

## EVIDENCE BASED PUBLIC HEALTH POLICY AND PRACTICE

# Late referral for assessment of renal failure

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It has been recommended that adult patients with a serum creatinine above 150  $\mu\text{mol/l}$  should be referred to a nephrologist for specialist assessment. This study ascertained all patients in Northern Ireland with creatinine above this concentration in 2001 ( $n=19\,286$ ) to see if this triggered referral within the subsequent year. After exclusion of those who were already known to a nephrologist and those who had acute renal failure, it was found that younger patients and diabetic patients were more likely to be referred. There was no difference in referral rates between male and female patients. However, only 6.5% of all non-diabetic subjects and 19% of diabetic patients were referred within 12 months after a first increased serum creatinine test.

In the past 20 years, the number of patients receiving treatment for end stage renal disease (ESRD) has risen substantially in most developed countries. This trend is driven by the aging of the population, better recognition of the outcomes and value of renal replacement therapy, and increased resources for haemodialysis. Yet data from renal units point to a pronounced variation in referral of patients with ESRD.<sup>1</sup>

The third edition of the Renal Association guidance suggests that patients should be referred to a specialist, early in the course of their disease when serum creatinine is between 150 and 200  $\mu\text{mol/l}$ ,<sup>2</sup> while the NICE guidance on the management of type II diabetes recommends referral when the creatinine reaches 150  $\mu\text{mol/l}$ .<sup>3</sup> The impact of using such thresholds on existing services or on patient outcomes is unknown. To start such a study and determine the potential

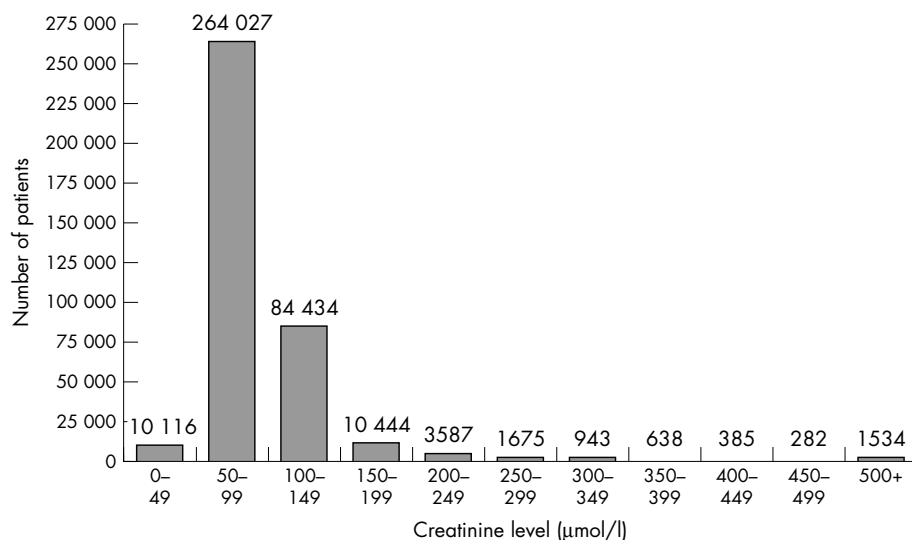
numbers of patients meeting these criteria, we have capitalised on the comprehensive coverage of the clinical biochemistry laboratories serving one region's entire 1.7 million population (Northern Ireland).

### METHODS

Our full methods (including details of record linkage protocols) and the prevalence of chronic kidney disease have been described elsewhere.<sup>4</sup> Briefly, we retrieved data on all serum creatinine, albumin and urea tests, urinary protein excretion tests, and HbA1c tests performed in Northern Ireland laboratories between 1 January 2001 and 31 December 2002. We reduced the test level database to a relational person level database of patients who had had any of these tests performed during 2001 and 2002. This analysis focuses on subjects whose first raised serum creatinine (above 150  $\mu\text{mol/l}$ ) was in 2001.

We were able to define the source and specialty of the doctor requesting the test and thus could exclude (from the analysis of subsequent referral rates) those whose first abnormal test had been ordered by a nephrologist. We defined a referred case as someone who had had any subsequent serum creatinine test ordered by a nephrologist within 12 months of the first abnormal result in 2001. We excluded those with acute renal failure from the analysis. We ascertained all deaths through the Office of the Registrar General and censored subjects on their date of death. Subjects with acute renal failure were defined as those who had a creatinine  $>300$   $\mu\text{mol/l}$  in 2001 that returned to  $<120$   $\mu\text{mol/l}$  within six months of the first raised test.

We defined as diabetic those subjects who had had any HbA1c test undertaken during the two year period. Results are presented by age and sex for patients 20 years and over.



**Figure 1** Distribution of creatinine results—maximum value for each subject tested in 2001.

Kaplan-Meier survival estimates (with 95% confidence limits) were obtained for the proportion referred by 12 months. Cox's proportional hazards regression was used to test variation in the referred proportion according to age, sex, and whether diabetic or not.

The study was approved by the Queens University Medical Ethics Committee, 2002.

## RESULTS

Twenty nine per cent of the resident population had at least one creatinine test in 2001 and 95% of all tests undertaken yielded a result below 150  $\mu\text{mol/l}$  (fig 1).

Tables 1 and 2 show that across both sexes and among diabetic and non-diabetic subjects the proportion "referred" is significantly higher at younger ages.

For example, compared with the oldest age category, 20–39 year olds had a more than fivefold chance of being referred to a nephrologist (table 2). Overall, less than 20% of diabetic patients and less than 7% of non-diabetic subjects had a subsequent investigation undertaken by a nephrologist within 12 months. Nevertheless the average number of renal/HbA1c tests performed on each "non-referred" cases during that period was 20 for diabetic patients and 14 for non-diabetic subjects (including tests ordered in both primary and secondary care settings).

## DISCUSSION

The feasibility and need for a study such as ours has previously been highlighted<sup>5</sup> but our comparatively static population in Northern Ireland offers us advantages over other regions served by more fragmented or dispersed health services, serving more mobile populations. While our chronic kidney disease prevalence data are reported elsewhere,<sup>4</sup> (based on serum creatinine measurement estimated to be between 1.56% and 3.25%), it should be borne in mind that previous estimates from the literature vary according to the study methodology used. Some earlier studies have been random population based surveys,<sup>6</sup> whereas we have analysed the data on all subjects who had their creatinine measured in a particular period. Although we will have "missed" some chronic kidney disease subjects (who did not have a creatinine test in 2001), you would expect the tested cohort to be "enriched" with subjects with some sort of illness (compared with the general population), and thus more likely to represent those in need of referral. We excluded 749 cases of presumed acute renal failure. While these subjects had to survive long enough to have at least a

**Table 2** Cox's proportional hazards regression of effects of age, sex, and diabetes on proportion referred within 12 months

	Comparison	Relative hazard
Sex	F v M	1.08 (0.98 to 1.20)
Diabetes	Yes v No	3.11 (2.81 to 3.43)
Age group	20–39 v 80+	5.81 (4.54 to 7.44)
	40–49 v 80+	5.31 (4.17 to 6.77)
	50–59 v 80+	3.79 (3.13 to 4.58)
	60–69 v 80+	3.19 (2.72 to 3.74)
	70–79 v 80+	2.21 (1.90 to 2.56)

second creatinine test, whether this misclassifies a comparatively small number of acute renal failure and chronic kidney disease cases is a moot point, for as most of these acute renal failure cases merit specialist investigation, we do not feel it bears significantly upon our overall conclusion that existing renal services in secondary care would have difficulty in meeting the Renal Association and NICE guidelines.

Previous studies of late referral defined referral delay according to the interval (greater or less than three months) between initial referral and the time to dialysis start. Such a late or "downstream" approach would not truly reflect the number of people in the general population for whom interventions may retard progression of kidney disease. Although not all patients with chronic kidney disease will progress to ESRD, their increased cardiovascular risk still offers opportunities for health gain. Undoubtedly, some patients will die with rather than from their chronic kidney disease.<sup>7</sup>

Although we have limited data on how our non-referred subjects were being managed in primary care (phase II of our study), we know that fewer than 8% had had additional tests of renal dysfunction performed (for example an estimate of the urinary albumin-creatinine ratio or 24 hour urinary protein excretion).<sup>8</sup> The most effective service model for early intervention is open to question.<sup>9</sup> While some modelling studies show that early referral to a specialist might be cost effective,<sup>10</sup> there is no reason why most of the necessary intervention could not be delivered by the primary care team.<sup>11 12</sup>

In Northern Ireland in 2001 there were about 1100 ESRD patients receiving renal replacement therapy and 9.5 whole time equivalent nephrologists saw about 1200 new out-patients with chronic kidney disease (Korner Statistics,

**Table 1** Cumulative risk of referral to a nephrologist within 12 months of initial abnormal creatinine result\*

	Age group	Number	Cumulative proportion referred (%)	95% Confidence limits
Non-diabetic patients	20–39	307	16.6	12.2 to 21.0
	40–49	327	16.2	11.7 to 20.6
	50–59	806	14.0	11.3 to 16.6
	60–69	1746	9.6	8.1 to 11.1
	70–79	4094	6.6	5.7 to 7.4
	80+	5689	3.0	2.5 to 3.5
	Total	12969	6.5	6.0 to 7.0
Diabetic patients	20–39	74	41.7	31.5 to 51.8
	40–49	95	24.9	19.7 to 30.2
	50–59	279	26.1	20.8 to 31.5
	60–69	801	25.8	22.7 to 29.0
	70–79	1392	18.4	16.3 to 20.5
	80+	1075	9.0	7.1 to 10.9
	Total	3716	19.2	17.9 to 20.6

\*Patients previously known to the nephrology service have been excluded from the denominator.

### What this paper adds

Many previous studies have assessed "late referral" as judged by the ("downstream") interval between referral and the start of dialysis, for patients with chronic kidney disease. Given the existing Renal Association guidance (that all patient with creatinine >150 µmol/l should be referred to a specialist), the novelty of this study is that it has ascertained the population prevalence of chronic kidney disease and calculated how many such patients have been referred to a specialist within 12 months. As early intervention may slow a decline in renal function, chronic kidney disease abatement and prevention strategies need to be better informed by this "upstream" approach.

KH09, Department of Health and Personal Social Services), while waiting times were typically less than two to three months (A P Maxwell, advisor to Regional Review of Renal Services; personal communication). Although dealing with many fewer ethnic minority patients (less than 1.0% resident population), it is otherwise typical (in capacity terms) of many other UK regions. While there is emerging clinical and economic evidence for the potential benefits of early referral to a nephrologist,<sup>10</sup> existing renal services in the UK could not cope with the number of patients with chronic kidney disease identified in this population based study. New screening, diagnostic, and treatment strategies are required to integrate the efforts of primary and secondary care services to improve the outcomes for people with chronic kidney disease. Failure to meet the challenge posed by the higher than appreciated prevalence of chronic kidney disease will result in missed opportunities for prevention of progressive renal failure. As a consequence, late referral of more advanced disease requiring expensive renal replacement therapy will continue to disadvantage non-diabetic and older patients.

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### Policy implications

The existing Renal Association guidelines will fail patients, unless significantly more renal specialists and clinics are available. Alternatively, improved primary care management of chronic kidney disease or shared care should be promoted.

Competing interests: APM served on the DHSSPSNI team that led the Northern Ireland Regional Review of Renal Services, 2002.

The membership of the Targeting Social Need Renal Group also includes: Dr Claire Willis (Department of Health and Social Services and Public Safety). Mr Sean McCann (Information and Analysis Branch, Northern Ireland Statistics and Research Agency). Professor Philip Reilly, Department of General Practice, the Queens University of Belfast. Ms Hazel Grandidier, Department of General Practice, the Queens University of Belfast. Mr Colin Fox, Northern Ireland Cancer Registry. The views expressed in the paper are those of the authors and not of their employers.

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### REFERENCES

- 1 Wilson R, Godwin M, Sequin R, et al. End stage renal disease: factors affecting referral decisions by family physicians in Canada, the United States and Britain. *Am J Kid Dis* 2001;**38**:42-8.
- 2 Renal Association. Treatment of adults and children with renal failure. *Standards and audit measures*. 3rd ed. London: Royal College of Physicians of London and the Renal Association, 2002.
- 3 National Institute of Clinical Excellence. Management of type 2 diabetes – renal disease, prevention and early management. Issued February 2002. <http://www.nice.org/page.aspx?o=27964>.
- 4 Reference withdrawn.
- 5 Hickman M, Barker M, Roderick P, et al. Assessment of the feasibility of conducting population prevalence studies of chronic renal failure according to ethnic group: a survey of clinical biochemistry laboratories in Greater London and south east England. *Ann Clin Biochem* 1999;**36**:94-8.
- 6 Clase CM, Garg AX, Kiberd BA. Prevalence of low glomerular filtration rate in non diabetic Americans: third national health and nutrition examination survey (NHANES III). *J Am Soc Nephrol* 2002;**13**:1338-49.
- 7 Drey N, Roderick P, Mullee M, et al. A population based study of the incidence and outcomes of diagnosed chronic kidney disease. *Am J Kidney Dis* 2003;**42**:677-84.
- 8 Reference withdrawn.
- 9 Wrone EM, Hornberger J. Evaluating the consequence of multidisciplinary case management for patients with chronic renal failure. *Am J Med* 1998;**105**:546-8.
- 10 McLaughlin K, Manns B, Culleton B, et al. An economic evaluation of early versus later referral of patients with progressive renal insufficiency. *Am J Kidney Dis* 2001;**38**:1122-8.
- 11 Kalra PA, Kumwenda M, MacDowall P, et al. Questionnaire study and audit of use of angiotensin converting enzyme inhibitor and monitoring in general practice: the need for guidelines to prevent renal failure. *BMJ* 1999;**318**:234-7.
- 12 Curtis B, Barrett BJ, Levin A. Identifying and slowing progressive chronic renal failure. *Can Fam Physician* 2001;**47**:2512-18.