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# UK Renal Registry 14th Annual Report: Chapter 7 Adequacy of Haemodialysis in UK Adult Patients in 2010: national and centre-specific analyses

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## Key Words

Adequacy · Haemodialysis · Urea reduction ratio

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## Summary

- Data suitable for urea reduction ratio (URR) analyses were available in 14,555 (74%) of the 19,686 adult patients receiving haemodialysis (HD) in the UK at the end of 2010.
- In 2010, 86% of prevalent (HD) patients achieved a URR >65%. The between centre range of prevalent

patients achieving this target was wide (between 63% and 98%).

- The median URR in 2010 was 74% (unchanged from 2009).
- URR was greater in those with longer dialysis vintage. Eighty nine percent of patients who had survived on dialysis for more than two years achieved a URR >65% compared with only 70% of those on dialysis for only 6 months.
- Large variation between centres in the percentage of patients achieving the UK Renal Association's URR guideline persists. Differences in sampling methodology of post-dialysis urea samples could explain part of the centre variability observed.

## Introduction

Amongst patients with established renal failure (ERF), the delivered dose of HD is an important predictor of outcome [1] which has been shown to influence survival [2–4]. The delivered dose of HD depends on treatment (duration and frequency of dialysis, dialyser size, dialysate and blood flow rate) and patient (size, weight, haematocrit and vascular access) characteristics [5]. The two widely accepted measures of urea clearance are Kt/V, the ratio between the product of urea clearance (K, in ml/min) and dialysis session duration (t, in minutes) divided by the volume of distribution of urea in the body (V, in ml) and URR derived solely from the percentage fall in serum urea (URR) during a dialysis treatment. Whilst Kt/V is a more accurate descriptor of urea clearance, its calculation is complex and requires additional data items [6, 7] not commonly reported by most UK renal centres. The UKRR has chosen URR rather than Kt/V for comparative audit of haemodialysis adequacy as these results are more widely available. Historical use of this measure has enabled temporal trends to be examined.

Based on published evidence, clinical practice guidelines have been developed by various national and regional organisations [8–11]. There is considerable uniformity between them with regard to the recommendations for minimum dose of dialysis although there are differences in the methodology advised. The main objective of this study was to determine the extent to which patients undergoing HD treatment for established renal failure in the UK received the dose of HD recommended in the UK RA clinical practice guidelines [9].

## Methods

Seventy-two renal centres in the UK submitted data electronically to the UKRR on a quarterly basis [12]. The majority of these centres have satellite units but for the purposes of this study the data from the renal centres and their associated satellite units were amalgamated. Data from two groups of patients were analysed. Firstly, analysis was undertaken using data from the prevalent HD patient population as of the 31st December 2010. For this analysis, data for URR were taken from the last quarter of 2010 unless that data point was missing in which case data from the 3rd quarter were taken. The prevalent population only included patients receiving HD who were alive on December 31st 2010. Data from those patients who had died before that date have not been included in the analysis. The

second analysis involved incident patients who had commenced treatment with HD during 2010. For these patients, analysis was undertaken using the last recorded URR during the quarter in which the patient had started dialysis.

Data from patients known to be receiving more or less than thrice weekly HD were omitted from the analyses. However, because not all centres report frequency of HD, it is possible that data from a small number of patients receiving HD at a different frequency were included in the analyses.

Analyses of the data from both groups of patients included calculation of the median URR and of the proportion of patients who had achieved the RA guideline (as outlined below) in each of the renal centres as well as for the country as a whole.

All patients with data were included in the statistical analyses at a national level, although centres with fewer than 20 patients, or providing less than 50% data completeness were excluded from the comparison between centres.

The UK RA clinical practice guidelines [9] in operation at the time these data were collected were as follows:

*HD should take place at least three times per week in nearly all patients. Reduction of dialysis frequency to twice per week because of insufficient dialysis facilities is unacceptable.*

*Every patient receiving thrice weekly HD should have consistently:*

- *either URR >65%*
- *or equilibrated Kt/V (eKt/V) of >1.2 (or single pool Kt/V of >1.3) calculated from pre- and post-dialysis urea values, duration of dialysis and weight loss during dialysis).*

*To achieve a URR above 65% or eKt/V above 1.2 consistently in the vast majority of the HD population clinicians should aim for a minimum target URR of 70% or minimum eKt/V of 1.4 in individual patients.*

*The duration of thrice weekly HD in adult patients with minimal residual renal function should not be reduced below 4 hours without careful consideration.*

*Patients receiving HD twice weekly for reasons of geography should receive a higher sessional dose of HD. If this cannot be achieved, then it should be recognised that there is a compromise between the practicalities of HD and the patient's long-term health.*

*Measurement of the 'dose' or 'adequacy' of HD should be performed monthly in all hospital HD patients and may be performed less frequently in home HD patients. All dialysis units should collect and report this data to their regional network and the UKRR.*

*Post-dialysis blood samples should be collected either by the slow-flow method, the simplified stop-flow method, or the stop dialysate flow method. The method used should remain consistent within renal units and should be reported to the Registry.*

The RA clinical practice guidelines for HD dose apply specifically to patients undergoing thrice weekly HD. In these patients it is recommended that blood for biochemical measurement (including pre-dialysis urea for URR) should be taken before the mid-week dialysis session [9].

## Results

### Data completeness

Data providing HD dose (URR) were available from 64 of the 72 renal centres which submitted data to the UKRR (table 7.1). Data were available for 74% (14,555) of the total prevalent population (19,686) treated with HD who met the inclusion criteria for these analyses.

Completeness in the 64 centres reporting URR data was generally good, with 49 centres reporting on more

than 90% of patients. Six centres reported URR data on less than 50% of prevalent patients (Dorset, Liverpool Aintree, Manchester Hope, Manchester Royal Infirmary, Swansea, Wirral) and their data were not included in the centre-level analyses although the patients were included in the national analyses. URR data were not received from eight centres (Brighton, Cardiff, Inverness, London Barts, London Kings, London Royal Free, London St Georges and Newcastle). The number preceding the centre name in each figure indicates the percentage of missing data from that centre.

Several centres had a reduction in the completeness of URR data submitted to the UKRR in 2010 compared with 2009. These changes may represent changes in data extraction, or a move by centres to utilising Kt/V rather than URR as the preferred measure of dialysis dose.

Of the total incident patient population (4,492) starting HD during 2010 and meeting the inclusion criteria for URR analyses, 48% (2,163) had URR data available during the first quarter of treatment.

**Table 7.1.** Percentage completeness of URR data returns

Centre	% complete	Centre	% complete
Abrdn	98	L Rfree	0
Airdrie	99	L St.G	0
Antrim	99	L West	92
B Heart	99	Leeds	100
B QEH	77	Leic	99
Bangor	99	Liv Ain	1
Basldn	97	Liv RI	97
Belfast	94	M Hope	43
Bradfd	97	M RI	13
Brightn	0	Middlbr	96
Bristol	100	Newc	0
Camb	97	Newry	98
Cardff	0	Norwch	96
Carlis	96	Nottm	99
Carsh	91	Oxford	85
Chelms	92	Plymth	97
Clwyd	97	Ports	95
Colchr	97	Prestn	85
Covnt	97	Redng	97
D & Gall	88	Sheff	96
Derby	92	Shrew	91
Derry	92	Stevng	98
Donc	98	Sthend	95
Dorset	42	Stoke	100
Dudley	93	Sund	97
Dundee	98	Swanse	42
Dunfn	96	Truro	100
Edinb	100	Tyrone	93
Exeter	100	Ulster	99
Glasgw	92	Wirral	29
Glouc	100	Wolve	67
Hull	96	Wrexm	86
Inverns	0	York	88
Ipswi	99	<b>England</b>	<b>74</b>
Kent	92	<b>N Ireland</b>	<b>96</b>
Klmarnk	88	<b>Scotland</b>	<b>91</b>
L Barts	0	<b>Wales</b>	<b>34</b>
L Guys	72	<b>UK</b>	<b>74</b>
L Kings	0		

### Achieved URR

For prevalent patients, the median URR (74% for UK; centre range 67%–80%) and percentage of patients attaining the RA guideline of a URR >65% (86% for UK; centre range 63%–98%) from 58 renal centres are shown in figures 7.1 and 7.2. Figure 7.3 illustrates the intuitive relationship between these two descriptive measures. As the proportion of patients achieving URR > 65% increased, the median URR also increased. As previously reported, there continued to be variation between renal centres, with 18 centres attaining the RA clinical practice guideline in >90% of patients, 39 centres attaining the guideline in 70–90% of patients and 1 centre in less than 70% of patients. This represents an improvement compared with 2009, when 5 centres achieved this target in <70% of patients. The 95% confidence intervals were wide however, with overlap between centres illustrated in figure 7.2.

### Changes in URR over time

The change in the percentage attainment of the RA clinical practice guidelines (URR >65%) and the median URR for the UK from 1998 to 2010 is shown in figure 7.4. Northern Ireland has provided data since 2005 and was included in these analyses. The proportion of patients attaining the RA guideline increased from 56% to 86% whilst the median URR has risen from 67% to 74% during the same time period. There has

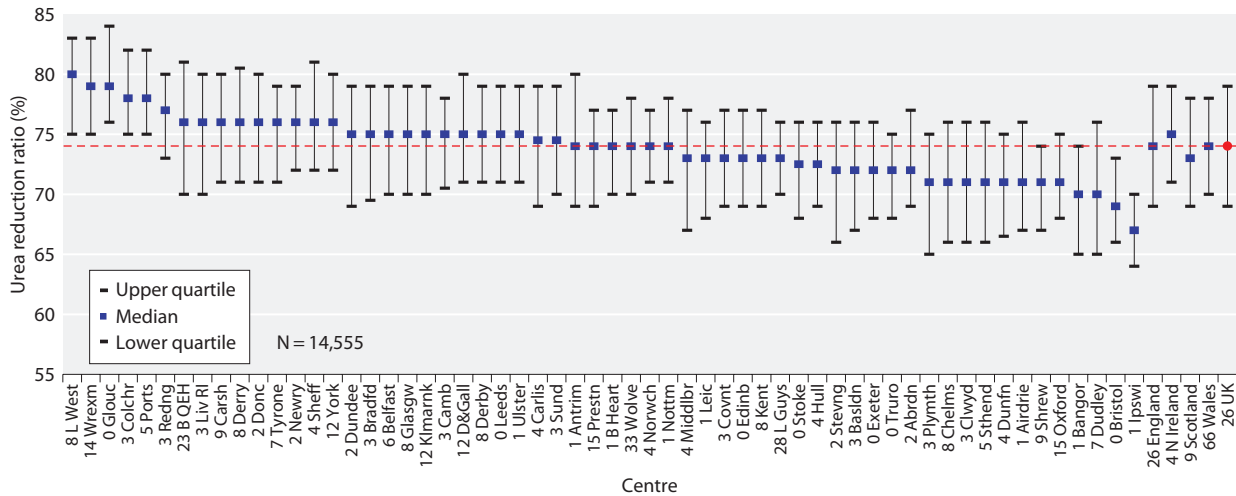


Fig. 7.1. Median URR achieved in prevalent patients in each centre, 2010

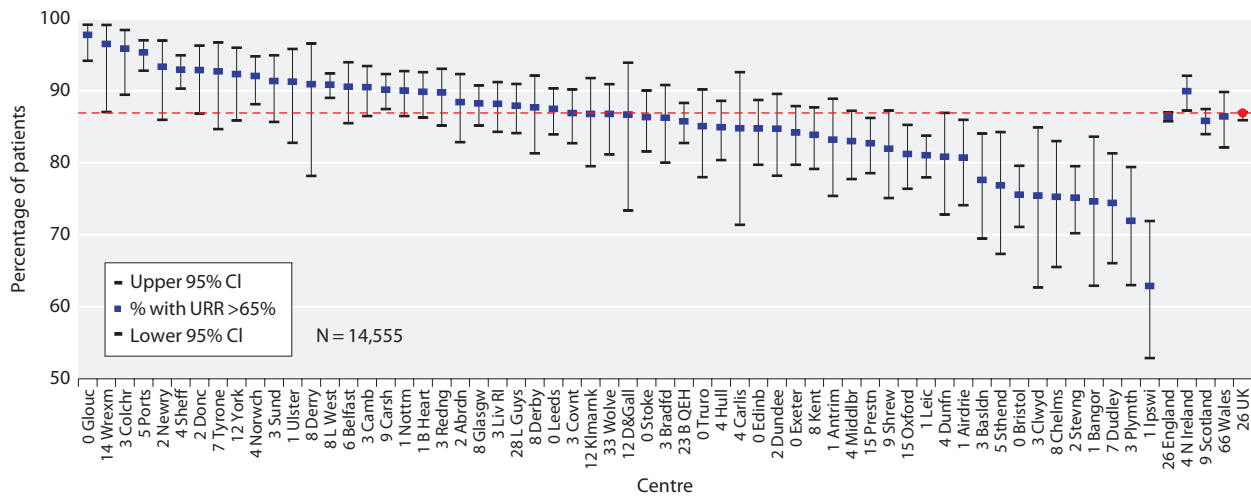


Fig. 7.2. Percentage of prevalent patients with URR >65% in each centre, 2010

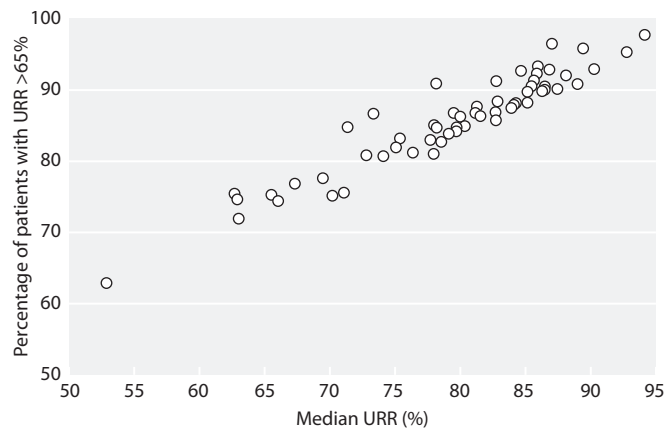
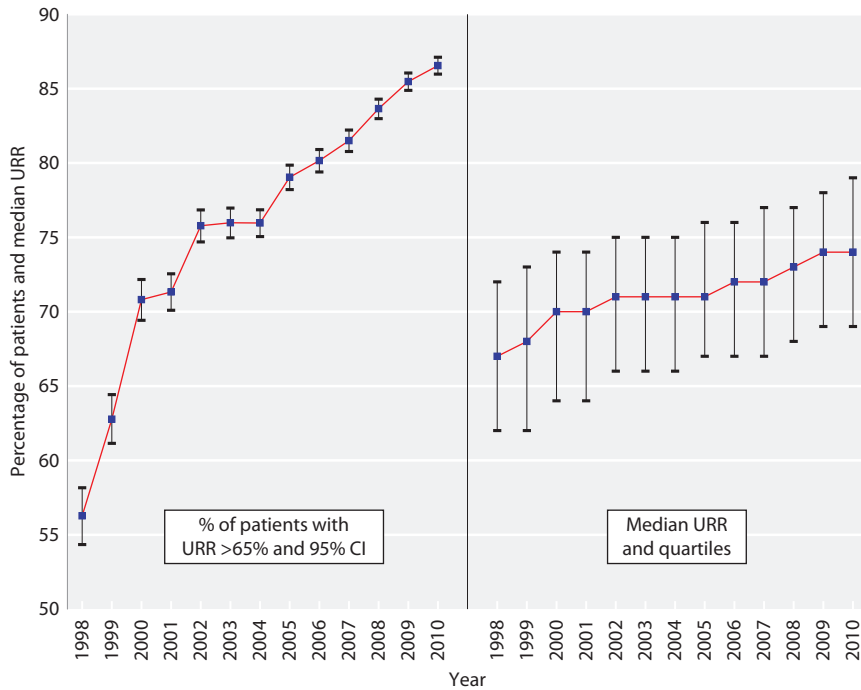


Fig. 7.3. Relationship between achievement of the Renal Association guideline for URR and the median URR in each centre, 2010

been no substantial change in median URR between 2009 and 2010.

*Variation of achieved URR with time on dialysis*

The proportion of patients who attained the RA guideline for HD was greater in those who had longest time on HD (figure 7.5). Of those dialysed for less than 6 months, 70% had a URR >65%, whilst 89% of patients who had survived and continued on RRT for more than two years attained the guideline target in 2010. Overall in all strata of time on dialysis, there has been an improvement in the proportion of patients receiving the target dose of HD over the last 12 years.



**Fig. 7.4.** Change in the percentage of patients with URR >65% and the median URR between 1998 and 2010 in the UK

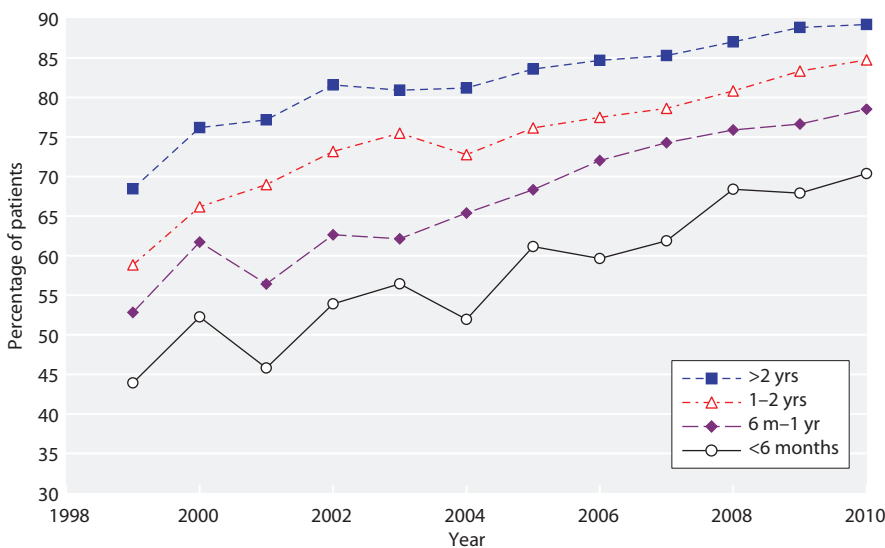
The median URR during the first quarter after starting HD treatment of the incident HD population in the UK in 2010 was 66% (centre range 57%–75%) (figure 7.6).

[2, 3]. It is therefore reassuring that the proportion of UK patients achieving the RA guideline for URR has been increasing in the last decade, with 86% of the HD population achieving the URR guideline in 2010. This increment will not only reflect improvements in practice and delivery of dialysis, but also enhanced coverage and quality of the data collected by the UK Renal Registry and renal centres over the years.

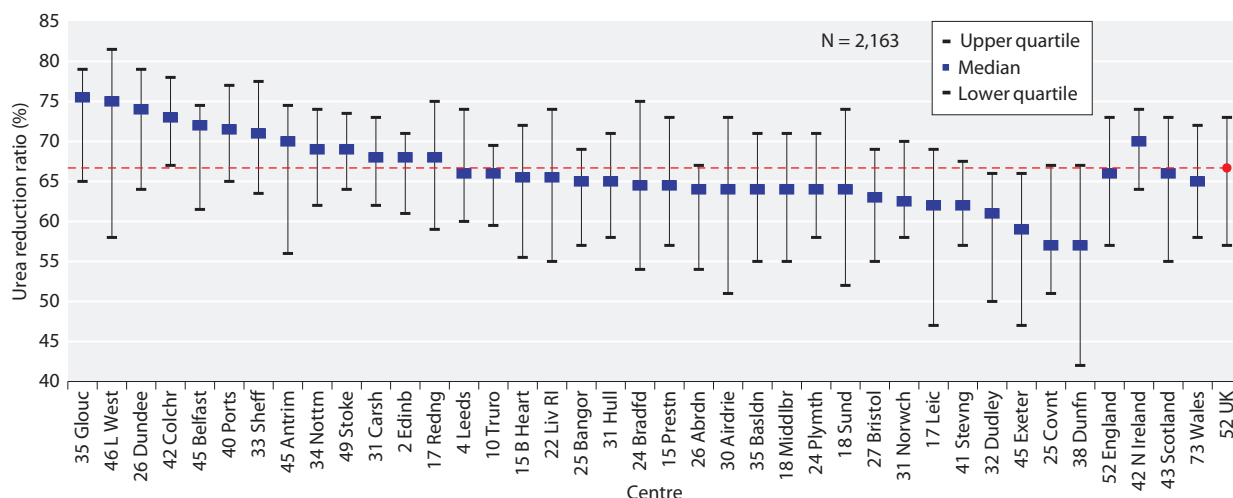
**Discussion**

The dose of delivered HD is recognised as having an important influence on outcome in ERF patients treated with HD and has been shown to correlate with survival

In order to consistently achieve a URR >65% the UK RA clinical practice guidelines recommend that clinicians should aim for a minimum target URR of



**Fig. 7.5.** Percentage of prevalent haemodialysis patients achieving URR >65% by survival on haemodialysis between 1999 and 2010



**Fig. 7.6.** Median URR in the first quarter after starting RRT in patients who started haemodialysis in 2010

70%. The median URR of patients undergoing HD in the UK in 2010 was 74% (centre range of 67%–80%) and only 2 centres had a median URR under 70%. Median URR showed a good correlation with the percentage achievement of URR target by centre.

In 2010, 89% of patients in the UK who had survived on HD for more than 2 years achieved the target of a URR >65%. The figure for patients during the first 6 months after starting treatment was lower (70%).

There was a wide range (63%–98%) of achievement of the RA guideline between different centres which is likely to reflect genuine differences in HD dose with both individual and centre level contributors although inconsistency in sampling methodology for the post-dialysis urea sample may play a part [13]. Advice given to renal centres following a postal survey in 2002 [13] aimed to achieve uniformity and this was reflected in the RA guidelines [14]. These recommended that the

post dialysis blood samples should be collected either by the slow-flow method, the simplified stop-flow method or the stop dialysate flow method. No reliable data are available to clarify whether the important variations in post-dialysis sampling methodology that were identified at that time still persist.

The use of urea clearance for measurement of HD dose is criticised by some [15] arguing that outcome is improved by longer treatment time independently of urea removal [5, 16–20] and that clearance of ‘middle molecules’ has an important impact [21, 22]. However, no consensus has yet emerged on alternative markers of HD dose and whilst this is the case the UKRR will continue to audit HD adequacy on the basis of urea clearance as assessed by URR.

Conflicts of interest: none

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