained, will need considerable renovation. In 1973 the total number of beds was 1793; 1323 of these were classified as general.

The total number of admissions to these beds was 34 888, giving an overall admission rate of 116 per 1000 population. This figure excludes (a) admissions to regional specialties (orthopaedics, ophthalmology, plastic surgery, radiotherapy, etc), which are provided outside the area, mainly by the Belfast hospitals; (b) admissions to psychiatric and mental subnormality hospitals; (c) maternity admissions; and (d) paediatric admissions.

There are also 18 residential homes in the area with accommodation for 840 residents. In Northern Ireland these homes are administered by the board, and not by local authority social services departments, as in the rest of Great Britain.

Most general practices in the Northern Area have attached district nurses, who provide nursing care for patients at home. There is little difficulty in recruiting staff at the hospitals or in the community, except for hospital doctors, who tend to avoid small hospitals because of the limitations in the range of work.

Location of hospitals in Northern Health and Social Services Board

Key:

No	Hospital	Beds available 1973	Main type
1	Coleraine	166	General
2	Ratheane	16	Geriatric
3	Mary Ranken	16	GP maternity
4	Hopefield	32	GP
5	Dalriada	50	GP
6	Route	130	General
7	Robinson Memorial	37	GP
8	Cushendall	18	GP
9	Waveney	209	General
10	Braid Valley	184	Geriatric
11	Ballymena Cottage	26	GP maternity
12	Moyle Smiley	206	General
13	Dixon	70	Convalescent
14	Mid-Ulster	195	General
15	Massereene	144	General
16	Carrickfergus	36	GP
17	Greenisland	79	Geriatric
18	Whiteabbey	179	General

Method

A questionnaire on physical, medical, and social dependence was completed for each patient in hospital, residential home, or the community. Since hospital provision was the major concern, two separate censuses were made of hospital patients, in March and September 1974. When the results showed differences that could not easily have arisen by chance a third census was undertaken as a check, and the results that were least divergent were combined for analysis. It was hoped this would reduce the errors and eliminate atypical results.

Similar questionnaires were developed for people in residential homes and domiciliary patients. A residential home was treated in the same way as a hospital except that only one survey of all patients in the home on one day in March was made. This approach was not feasible for domiciliary patients. Instead the sample consisted of all patients seen by all district nurses during a week in March. The period was arbitrary, but the district nurses generally considered that ill patients would be visited at least once a week. The results, therefore, related to all people in the study area receiving total institutional care (except those already specified) or ill enough to require home nursing. Questionnaires were completed by ward sisters, heads of residential homes, and district nurses. A member of the planning team checked

the forms to ensure a high standard of accuracy and completeness. Coding and analysis were carried out centrally.

CRITERIA

A fundamental aspect of the study was the development of criteria for assessing the appropriate degree of care for each patient. Our interest centred on the levels of care provided by acute hospitals, by supporting hospitals, and in the community.

Acute hospitals provide complex diagnostic services and the more technically dependent forms of treatment. Supporting hospitals aim at caring locally for patients who do not need or no longer need the services of the acute hospitals. They also aim at complementing the community services. These hospitals could provide preconvalescent and continuing geriatric, psychiatric, and psychogeriatric care; allow patients to be admitted directly for treatment by general practitioners; and provide consultant outpatient clinics and day care. Unlike the dependence groupings associated with inpatient care in acute hospitals, where the amount of nursing time can be used to determine nursing work load,¹² there is no such objective yardstick to indicate where a patient should be placed, so we proceeded on the basis of a consensus of medical and nursing opinions.

The questionnaire included 27 questions, excluding those on age, sex, and civil status, and the medical and nursing staff immediately dismissed the information obtained by some of the questions as unimportant. The remaining answers (see table I) were assessed against a background of (a) a review of the case notes of a sample of patients, and (b) ward rounds with consultants to elicit the combination of factors that would best discriminate between the different levels of care needed. Eventually the hospital and planning staffs achieved a good measure of agreement. The threshold erred on the side of generosity. For example, when it was doubtful whether a patient should be in an acute or supporting hospital the decision was made in favour of the acute hospital. Thus our results are probably an estimate of maximum rather than minimum demand. Clearly more stringent criteria would have reduced the numbers needing care in an acute hospital, but they would have produced less unanimity among the professionals concerned. Further work is being undertaken to explore the effect of alternative classifications.

Hospital care was determined according to the level of technical and nursing care required. A low level of need for technical care coupled with a need for high-level nursing care nominally indicated the need for a supporting hospital, but it is unrealistic to adopt a completely mechanistic approach and there were exceptions to this rule. For example, when a patient had been in an acute hospital and

was waiting, say, for a consultant visit then he was left in the acute hospital category. The criteria were interpreted against a background of practical management so the results are related to the real world rather than to some idealistic state.

Results

The two hospital surveys provided information on 2797 patients but for simplicity table II shows the average daily number of patients over all 18 hospitals. Tables A and B† show the same figures but broken down according to age and sex. Table III shows the data for residential homes and domiciliary care. Together the tables provide a snapshot of the overall demand for patient care in a community of about 300 000 people.

TABLE III—Analysis of survey of residential homes and domiciliary patients

	Residential care		Domiciliary care	
	Needing inpatient care	Needing other care	Needing inpatient care	Needing other care
No (%,) of patients	34 (5)	678 (95)	129 (5)	2567 (95)

A sixth of the inpatients did not require the services of a hospital, while 5% of patients at home and a similar proportion of those in residential homes did need hospital services. The addition of those who were justifiably in hospitals and those outside hospital whose degree of dependence would have merited care in hospital gave a total of 1193, which represents a rate of 4.0 per 1000 for all types of hospitals, excluding regional specialties and psychiatric, mental subnormality, maternity, and children's hospitals. To estimate the number requiring acute and non-acute care, patients in residential homes and at home who needed hospital care were all classified as non-acute cases. This meant that 464 patients required acute care and 729 non-acute care, a ratio of 0.6:1.

With the liberal policy adopted a community of 100 000 is likely to require on any one day acute hospital accommodation for 150-160 patients and non-acute facilities for 240-250 patients. There would also be about 230 people in residential homes and nearly 900 patients to be cared for jointly at home by the district nurse and general practitioner.

Discussion

Despite the recent explosion in information on health services and the elaborate statistical guides compiled for health care planning,¹³ no one has made a basic estimate of the real demand for hospital or community care. Forsythe and Logan⁴ found that 40% of the women and 25% of the men in medical beds in acute hospitals in Barrow-in-Furness did not need to be there on solely medical grounds, and in a further 15% of women and 21% of men there was some doubt. The lower percentage in our study was to be expected because we considered both medical and nursing reasons for hospital care in both acute and non-acute hospitals. At the Radcliffe Infirmary, Oxford, which has one

†Copies of tables A and B are available on request from the authors.

TABLE I—Information obtained from questionnaire about each patient that was useful in determining most appropriate degree of care*

Time spent out of bed	Clinical, cardiac, and x-ray observations made
Degree of mobility	Types of dressings applied or suction administered
Degree of continence of urine	Frequency of oral and intramuscular medication
Degree of continence of faeces	Types of medication
Amount of help needed in:	Types of laboratory test performed
Washing	Injuries requiring traction
Using toilet	Whether patient was waiting for results, investigations, consultant's opinion, or surgery
Eating	Presence of burns
Dressing	
Degree of consciousness and whether patient had special care	
Type of surgery and number of days since operation	

*Copies of the questionnaire can be obtained from the authors.

TABLE II—Analysis of survey of hospital inpatients

Specialty	Average daily No of patients in hospital	No (%,) not requiring hospital care	No (%,) requiring care in:		
			Hospital (acute and supporting)	Acute hospital	Supporting hospital
Medicine†	266	36 (13.5)	230 (86.5)	163 (61.3)	67 (25.2)
Surgery	276	16 (5.8)	260 (94.2)	213 (77.2)	47 (17.0)
Ear, nose, and throat	29	1 (3.5)	28 (96.6)	28 (96.6)	
Gynaecology	57	4 (7.0)	53 (93.0)	51 (89.5)	2 (3.5)
General practitioner, geriatric, and convalescent hospitals	608	149 (24.5)	459 (75.5)	9 (1.5)	450 (74.0)
Total	1236	206 (16.7)	1030 (83.3)	464 (37.5)	566 (45.8)

†Includes dermatology.

of the highest rates of throughput of patients in the United Kingdom, Loudon⁸ found very few patients who could have been discharged home, but 17% of medical patients and 1% of surgical patients could have been cared for appropriately in a general practitioner unit.

Acute hospital facilities are undoubtedly often used where less expensive alternatives would meet the patients' needs. The fact that perhaps a fifth of the inpatients could be accommodated elsewhere indicates the wide margins within which planners can allocate their priorities, assuming, of course, that they could persuade people to accept fewer facilities when demand was at its greatest.

Generally, the Department of Health and Social Security provides 2.0 to 2.5 beds per 1000¹⁴ as the inclusive norm for all acute beds, including paediatrics. The geriatric norm is 10 beds per 1000 people aged over 65 years¹⁵ (this includes five beds per 1000 in community hospitals). Given that a tenth of the population is aged 65 years or more, the number of beds for geriatrics in a population of 1000 will be 1, to which can be added the provision for the general acute specialties. This amounts to 3.5 beds per 1000, which is slightly less than that found in this study. Our significant finding is that demand for highly expensive acute hospital beds is much smaller than the current national provision. If our results are typical then probably no more than 1.5 general acute beds per 1000 population are needed, and in some circumstances even fewer may be adequate. A further 2.0 to 2.5 beds per 1000 population would be needed in supporting or community hospitals, which would provide nursing care. These estimates, however, must be interpreted with caution until further field studies, which need not be costly or prolonged, have been made in other areas.

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Reprints of the paper and copies of the tables, the criteria, and survey forms can be obtained from SND.

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SHORT REPORTS

Clonidine-induced facilitation of baroreceptor reflex

The hypotensive action of clonidine may result in part from its facilitation of the baroreceptor reflex. In the present study direct stimulation of the carotid sinus nerve in a conscious hypertensive patient was performed during low- and high-dose clonidine treatment to show the drug's facilitatory effect on the human baroreceptor reflex.

Methods and results

A 56-year-old man had a permanent carotid sinus nerve stimulating device, a baropacer,¹ implanted in 1968 as treatment for severe hypertension refractory of medical treatment. He was maintained on various antihypertensive medications thereafter, and between April 1975 and December 1976 his blood pressure was adequately controlled with continuous baropacing and concomitant clonidine (1.8 mg/day) and diuretic treatment. On 8 December 1976 the diuretic spironolactone was discontinued and between 1 and 9 January 1977 the dose of clonidine was tapered to 0.2 mg twice daily (0800 and 1500 h). The baropacer was turned off 24 hours before the beginning of the study, for which informed consent had been given.

On day 1 (10 January) the 0800 dose of clonidine was replaced by a placebo tablet. Baseline blood pressure and heart rate measurements were recorded using a Roche 1216 Arteriosonde and an electrocardiograph tracing. The baropacer was then activated for 20 minutes and turned off for the remaining 40 minutes of the first hour. The procedure was repeated for each of the next three hours. At 1500, the patient received clonidine 0.6 mg and the baropacer was turned on until 0800 of the next morning. On day 2

a total dose of clonidine, 1.2 mg, was administered, with a further 0.4 mg given at 0300 on day 3. At 0800 on day 3 the baropacer was again switched on for the first 20 minutes of each of four consecutive hours and changes in blood pressure and heart rate were followed.

On day 1 during low-dose clonidine treatment the average mean blood pressure (diastolic + 1/3 pulse pressure) and heart rate at the start of the 4-hourly observation periods were 154 mm Hg and 72 beats/min (figure). Subsequent stimulation of the carotid sinus nerve reduced the average heart rate to 57 beats/min but decreased the mean blood pressure to only 146 mm Hg at 6 minutes. In contrast, on the high-dose clonidine day, activation of the baropacer resulted in a pronounced fall in mean blood pressure from (144 to 115 and 116 mm Hg at 2 and 20 minutes, respectively). The average heart rate (54 beats/min) was appreciably lower than on day 1 and fell to 50 beats/min at 8 minutes.

Discussion

The depressor response to carotid sinus nerve stimulation in this patient during high-dose clonidine therapy supports the concept that the drug's hypotensive action may be mediated in part by its facilitation of the baroreceptor reflex. These observations agree with those of animal studies²⁻³ in which activation of the sinoaortic nerves has been shown to produce a greater hypotensive response during clonidine treatment. In the anaesthetised cat³ the fall in arterial pressure appears to result from a decrease in sympathetic outflow since clonidine also reduces discharges at the level of preganglionic splanchnic and post ganglionic renal nerves. In man,⁴ enhancement of alpha-adrenoceptor activity with bolus injections of phenylephrine produces a more pronounced reflex bradycardia during clonidine treatment, suggesting that the drug facilitates the baroreceptor mechanism.