Occasional Review

Deployment of resources in treatment of end stage renal failure in England and Wales

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The restricted availability of resources of the National Health Service for the treatment of patients suffering from end stage renal failure has been the subject of increasing attention from the media. Yorkshire Television (*A Lottery for Life*, 2 August 1983) attempted to show that patients' chances of receiving haemodialysis are dependent to a considerable extent on the provision of resources in their area of residence as well as on clinicians' criteria for selecting patients for treatment. More recently, in a leading article in the *BMJ* (22 October, p 1157) Dr A J Wing confirmed that regional services for the treatment of end stage renal failure do vary: there was a twofold variation in the regional crude acceptance rates in 1981. This paper provides a review of the deployment of resources in England and Wales, with particular reference to the regional variations.

Growth of patient numbers

NEW PATIENTS

The European Dialysis and Transplant Association registry of patients receiving replacement treatment for end stage renal failure shows that 25.2 new patients per million population started treatment in England and Wales in 1981 (table I). This figure was almost the same as the median for 35 countries covered by the registry. If we compare these figures with those of the five west European countries with the largest total populations, however, the 1981 acceptance rate in England and Wales was well below that in Spain, where the rate was 36.7.¹ The rates for the other three countries were even higher relatively: West Germany 49.7, Italy 43.1, and France 42.3.

In the period 1978-81 the annual number of new patients accepted for treatment in England and Wales rose from 960 to 1238. Table I shows, however, that the annual percentage rate of increase actually fell from 13% in 1978-9 to 4% in 1980-1.

Three British studies that assessed the annual incidence of persons with chronic renal failure judged "suitable" for replacement treatment (in Nottingham,² Glamorgan,³ and Northern Ireland⁴) produced similar estimates. For persons up to the age of 50 years the incidence was 28-29 per million population per annum, and for those up to 60 years it was 38-39 per million per annum. These figures would have been higher if patients with severe coexisting medical conditions such as diabetes and ischaemic heart disease or disabling mental and social problems had been included. The incidence

for patients of all ages is considered to be more than 45 per million population.² Sweden is now accepting more than 50 new patients per million population for renal replacement.¹ Yet serial mortality rates show that Sweden and England and Wales had similar prevalences for nephritis and nephrosis between 1951-5 and 1966-70.⁵ In contrast, Spanish serial mortality rates for nephritis and nephrosis have been at least double the British rates for many decades.

A joint planning group of the South East and South West Thames regional health authorities has recommended that the minimum target "take on" rate should be 40 new patients per million population.⁶ In England and Wales this represents about 2000 new patients each year. The 1981 figure of 1238 new patients accepted (table I) is less than two thirds of this minimum target. Moreover, it may be some years before the target is achieved for three reasons: (a) the total number of patients receiving renal replacement is continually expanding, (b) there may be a shortage of medical and nursing staff, and (c) some regional health authorities and district health authorities are allocating only marginal increments to budgets for renal replacement.

TABLE I—No of new patients accepted and total patients receiving treatment for end stage renal failure, annual percentage increase, and rates per million population in England and Wales 1978-81

New patients accepted for treatment			Total patients receiving treatment*		
No	Annual percentage increase	Rate per million population	No	Annual percentage increase	Rate per million population
1978	960	19.5	4750		96.5
1979	1085	13.0	5426	14.2	110.3
1980	1186	9.3	6209	14.4	126.2
1981	1238	4.4	7028	13.2	142.8

*At 31 December.
Source: Wing *et al* (ref 1).

ALL PATIENTS

Table I shows that the pool of new and established patients receiving treatment for end stage renal failure in England and Wales increased by nearly half from 1978 to 1981—from 4750 to 7028—and the percentage increase was 13-14% in each of these years. One reason for the sustained growth is that the life expectancies of each age group of patients receiving treatment for end stage renal failure are continually improving.⁷ Moreover, survival after one year of dialysis now equals survival after one year of transplantation in all age groups.

All patients receiving renal replacement are chronically ill. Once treatment has started their clinical state is regularly monitored, and the treatment is administered by hospital renal

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services even if they supervise their own dialysis at home or they have a successful kidney transplant. These requirements, naturally, have implications for resources.

Medical and nursing staff

The ratio of consultant nephrologists and senior hospital medical officers to patients with end stage renal failure accepted for treatment in England and Wales in 1981 was one consultant to 19 new patients.^{1 8} This ratio was just above the figure for 1979 of one to 18.^{1 9} More noteworthy was the change in the ratio of nephrologists to total patients. In 1979 there was one consultant to 90 patients; by 1981 the ratio was one to 106. The average number of cases of end stage renal failure per consultant had increased by 18% in two years, and these consultants were also managing patients with chronic renal failure, treating cases of acute renal failure, and, in some instances, carrying a general medicine workload. (More than 30 surgeons were administering renal transplant units in England and Wales in 1982.⁷)

There was no commensurate expansion of doctors in the junior hospital grades to help with this increased workload. The number of senior registrars, registrars (excluding non-health authority funded research posts), and senior house officers in nephrology in England and Wales only rose from 91 to 95 in the three years 1979-82.^{9 10}

The data needed to calculate nursing staff ratios are not available.

In 1978, when the government promised 400 extra dialysis machines, the Office of Health Economics surveyed dialysis units in England.¹¹ Of the 41 units that replied, only one reported unavailability of machines as a constraint; 65% said that shortage of staff was the most important factor. In some units the difficulties arose not just because they had too few nursing posts; they also could not fill their existing vacancies.

Policies and treatment loads of regional health authorities

In England policy decisions about regional renal replacement programmes are taken by the 14 regional health authorities and some show a conflict between their long term targets and their short term commitments. The South East and South West Thames regional health authorities reviewed their joint renal services and the report recommended: "There should be no change in the level of financial resources for the service in 1982-83,"⁶ despite another recommendation that an annual rate of 40 new patients per million was to be regarded as a reasonable long

term aim. The North East Thames Regional Health Authority's consultative strategic planning guidelines for 1983-93 proposed that "there be no change in the current care provision of renal services"¹² though the region's long term target is more than 50 new patients per million population annually. In West Midlands, the region with the largest total population, the regional health authority in 1982-3 allocated funds for the acceptance of new patients for dialysis to the Coventry renal unit only; the other renal units in the region were to experience "no growth."¹³

The policy making of the various regional health authorities deserves scrutiny not least because of the large variation in the regional provision of renal replacement treatments. The figure shows that in 1981 six regions (including the joint South Thames region) had an overall patient load exceeding 150 per million population, whereas in five regions the rates were less than 120 per million. (The regional numbers prepared by the European Dialysis and Transplant Association registry¹ are based on the centres providing treatment and are not adjusted for cross boundary flows of patients. For example, the figures for Mersey are slightly depressed because some patients resident in the region are treated in Wales.) One of these regions was West Midlands. The rate for Wales was no higher. The figure also shows that the regional rates of new patients accepted for treatment in 1981 correlated significantly ($p < 0.02$) and positively with the rates of total patients receiving treatment. The inequalities appear to be widening.

Relation between new patients accepted for treatment for end stage renal failure (ESRF) in 1981 and total patients receiving treatment for end stage renal failure at 31 December 1981 in English health regions and Wales. Source: Wing *et al* (ref 1).

TABLE II—Regional and national totals of patients in each treatment mode for end stage renal failure and rates per million population, 31 December 1981

Health region	No of patients					Patients per million population				
	Hospital haemodialysis	Home haemodialysis	CAPD	Functioning transplant	Total*	Hospital haemodialysis	Home haemodialysis	CAPD	Functioning transplant	Total*
Northern	120	90	87	232	557	39	29	28	75	180
Yorkshire	111	88	38	139	390	31	24	11	39	108
Trent	106	276	84	175	653	24	61	19	39	145
East Anglia	83	72	1	204	362	44	38	0.5	107	191
North West Thames	65	147	23	291	558	19	42	7	83	159
North East Thames	94	253	111	341	837	25	68	30	92	226
South East Thames	132	208	96	521	1031	20	32	15	80	159
South West Thames										
Wessex	22	85	33	113	256	8	32	12	42	95
Oxford	33	102	47	179	367	14	44	20	78	160
South Western	50	138	25	111	336	17	46	8	37	112
West Midlands	116	125	32	271	601	22	24	6	52	116
Mersey	59	68	33	133	312	25	28	14	55	130
North Western	63	128	41	172	427	16	32	10	43	107
Wales	31	120	22	152	333	11	43	8	54	119
England and Wales†	1092	1900	673	3034	7028	22	39	14	62	143

CAPD = Continuous ambulatory peritoneal dialysis.

*Totals include patients receiving intermittent peritoneal dialysis and patients with incomplete data.

†Including the Isle of Man.

Source: Wing *et al* (ref 1).

There were, moreover, pronounced differences between the regions in the proportions of patients receiving different modes of treatment (table II). For example, in East Anglia 56% of the patients had functioning transplants, and of those receiving haemodialysis more than half were treated in hospital. In contrast, in the Trent and South Western regions no more than one third of the patients had functioning transplants and the regions' home haemodialysis programmes were far larger than their hospital haemodialysis programmes.

Financial resources

Estimates of financial expenditures on end stage renal replacement have been derived from a costing study by the Department of Health and Social Security of three large English renal units.¹⁴ The study calculated the "basic" costs of haemodialysis, continuous ambulatory peritoneal dialysis, and transplantation, and the costs resulting from complications. Table III shows the estimated annual costs (in November 1981 prices) of treating individual patients who remain in a "steady state"—that is, who do not change treatment modes. (Another 1981 costing study of the North Western regional renal programme produced comparable annual estimates (B Moores, unpublished observations).)

TABLE III—Estimated annual costs derived from three renal units of treating patients with end stage renal failure who remain in a "steady state"* (November 1981 prices)

Treatment	Basic annual cost† (£)	Total annual cost‡ (£)
Hospital haemodialysis	9500-11000	11200-13650
Home haemodialysis	6500- 7000	7100- 8700
CAPD	5400- 6200	7500- 9800§
Functioning transplant:		
First year		5000- 5700
Maintenance		1400- 1650

CAPD = Continuous ambulatory peritoneal dialysis.

*Patients who do not transfer from one treatment to another during a year.

†Excluding costs of inpatient admissions, outpatient attendances, drugs, tests, etc. Apart from haemodialysis machines, home conversion costs, and minor equipment for continuous ambulatory peritoneal dialysis (all of which were calculated on an annuity of 5% of initial outlay), they are current costs.

‡Including costs of inpatient admissions for complications, outpatient attendances, drugs, tests, etc.

§Data on complications of continuous ambulatory peritoneal dialysis were based on very few patients.

Source: Mancini (ref 14).

Functioning transplants are undoubtedly the best economic option by these estimates. Even the first year costs, inclusive of costs of the transplantation operation, are lower than the basic costs for the self supervised dialysis treatments (table III). If, however, a graft fails within the first year, the cost for that year will lie between £8500 and £13 500 depending on how soon the patient returns to maintenance dialysis.¹⁴ (The survival rate for first cadaveric grafts is 57% at two years and 53% at three years.⁷)

Table IV shows an estimated annual expenditure of £0.8m (in November 1981 prices) per million population for treating patients with end stage renal failure assuming they remain in a steady state—that is, they do not transfer from one treatment to another. The rates of treatment for end stage renal failure per million population are those at 31 December 1981 (see table II). The average total annual costs per patient (column 2) are the midpoints in the ranges given in table III. To obtain the overall expenditure, however, costs incurred when patients start or transfer between treatments must be added and savings caused by deaths subtracted. For example, 18.6 transplant operations per million population were performed in the United Kingdom and Eire in 1982.¹⁵ If all these transplants functioned successfully, the first year costs including operation

TABLE IV—Estimated annual expenditure per million population in England and Wales of treating patients with end stage renal failure who remain in a "steady state"* (November 1981 prices)

Treatment	Patients per million population 31 December 1981	Mean total annual cost per patient (£)	Estimated annual expenditure on patients per million population (£)
Hospital haemodialysis	22	12 425	273 400
Home haemodialysis	39	7 900	308 100
CAPD	14	8 650	121 100
Functioning transplant	62	1 525	94 600
		(maintenance)	(maintenance)
Total	137†		797 200‡

CAPD = Continuous ambulatory peritoneal dialysis.

*Patients who do not transfer from one treatment to another during a year.

†Excluding patients receiving intermittent peritoneal dialysis and patients with incomplete treatment data.

‡To obtain overall expenditure, costs incurred when patients start or transfer between treatments must be added—for example, dialysis training costs, transplant operation costs—and savings caused by deaths subtracted.

Sources: Wing *et al* (ref 1), Mancini (ref 14).

TABLE V—Estimated annual expenditure in English health regions and Wales of treating patients with end stage renal failure who remain in a "steady state"* (November 1981 prices)

Health region	Patients per million population 31 December 1981†	Estimated annual expenditure on patients per million population‡ (£)	Estimated average annual expenditure per patient (£)
Northern	171	1 070 300	6300
Yorkshire	105	729 400	6900
Trent	143	1 003 900	7000
East Anglia	190	1 014 400	5300
North West Thames	151	755 000	5000
North East Thames	215	1 247 600	5800
South East/South West Thames	147	753 000	5100
Wessex	94	520 000	5500
Oxford	156	813 500	5200
South Western	108	700 300	6500
West Midlands	104	594 200	5700
Mersey	122	736 800	6000
North Western	101	603 700	6000
Wales	116	627 900	5400

*Patients who do not transfer from one treatment to another during a year.

†Excluding patients receiving intermittent peritoneal dialysis and patients with incomplete treatment data.

‡To obtain overall expenditure, costs incurred when patients start or transfer between treatments must be added—for example, dialysis training costs, transplant operation costs—and savings caused by deaths subtracted.

Sources: Wing *et al* (ref 1), Mancini (ref 14).

costs (see table III) would be £100 000 per million. Failed transplants would raise this figure.¹⁴

Table V shows comparable estimates of expenditure by the health regions on patients in a steady state (these estimates take account of the differing distribution of patients with end stage renal failure between treatment modes within each region (table II)). In the Northern, Trent, East Anglian, and North East Thames regions in 1981-2, in excess of £1m per million population was probably spent treating patients in a steady state, whereas in the North Western, West Midlands, and Wessex regions the figure is likely to have been £0.6m or less.

Table V also shows the estimated average annual expenditure for each patient in a steady state in each region. The four regions with the lowest expenditures per patient were those with the largest proportions of patients with functioning transplants in 1981—half or more. Conversely, the three regions with the highest expenditures per patient had the smallest proportions of patients with transplants—a third or less.

Discussion

Rates of survival at one year for patients accepted for renal replacement continue to improve. Moreover, survival with dialysis is now comparable with survival after transplantation.⁷ Retrospective analyses of the results of treatment given to middle aged and elderly patients presenting with chronic renal failure¹⁶

or end stage renal failure¹⁷ have shown that these patients can achieve noteworthy survival outcomes—62% survival over five years if given replacement treatment.¹⁷ Some renal units are now accepting older patients, particularly for treatment by continuous ambulatory peritoneal dialysis. This trend was reflected in the regional average ages of patients receiving continuous ambulatory peritoneal dialysis in 1981.¹

Since transplantation is the best economic option,¹⁴ it is encouraging that of the five European countries with the largest total populations England and Wales have by far the highest proportion of patients with end stage renal failure with functioning transplants—43% in 1981.¹ There is also growing availability of cadaveric kidneys for transplantation. In 1982, 1098 cadaveric kidneys were transplanted in the United Kingdom and Eire, 17% more than the previous best year (1980).¹⁵ None the less, the UK Transplant Service estimates that the national waiting list for transplants will double every four years unless it is matched by an appropriate increase in the rate of transplantation.⁷

In an effort to accelerate the rate of “harvesting” cadaveric kidneys in the North Western and Mersey regions, a scheme has been launched to encourage the general public to opt in as potential kidney donors. The names are entered on a computer installed at the University of Manchester Institute of Science and Technology (B Moores, unpublished observations). The onus for retrieving cadaveric kidneys does, however, lie with doctors. One suggested method of increasing retrieval rates is to appoint transplant coordinators to liaise between transplant centres and the donor hospitals. There are more than 300 donor hospitals serving 26 transplant centres in England and Wales, yet only six of these centres had a transplant coordinator by 1982.⁷

Analysis of routine medical manpower statistics cannot show whether all doctors in nephrology are managing the relatively large caseloads referred to earlier. There is, however, evidence to show that the number of patients with end stage renal failure treated in each region is dependent on the availability of medical manpower. The Renal Association, in conjunction with the Royal College of Physicians, carried out a survey in 1982 of medical staffing in nephrology¹⁸; this was a follow up of a survey carried out in 1975.¹⁹ Information applying to March 1982 was collected on the weekly numbers of nephrology sessions worked by senior medical staff, including academic appointments, and junior medical staff, also including academic appointments and medical assistants. When the total weekly sessions for the health regions and Wales were correlated with the regional totals for 31 December 1981 of patients receiving treatment for end stage renal failure,¹ highly significant positive relations were observed (senior medical staff $r=0.954$, $p<0.001$, and junior medical staff excluding medical assistants $r=0.884$, $p<0.001$). The Renal Association also surveyed the renal units in 1982 to obtain data on staffing levels for continuous ambulatory peritoneal dialysis and the funding of nursing posts.

The costing study of the DHSS of three large renal units produced estimates within each type of treatment by dialysis which varied by as much as 20-30%.¹⁴ The variations were caused by differences between the units in prices paid for consumables; in their policies on patient selection for alternative treatments; and in the treatment procedures for complications. The DHSS has established an ad hoc working group to advise the Department on aspects of the management of patients with end stage renal failure that might benefit from health services research.

There is manifestly inequitable distribution of renal resources within England and Wales. The twofold variation in regional rates for patients with end stage renal failure makes this obvious. It is also clear that renal services consume a tiny proportion of the NHS budget. The estimated annual expenditure for patients in a steady state derived from the DHSS 1981 costings was around £0.8m per million population. If a further 25% is added to cover the costs of new patients and those transferring between treatment modes, the figure is still in the order of £1m.

The net cash limits for the regional health authorities in England in 1981-2 totalled £163m per million population.²⁰ Thus the national expenditure on end stage renal failure was equivalent to about 0.6% of the cash limits.

Society has willingly donated its kidneys (both from cadavers and from live relations) to prolong the lives of sufferers from end stage renal failure. Currently its members are contributing about £1 per person per annum towards the treatment of end stage renal failure within the NHS. Whether society, if asked, would wish to increase this amount to enable virtually all such sufferers to be offered treatment and the regional imbalances in services to be remedied, policy makers in both central government and the health regions need to consider urgently. Furthermore, because of the extensive auditing of workloads and outcomes, manpower, and treatment costs undertaken by physicians and surgeons in end stage renal failure, informed decisions can be reached about the size and type of resources—manpower, capital, and recurrent treatment expenditures—required.

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