

# Hospital Topics

## Integrated dialysis and renal transplantation: small is beautiful

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### Summary and conclusions

Many patients in Britain with chronic renal failure suitable for renal replacement treatment die because not enough treatment facilities are available. Moreover, the number of renal transplants performed is insufficient to meet even present needs, so the number of patients on dialysis is rising. The integrated dialysis and transplant unit in Aberdeen, which has a population base much smaller than the average British unit, meets community needs for dialysis and transplantation. The problem of harvesting cadaver kidneys has been solved; the present supply has not only enabled the number of patients on dialysis to remain stable but has resulted in a net export of kidneys. The Aberdeen unit shows how estimated needs for chronic dialysis and renal transplantation may be met.

### Introduction

The provision of facilities in Britain for treating patients with end-stage renal disease (ESRD) does not match the known prevalence of the condition. In 1978 the number of new patients accepted for treatment was 20.7 per million population,<sup>1</sup> whereas the estimated annual incidence of patients with ESRD suitable for renal replacement treatment is about 40 per million.<sup>2</sup> Countries in the rest of the EEC provide facilities for many more patients than Britain; of other European countries, only Eire, Portugal, Turkey, and the Eastern Bloc States accept fewer new patients with ESRD.<sup>1-3</sup> One reason for this may be the number of renal units per million population; Britain has one unit per million population whereas the rest of the EEC has 3.6.<sup>3</sup> In addition, transplantation is performed in only 29 centres in Britain—about one centre per two million population.

In terms of population served the renal unit in Aberdeen is small by British standards, providing an integrated dialysis and transplantation service for half a million. We outline the advantages to be gained from such a unit, with regard to the number of patients treated and the number of transplant operations performed.

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### Aberdeen renal unit

#### STRUCTURE AND OPERATION

The unit opened in 1967 and comprises nine beds for patients on maintenance haemodialysis, a separate facility for patients with acute renal failure, and additional beds in a general medical ward for patients needing investigation and treatment in hospital. The chronic dialysis unit caters for the Grampian Region, Orkney, and Shetland, which together have a mixed urban and rural population of 504 000 (Grampian Regional Council, 1978 estimate). Of the 40 patients needing maintenance haemodialysis at the end of 1979, 24 dialysed at home, five were in training for home dialysis, and 11 needed long-term hospital haemodialysis. Facilities for children have been provided since 1978. There is no rigid policy for acceptance of patients, but few aged over 60 have been treated. Patients with acute renal failure from the areas described above and from the Highland Region are also accepted for dialysis; although 30-35 such patients are treated annually they are not discussed further here.

Since 1975 renal transplantation has been performed in the hospital that houses the dialysis unit. Most patients, whether on home or hospital dialysis, are considered potential transplant recipients. Dialysis and transplantation are seen as complementary rather than alternative treatments, and consequently our results refer in the main to combined treatments. The unit also provides transplantation facilities for chronic dialysis patients in the Highland Region at Inverness, but these patients are not included in the analysis below.

The medical staff of the unit consists of a full-time registrar and three physicians with additional general medical duties; university and research workers are included in a night and weekend cover rota. Transplantation and dialysis-access surgery are performed by a vascular surgeon and his team. The nursing staff comprises three full-time sisters, ten full-time-equivalent nurses, two auxiliaries, and three part-time orderlies. The remaining staff comprises a home dialysis administrator, a dialysis technician and trainee, and a secretary.

#### STOCK AND FLOW OF PATIENTS

The number of new patients accepted for treatment each year (the flow) is shown for 1971-9 (table I). Table II shows the stock, or total

TABLE I—Flow of new patients/million/year to dialysis and transplantation<sup>a</sup>

	1971	72	73	74	75	76	77	78	79
Aberdeen	14	6	20	14	20	24	32	24	30
UK average	10.2	12.5	13.2	14.8	15.3	15.5	15.9	20.7	NA

NA = Not available.

TABLE II—Stock of patients/million alive on 31 December each year—dialysis and transplantation combined<sup>b</sup>

	1971	72	73	74	75	76	77	78	79
Aberdeen	40	42	62	70	82	94	110	116	134
UK average	30.0	38.2	46.1	53.2	62.0	71.3	79.5	94.4	NA

NA = Not available.

number of patients treated by dialysis and transplantation. In both graphs British data are shown for comparison.

#### RENAL TRANSPLANTATION

Table III shows the annual number of first and subsequent transplants performed; the proportion of the stock of patients with functioning grafts is also indicated. The table also shows the flow to and from Aberdeen of kidneys for transplantation; apart from 1977 there has been a net export of kidneys each year.

TABLE III—Contribution of transplantation<sup>2</sup>

	No of transplants performed*		Aberdeen stock of patients*		
	UK average	Aberdeen	Dialysis	Transplant	Total
1972	8.5	—	42	—	42
1973	8.3	—	62	—	62
1974	9.6	—	70	—	70
1975	11.1	14	72	10	82
1976	10.8	22	76	18	94
1977	12.4	22	80	30	110
1978	16.7	24	72	44	116
1979	Not available	28	80	54	134

\*Per million population.

TABLE IV—Import and export of cadaver kidneys 1975-9

	1975	76	77	78	79
Transplants performed*	7	11	12	12	15
Local kidneys					
Obtained	10	16	16	18	28
Used locally*	7	7	9	9	12
Discarded	2	—	5	4	3
Exported	1	9	2	5	13
Imported kidneys					
Used	—	4	3	3	3
Discarded	—	—	1	—	1
Net export	1	5	-2	2	9

\*Local usage includes two patients from Highland Region not included in other analyses.

#### MORBIDITY, MORTALITY, AND GRAFT SURVIVAL

Morbidity and mortality have been reported more fully elsewhere,<sup>4</sup> but the salient data are an annual mortality of about 10% and overall patient survival of 57% at five years. Graft survival rates for all transplants are 60% and 42% at one and two years respectively.

#### Discussion

Our results suggest that a small integrated dialysis and transplant unit has considerable advantages for treating ESRD both in terms of the overall level of provision of services and in the transplantation rate. With our unit we provide a level of treatment approaching that of the EEC or Scandinavia.

The distribution of nephrological services within Britain is very uneven.<sup>5</sup> There is a sevenfold difference in stock and a threefold difference in flow of patients between regions<sup>1</sup>; clearly the service provided in some parts of the country is grossly inadequate, even though the discrepancy may be partly due to acceptance by some units of patients from outside their region. In Aberdeen, however, our high stock and flow of patients and high transplant rate has not entailed outside referrals. In 1977<sup>6</sup> it was pointed out that treatment of ESRD in England and Wales lagged behind the rest of Europe; it was suggested that any major expansion of services might be achieved by increasing the number of units rather than by increasing the work load of existing units. This expansion has not occurred, however, and the ever-increasing patient load for most British renal units is daunting. For example, even if one assumes a low incidence of ESRD of 30 per million per year and a high annual mortality of 12%, the eventual stock of patients treated by dialysis and transplantation will be 250 per million; or 250 patients per renal

unit in Britain. The only economical means of supporting such a large number of patients at present is by transplantation.<sup>7</sup> Nevertheless, while studies have shown that cadaver kidneys are available in adequate numbers to meet this need, it is often impossible to use more than a small fraction of these potential donors.<sup>8-9</sup> Perhaps it is here that a small renal unit has the most to offer: our experience has shown that the supply of cadaver kidneys for transplantation may be readily and fully utilised when the renal unit is in the same hospital as the neurosurgical unit. When a large transplant unit relies on several outlying neurosurgical units for cadaver kidneys, the harvesting of suitable organs will probably be inadequate.<sup>8-9</sup>

There are several possible objections to small integrated dialysis and transplant units. Firstly, it might be argued that liberal acceptance of patients for renal replacement treatment might lead to the treatment of unsuitable patients and a high mortality. This has not, however, been our experience; our annual mortality of 10% is comparable with overall British mortality of 11%.<sup>2</sup> In Scandinavia a flow of 30 patients per million a year results in 8-11% mortality a year.<sup>3</sup> Secondly, the establishment of many small units might be expected to dilute the experience of larger centres and make research into unusual renal diseases more difficult. While there may be some truth in this, the concentration on large centres has resulted in a low overall level of treatment. Thus while a few large centres will inevitably remain, the service need may be better met by small units. The costing of small integrated renal units is clearly of political importance; but it is arguable if it should be a major concern of clinicians. Furthermore, while a detailed breakdown of the costs of our own unit could be made, the relevance of such an exercise to units in less sparsely populated areas (where, for example, transport costs will form a lower proportion of the budget) may not be great. We have concentrated on the real medical benefits that are gained from a small integrated dialysis and transplant unit—benefits in terms of a high overall acceptance of patients and high rate of transplantation of local cadaver kidneys with reasonable mortality and morbidity—and have largely left the political and economic issues for others to resolve. But so far as patient care is concerned, the creation of new small integrated dialysis and transplant units appears to offer the only reasonable hope of providing for the unmet and ever-growing need for treatment for chronic renal failure.

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