Equity of access to renal transplant waiting list and renal transplantation in Scotland: cohort study

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Abstract

Objective To examine the access to the renal transplant waiting list and renal transplantation in Scotland.
Design Cohort study.
Setting Renal and transplant units in Scotland.
Participants 4523 adults starting renal replacement therapy in Scotland between 1 January 1989 and 31 December 1999.
Main outcome measures Impact of age, sex, social deprivation, primary renal disease, renal or transplant unit, and geography on access to the waiting list and renal transplantation.
Results 1736 of 4523 (38.4%) patients were placed on the waiting list for renal transplantation and 1095 (24.2%) underwent transplantation up to 31 December 2000, the end of the study period. Patients were less likely to be placed on the list if they were female, older, had diabetes, were in a high deprivation category, and were treated in a renal unit in a hospital with no transplant unit. Patients living furthest away from the transplant centre were listed more quickly. The only factors governing access to transplantation once on the list were age, primary renal disease, and year of listing. A significant centre effect was found in access to the waiting list and renal transplantation.
Conclusions A major disparity exists in access to the renal transplant waiting list and renal transplantation in Scotland. Comorbidity may be an important factor.

Introduction

In Scotland (population 5.2 million), the number of newly identified cases of end stage renal failure has increased from 60 per million population in 1989 to 108 per million population in 1999.[1] Kidney transplantation is the most successful and cost effective treatment, yet not all patients receiving dialysis are suitable for transplantation, and there is evidence that selection criteria vary widely.[2–4]

The Renal Association has highlighted the importance of ensuring there is equity of access to transplantation.[5] However, growing evidence, mainly from the United States, shows that transplantation rates are associated with a patient's health status as well as socioeconomic and geographical factors, and that these vary significantly across different ages and races and between men and women.[6–9] We investigated the relation between socioeconomic and geographical factors and access to the renal transplant waiting list and renal transplantation in Scotland to determine whether similar discrepancies exist.

Methods

From the Scottish Renal Registry and UK Transplant databases we identified 4523 adults aged 18 or over starting renal replacement therapy in Scotland between 1 January 1989 and 31 December 1999. They were followed to placement on the waiting list, transplantation, death, or end of the study (31 December 2000). We excluded 408 patients (9%).

The clinical outcomes were access to the waiting list for transplantation and access to a kidney graft. Regression analysis was used to investigate the factors associated with the likelihood of being placed on the waiting list and undergoing transplantation. We determined the time when 50% of the patients were placed on the waiting list or underwent transplantation.

Variables considered were patient's age when starting renal replacement therapy, sex, social deprivation, distance from the patient's home to the transplant centre, primary renal disease, type and year of first renal replacement therapy, centre where first renal replacement therapy was undertaken, and the centre where the patient was listed for transplantation.

An intention to treat approach was used to calculate the time it took 50% of the patients to be listed. This method, although statistically correct, does not give a true indicator of how long it takes for someone suitable for transplantation to be put on the list. Therefore as an indicator of current clinical practice, we performed a separate analysis, taking into account only patients put on the list within the study period. See bmj.com for details of statistics.

Results

Between 1 January 1989 and 31 December 1999, 4523 adults started renal replacement therapy in Scotland. Of these, 1736 (38.4%) were placed on the waiting list for renal transplantation and 1095 (24.2%) received a kidney transplant by the end of the follow up period. The mean age at the onset of renal replacement therapy was 57.73 (SD 16.03) years, whereas the mean ages at listing and undergoing transplantation were 46.60 (SD 14.14) and 44.30 (SD 13.52) years, respectively. Overall, 50% of patients receiving dialysis were placed on the waiting list in 2.84 years whereas 50% of those on the list underwent transplantation in 1.74 years (95% confidence interval 1.55 to 1.92).

Access to the waiting list

Sex and age

The table shows the relative risk of access to the renal transplant waiting list for the variables analysed in the intention to treat analysis. The same variables were used in the analysis of the access time to the waiting list (see bmj.com). Women were less likely to be put on the list and had to wait significantly longer before they were. The older the patient, the lower the rate of being placed on the list and the longer the time spent on dialysis before being put on the list.

Multivariate Cox proportional hazards model showing relative risk of access to waiting list for transplantation in Scotland

Variable	No (%) of patients (n=4115)	Relative risk (95% CI)	P value*
Men†	2397 (58.3)	1	
Women	1718 (41.7)	0.81 (0.73 to 0.90)	<0.0001
Age group:			
18-34†	446 (10.8)	1	
35-49	664 (16.1)	0.75 (0.65 to 0.86)	<0.0001
50-59	721 (17.5)	0.44 (0.38 to 0.51)	<0.0001
60-64	564 (13.7)	0.21 (0.17 to 0.25)	<0.0001
>65	1720 (41.8)	0.07 (0.06 to 0.08)	<0.0001
Deprivation category:			
1 (least deprived)†	203 (4.9)	1	
2	518 (12.6)	0.69 (0.53 to 0.91)	0.008
3	903 (21.9)	0.72 (0.56 to 0.93)	0.011
4	1035 (25.2)	0.66 (0.51 to 0.84)	0.001
5	616 (15.0)	0.57 (0.44 to 0.75)	<0.0001
6	532 (12.9)	0.62 (0.47 to 0.81)	0.001
7 (most deprived)	308 (7.5)	0.54 (0.39 to 0.74)	<0.0001
Primary renal disease:			
Primary glomerulonephritis†	672 (16.3)	1	
Interstitial nephritis	856 (20.8)	0.78 (0.68 to 0.90)	0.001
Multisystem disease	988 (24.0)	0.54 (0.45 to 0.64)	<0.0001
Diabetes	674 (16.3)	0.50 (0.42 to 0.58)	<0.0001
Other or unknown	925 (22.5)	0.60 (0.51 to 0.72)	<0.0001
First renal replacement therapy:			
Haemodialysis†	2899 (70.4)	1	
Peritoneal dialysis	1216 (29.6)	1.46 (1.32 to 1.64)	<0.0001
Transplant centre:			
Centre 1†	516 (12.5)	1	
Centre 2	400 (9.7)	0.88 (0.71 to 1.09)	0.24
Centre 3	811 (19.7)	0.44 (0.36 to 0.53)	<0.0001
Centre 4	2388 (58.0)	0.38 (0.32 to 0.45)	<0.0001
Distance to transplant centre:			
0-50 km	3511 (85.3)	1	
50-100 km	302 (7.3)	1.12 (0.92 to 1.40)	0.25
>100 km	302 (7.3)	0.69 (0.55 to 0.85)	0.001
Year of first renal replacement therapy, per year		0.95 (0.93 to 0.97)	<0.0001
Renal unit in hospital with transplant centre:			
Yes†	2351 (57.1)	1	
No	1764 (42.9)	0.72 (0.65 to 0.80)	<0.0001

All variables not shown, but similar relative risk observed.
*Cox regression.
†Reference category.

Social deprivation, primary renal disease, and type of first renal replacement therapy

The likelihood of placement on the waiting list decreased with increased social deprivation. Patients with diabetic nephropathy had the lowest rate for being put on the list, with less than 50% being put on it within 10 years of starting dialysis. Patients with diabetes who were eventually listed, however, spent the shortest time on dialysis before being put on the list. Patients who underwent peritoneal dialysis were placed on the list more quickly and had a 46% better chance of listing than those on haemodialysis.

Renal unit and transplant centre

Patients were more likely to be listed and waited a shorter time if referred to centres 1 and 2 (see table). Patients starting dialysis in the four units situated in a hospital with a transplant centre were more likely to be placed on the list and waited a significantly shorter time than the other patients.

Distance to transplant centre

Patients living furthest away from the transplant centre (>100 km) were more likely to be put on the waiting list, and this was sooner after starting dialysis than patients living closer to the unit. We found a 5% reduction in the rates of listing for each year closer to the end of the follow up period. When the analysis was restricted to those patients who were put on the list (rather than the intention to treat analysis), all variables except sex remained important factors for access to the list.

Access to transplantation

Older patients were less likely to undergo transplantation and spent longer on the waiting list (see bmj.com). Patients with renal failure of unknown origin and those with multisystemic disease had the least chance of undergoing transplantation. They also spent over two years on the active waiting list before receiving a transplant.

We found a significant centre effect on the likelihood of transplantation and time spent on the waiting list. This seemed to be due to the outlying effect of centre 2, where patients had a 43% less chance of undergoing transplantation than those in centre 1. The chance of transplantation decreased by 4% for each year closer to the end of the study period.

Discussion

Major differences are apparent in access to the renal transplant waiting list and renal transplantation in Scotland. Similar disproportions have also been identified as a problem in the United States, Canada, and Europe.[7 8 10 11]

Age is a major factor influencing access to transplantation. The sharper decline in access to the waiting list indicates that the main selection process takes place at this stage and may be attributable to higher comorbidity in older people. Once on the waiting list, the difference is diminished.

Explanations for the observed sex difference include patient preference, sex selection by health professionals, socioeconomic and health status, non-compliance, and sex based differences in family preferences for transplantation.[12–14] Once on the waiting list, women have a similar probability to men of receiving a transplant, suggesting that the system for allocation in the United Kingdom may have eliminated differences between the sexes, unlike other transplant programmes, where there is a persistent disparity.[10 15]

The rates for placement on the waiting list declined with increasing socioeconomic deprivation. Patients who are socioeconomically disadvantaged may have higher comorbidity, and medical non-compliance may be more common.[16] It is also possible that healthcare workers are biased to manage patients in ways that allow some to be listed sooner than others.[17] Unlike other analyses, our study shows that once on the list, patients have an equal chance of transplantation, irrespective of socioeconomic status.[6]

Patients with diabetes have the lowest rate of access to the waiting list for transplantation, which may be due to additional and more severe comorbidity. Although transplantation rates for these patients are

What is already known on this topic

Potential barriers along the pathway to transplantation are apparent in several countries

Transplantation rates vary across different ages and races

Selection on to the renal transplant waiting list and undergoing transplantation are associated with health status and socioeconomic and geographical factors

What this study adds

For the first time in the United Kingdom, inequities in access to the renal transplant waiting list and renal transplantation have been identified

Inequities in access to the renal transplant waiting list and transplantation in Scotland are associated with socioeconomic, demographic, and geographical factors

These inequities may exist elsewhere in the United Kingdom because of similarities in management of patients with end stage renal failure and transplantation

better than their listing rates, the likelihood of further complications may underlie the persisting differences in access to transplantation.

The type of first renal replacement therapy also predicted access to the waiting list. This finding should be interpreted with care, as the type of first dialysis varies, and many patients will switch between dialysis modalities throughout their treatment. A longer waiting time on dialysis before transplantation has been correlated with a poorer outcome.[18] We found no correlation between the chance of transplantation and the length of time spent on dialysis before listing.

The further away from the transplant centre patients lived the quicker they were placed on the waiting list. No differences were found in access to transplantation after being put on the list.

Patients had a better chance of being placed on the waiting list when they started dialysis in a renal unit in a hospital with a transplant unit. Factors implicated are centre characteristics, size, and organisational aspects, the attitudes of healthcare staff towards transplantation, and training.[4 13] This effect may be eliminated with the introduction of guidelines for evaluating candidates for transplantation, as used in the United States and Europe.[16 19]

Conclusions

Inequities in access to the renal transplant waiting list and renal transplantation are apparent in Scotland. Throughout the United Kingdom the management of end stage renal failure, referral patterns for transplantation, and the transplantation process are similar, therefore these inequities may exist elsewhere.

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Ethical approval: This study was part of a research project that was approved by the Lothian research ethics committee (research ethics subcommittee for medical and clinical oncology; reference No LREC/2000/4/163).

1 The Scottish Renal Registry. *2000 annual report*. Glasgow: SRR, 2001.
2 Port FK, Wolfe RA, Mauger EA, Berling DP, Jiang K. Comparison of survival probabilities for dialysis patients vs cadaveric renal transplant recipients. *JAMA* 1993;270:1339-43.
3 Johnson RWG. Should we revisit recipient selection? *Transplant Proc* 1996;28:36-41.
4 McMillan MA, Briggs JD. Survey of patient selection for cadaveric renal transplantation in the United Kingdom. *Nephrol Dial Transplant* 1995;855-8.
5 The Renal Association. *Treatment of adult patients with renal failure—recommended standards and audit measures*, 2nd ed. London: Renal Association and RCP, 1997.
6 Gaylin DS, Held PJ, Port FK, Hunsicker LG, Wolfe RA, Kahan BD, et al. The impact of comorbid and sociodemographic factors on access to renal transplantation. *JAMA* 1993;269:603-8.
7 Wolfe RA, Ashby VB, Milford EL, Bloembergen WE, Agodoa LY, Held PJ, et al. Differences in access to cadaveric renal transplantation in the United States. *Am J Kidney Dis* 2000;36:1025-33.
8 Schaubel DE, Stewart DE, Morrison HI, Zimmerman DL, Cameron JI, Jeffery JJ, et al. Sex inequality in kidney transplantation rates. *Arch Intern Med* 2000;160:2349-54.
9 Eggers PW. Racial differences in access to kidney transplantation. *Health Care Finance Rev* 1995;17:89-103.
10 Purdy A, Wilson R, Godwin M, Morton R, Toffelmire E. Sex differences in renal transplantation in Canada. *J Wom Health Gend Based Med* 1999;8:631-5.
11 Miceli M, Di Lallo D, Perucci CA. Absence of economic barriers does not reduce disparities in the access to renal transplantation: a population based study in a region of central Italy. Dialysis register of Lazio Region. *J Epidemiol Community Health* 2000;54:157-8.
12 Aaronson KD, Schwartz JS, Goin JE, Mancin DM. Sex differences in patient acceptance of cardiac transplant candidacy. *Circulation* 1995;91:2753-61.
13 Soucie JM, Neylan JF, McClellan W. Race and sex differences in the identification of candidates for renal transplantation. *Am J Kidney Dis* 1992;19:414-9.
14 McCauley J, Irish W, Thompson L, Stevenson J, Lockett R, Bussard R, et al. Factors determining the rate of referral, transplantation, and survival on dialysis in women with ESRD. *Am J Kidney Dis* 1997;30:739-48.
15 Bloembergen WE, Mauger EA, Wolfe RA, Port FK. Association of gender and access to cadaveric renal transplantation. *Am J Kidney Dis* 1997;30:733-8.
16 Kasiske BL, Ramos EL, Gaston RS, Bia MJ, Danovitch GM, Bowen PA, et al. The evaluation of renal transplant candidates: clinical practice guidelines. *J Am Soc Nephrol* 1995;6:1-34.
17 Kasiske BL, London W, Ellison MD. Race and socioeconomic factors influencing early placement on the kidney transplant waiting list. *J Am Soc Nephrol* 1998;9:2142-7.
18 Meier-Kriesche HU, Port FK, Ojo AO, Rudich SM, Hanson JA, Cibrik DM, et al. Effect of waiting time on renal transplant outcome. *Kidney Int* 2000;58:1311-7.
19 European Renal Association-European Dialysis and Transplant Association. European best practice guidelines for renal transplantation (part I). *Nephrol Dial Transplant* 2000;15(Suppl 7):3-83.

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Endpiece

The requirements for a surgeon

The conditions necessary for a surgeon are four: first, he should be learned. Second, he should be expert. Third, he must be ingenious. Fourth, he should be able to adapt himself.

Guy de Chauliac. *The art of surgery*. 1363.
(The first European book on surgery)

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