Chapter 12
Clinical, Haematological and Biochemical Parameters in Patients receiving Renal Replacement Therapy in Paediatric Centres in the UK in 2009: national and centre-specific analyses

Malcolm Lewis[a], Clare Castledine[b], Dirk van Schalkwyk[b], Manish D Sinha[c], Carol Inward[d]

[a]Manchester Childrens Hospital, Manchester, UK; [b]UK Renal Registry, Bristol, UK; [c] Evelina Children's Hospital, London, UK; [d]Bristol Royal Hospital for Children, Bristol, UK

Key Words
Biochemical variables · Children · Dialysis · ERF · Haemoglobin · Height · Quality improvement · Transplant · Weight

Summary

- Median weight z-score for children on dialysis was −1.0 whereas children with a functioning transplant had normal weights.
- Median height z-score for children on dialysis was −2.0 and for children with a functioning transplant −1.4.
- 73% of transplant patients and 52% of dialysis patients had a systolic blood pressure within the 90th percentile standard.
- 44% of transplant patients, 83% of HD patients and 38% of PD patients had a haemoglobin within the age appropriate standard.
- Transplant patients with eGFR <45 mls/min/1.73 m^2 and those using MMF had significantly worse haemoglobin standard attainment.
- 49% of HD patients and 61% of PD patients achieved the audit standard for phosphate.

Introduction

The British Association for Paediatric Nephrology (BAPN) registry was established in 1996 in parallel with the establishment of the UK Renal Registry (UKRR). The data to be collected was agreed by the registry committee of the BAPN and data collection forms distributed to each of the participating centres. Data returns have been a mixture of electronic and paper returns as progress has been made towards a merger of the adult and paediatric registries with paediatric returns coming from hospital renal information systems. When complete this will allow more detailed analysis of laboratory parameters. Currently, only one annual dataset is recorded for each patient.

This year the Paediatric Renal Registry report focuses on the following variables for the prevalent paediatric dialysis and transplantation cohort on 31st December 2009:

1. Report on the completeness of data returns to the renal registry
2. Overview of anthropometric characteristics in children with established renal failure (ERF)
3. Overview of blood pressure control in children with ERF
4. Anaemia
5. Key biochemical findings in this population

Analyses of prevalent paediatric patients receiving renal replacement therapy for the year 2009 and for the period 1999–2009 inclusive are reported. Due to low numbers of patients in each cohort no incident cohort analyses have been undertaken. Centre specific data for each paediatric nephrology centre in the UK has also been provided.

Methods

There were 13 centres providing care for children requiring renal replacement therapy in the UK, 10 of which also provided surgical renal transplant services. All 13 centres provide outpatient and in-patient follow up for children who have received kidney transplants. Centres are listed in table 12.1 and appendix K.

Data collection

The data presented in this report relate to the annual census date of 31st December 2009.

The paediatric centres with access to renal IT systems submitted encrypted electronic data directly to the UKRR. The software routines to extract the data were run with the assistance of staff at the UKRR.

Paper or electronic returns in the original BAPN database format were sent to the UKRR for entry onto the original BAPN database as in previous years from those centres without access to renal IT systems and then data were amalgamated. Complete transfer to the UKRR encrypted database is still awaited.

Governance, reporting and standardisation

Information governance, reporting and standardisation were all performed in an identical manner to previous analyses to allow comparison [1]. As before, with the value of many clinical parameters in childhood varying with age and size, data are presented as z-scores.

Anthropometry

The reference range for height (Ht), weight (Wt) and body mass index (BMI) in childhood varies with gender and age. BMI was calculated using the formula BMI = Wt (kg)/Ht $(m)^2$. Height, weight and BMI were all adjusted for age and z-scores were calculated based on the British 1990 reference data for height and weight [2].

Blood pressure (BP)

The reference range for blood pressure varies with gender, age and height. The data is therefore presented as z-scores based on data from the Fourth report of the National High Blood Pressure Education Programme (NHBPEP) working group in the United States [3].

Laboratory values

Haemoglobin (Hb), ferritin (Ferr), calcium (Ca) and phosphate (Phos) were analysed using age related laboratory reference ranges as in table 12.2. Data analysis is presented for each centre individually and at a national level for each variable.

Table 12.1. Paediatric renal centres, their abbreviations and IT systems

Paediatric centre	Abbreviation	Renal IT system
Belfast	Blfst_P	None
Birmingham	Bham_P	CCL Proton
Bristol	Brstl_P	CCL Proton
Cardiff	Cardf_P	CCL Proton
Glasgow	Glasg_P	None
Leeds	Leeds_P	CCL Proton
Liverpool	Livpl_P	None
London Evelina	L Eve_P	None
London Great Ormond Street	L GOSH_P	CCL Proton*
Manchester	Manch_P	None
Newcastle	Newc_P	CCl clinical vision
Nottingham	Nottm_P	CCL Proton
Southampton	Soton_P	Bespoke**

*GOSH has a link to the CCL PROTON system in Bristol but with no lab links

**Recent implementation of a bespoke renal IT system has enabled transmission of a limited dataset from Southampton this year

Table 12.2 Summary of relevant biochemical clinical audit measures

	Age			
Parameter	<1 year	1–5 years	6–12 years	>12 years
Haemoglobin (g/dl) in transplant patients – unless eGFR <40 (then as per anaemia – see below)	10.5–13.5	12–14	11.5–14.5	13–17.0
Anaemia* (g/dl) (NICE guidelines for dialysis patients only)	<10.0 for <2 yr Maintain 10–12 for <2 yr	<11.0 for >2 yr Maintain 10.5–12.5 for >2 yr	<11.0 for >2 yr Maintain 10.5–12.5 for >2 yr	<11.0 for >2 yr Maintain 10.5–12.5 for >2 yr
eGFR (transplant patients)	Estimated GFR (eGFR) as per Schwartz formula: (height × k)/plasma creatinine The value for k is that in use at the reporting centre			
Ferritin (μg/L)	200–500	200–500	200–500	200–500
Corrected calcium (mmol/L)	2.24–2.74	2.19–2.69	2.19–2.69	2.15–2.55
Phosphate (mmol/L)	1.1–1.95	1.05–1.75	1.05–1.75	1.05–1.75
Parathyroid hormone (individual centre units)	Within twice the normal range Levels may be maintained within normal range if growing appropriately			

*For transplant patients the reference range used is the normal range for age

Statistical analysis

Data were analysed to calculate summary statistics (maximum, minimum, mean and median values in addition to standard deviation and quartile ranges). Where applicable, the percentage achieving the audit standard was also calculated. Patients without data were excluded from that analysis.

Longitudinal analyses of attainment of standards over time were also performed. This was based on a single data point per ERF patient per year collected as described previously. Changing audit standards over time and variable data return for previous years encourages cautious interpretation of these analyses. All analyses were done using SAS 9.2.

Standards

Standards are from the Treatment of Adults and Children with Renal Failure, Renal Association 2002 guidelines unless otherwise stated [4].

Anthropometry

'Height and weight should be monitored at each clinic visit. Measures of supine length or standing head circumference should be measured during each visit up to two years of age and 6 monthly up to 5 years of age. All measurements should be plotted on European reference growth charts for healthy children.'

Blood Pressure

'Blood pressure varies throughout childhood and should be maintained within 2 standard deviations of the mean for normal children of the same height and sex. Systolic blood pressure during PD or post-HD should be maintained at <90th percentile for age, gender and height.'

The analyses of blood pressure in this report present the achievement of blood pressures at or below the 90th percentiles.

Anaemia

Guidance on the management of anaemia in adults and children with chronic kidney disease was published by the National Institute for Clinical Excellence (NICE) in 2006 (Clinical Guideline 39) [5]. The recommendation in this guidance is that in children with chronic kidney disease, treatment should maintain stable haemoglobin levels between 10 and 12 g/dl in children below 2 years of age and between 10.5 and 12.5 g/dl in children above 2 years of age. For the purposes of this report, the NICE standards have been adopted.

Calcium, phosphate and parathyroid hormone levels

Phosphate and calcium should be kept within the normal range [4]. For analyses of calcium and phosphate

the age related ranges as described previously have been used [1].

Results

Data completeness

Tables 12.3 to 12.6 show the completeness of data returns for transplant and dialysis patients for 2009 and the 1999–2009 period. Each patient was assessed with regard to the completeness of data for each year between 1999 and 2009. Thus the total does not represent the number of patients treated but the number of patient treatment years assessed for each modality.

No data was submitted from Southampton in 2008 pending the establishment of data extraction routines.

Overall completeness is good, however in 2009, height, weight and blood pressure data from GOSH were less complete due to problems with the entry of timeline events without which these parameters cannot be calculated. The data items shown in these tables are those used in this chapter to aid interpretation.

Height, weight and BMI

Figures 12.1 and 12.4 show that children receiving renal replacement therapy were short for their age. The height deficit was greater in children on dialysis than in those who had a functioning kidney transplant.

Children with a functioning kidney transplant had a normal weight (figure 12.2). Those on dialysis had a weight below that of healthy children (figure 12.5) with a UK median z-score of −1.

Body mass index in children with a functioning transplant in 2009 showed inter-centre variation with a median UK z-score of 0.8 (figure 12.3). The UK median z-score in those on dialysis was 0.2 (figure 12.6). The most likely explanation for this is the short stature seen in this group.

Figure 12.7 shows that the UK average median z-score for height and the percentage of children receiving growth hormone each year has not changed since 1999. However the group of children who were receiving growth hormone appear to have more severe height restriction since 2006. More detailed analysis dividing patients into those on dialysis and those with allografts, together with analysis according to primary diagnosis and comorbidity will be required to establish the reason for this.

Blood pressure

Analyses of blood pressure management have shown that blood pressure is higher in children receiving renal replacement therapy than in healthy children (figures 12.8 and 12.9). There was wide inter-centre variation in systolic blood pressure, particularly in dialysis patients in 2009 with a UK median z-score of 0.9 for dialysis patients and 0.5 for transplant patients.

Children receiving peritoneal dialysis had higher blood pressures than children with kidney transplants or those on haemodialysis (table 12.7). In the UK as a whole in 2009, 75.6% of children on haemodialysis

Table 12.3. Percentage data completeness for transplant patients by centre for each biochemical, blood pressure and growth variable and total number of patients per centre in 2009

Centre	Transplant patients N	Height	Weight	BMI	Systolic BP	Hb	eGFR	Ferritin
Blfst_P	17	94	94	94	88	100	94	12
Bham_P	54	96	96	96	94	98	94	32
Brstl_P	38	97	100	97	90	97	92	63
Cardf_P	20	95	95	95	95	15	15	10
L GOSH_P	138	0	0	0	0	100	0	99
Glasg_P	54	98	100	98	98	100	98	82
L Eve_P	80	99	100	99	99	100	98	90
Leeds_P	61	95	100	95	95	100	95	25
Livpl_P	28	100	100	100	100	100	100	89
Manch_P	37	100	100	100	100	100	100	19
Newc_P	35	97	100	97	97	97	97	74
Nottm_P	15	87	93	87	67	87	80	80
UK	**577**	**74**	**75**	**74**	**72**	**96**	**80**	**56**

Table 12.4. Percentage data completeness for dialysis patients by centre for each variable and total number of patients per centre in 2009

Centre	Dialysis patients N	Height	Weight	BMI	Systolic BP	Hb	PTH	Ca	Phos	Ferritin
Blfst_P	10	80	90	80	80	100	70	80	80	80
Bham_P	38	95	95	95	95	100	89	100	100	82
Brstl_P	7	71	71	86	71	100	86	100	100	71
Cardf_P	7	100	100	100	86	29	29	29	29	29
L GOSH_P	41	15	15	15	15	100	100	100	100	100
Glasg_P	14	86	100	86	86	100	100	100	100	93
L Eve_P	21	100	100	100	100	100	100	100	100	100
Leeds_P	17	94	100	94	94	100	100	100	100	100
Livpl_P	5	100	100	100	100	100	100	100	100	80
Manch_P	23	100	100	100	100	100	52	100	100	100
Newc_P	6	83	100	83	83	100	100	100	83	100
Nottm_P	17	82	88	82	71	100	71	100	100	94
UK	**206**	**77**	**88**	**85**	**82**	**94**	**83**	**92**	**91**	**86**

Table 12.5. Data completeness for each variable for each transplant patient per year from 1999–2009

Centre	Transplant patient years	Height	Weight	Systolic BP	Hb	eGFR	Ferritin
Blfst_P	134	95	95	94	100	95	31
Bham_P	398	99	99	99	99	98	23
Brstl_P	370	98	98	95	96	95	21
Cardf_P	196	88	91	92	89	80	57
L GOSH_P	945	74	76	75	96	73	55
Glasg_P	386	95	97	97	99	95	49
L Eve_P	677	95	98	98	100	94	57
Leeds_P	340	94	95	77	95	92	25
Livpl_P	287	96	98	99	99	95	52
Manch_P	655	98	99	98	99	97	3
Newc_P	232	97	98	98	98	97	35
Nottm_P	566	92	93	92	97	91	39
UK	**5,241**	**93**	**95**	**93**	**97**	**92**	**37**

*Blood pressure data from Leeds from 2008 was subject to a downloading issue

Table 12.6. Data completeness for each variable and total number of dialysis patients in each centre from 1999–2009

Centre	Dialysis patient years	Height	Weight	Systolic BP	Hb	PTH	Ca	Phos	Ferritin
Blfst_P	71	89	99	94	100	76	96	94	65
Bham_P	256	98	98	97	100	82	100	100	74
Brstl_P	144	94	98	97	97	92	98	98	63
Cardf_P	33	88	97	94	85	73	85	85	76
L GOSH_P	304	77	83	82	99	72	99	98	84
Glasg_P	122	84	97	95	98	86	98	99	85
L Eve_P	113	86	96	90	98	82	86	97	81
Leeds_P	143	86	91	78	94	72	92	93	87
Livpl_P	73	89	100	99	99	81	96	96	84
Manch_P	216	91	93	89	98	56	97	97	74
Newc_P	72	92	96	96	99	81	99	97	85
Nottm_P	176	76	86	76	98	61	98	98	77
UK	**1,741**	**87**	**94**	**91**	**97**	**76**	**95**	**96**	**78**

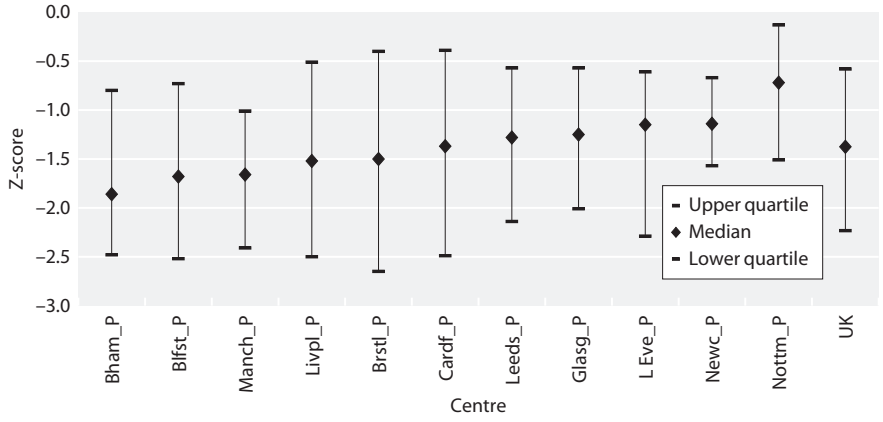

Fig. 12.1. Median height z-scores for transplant patients in 2009

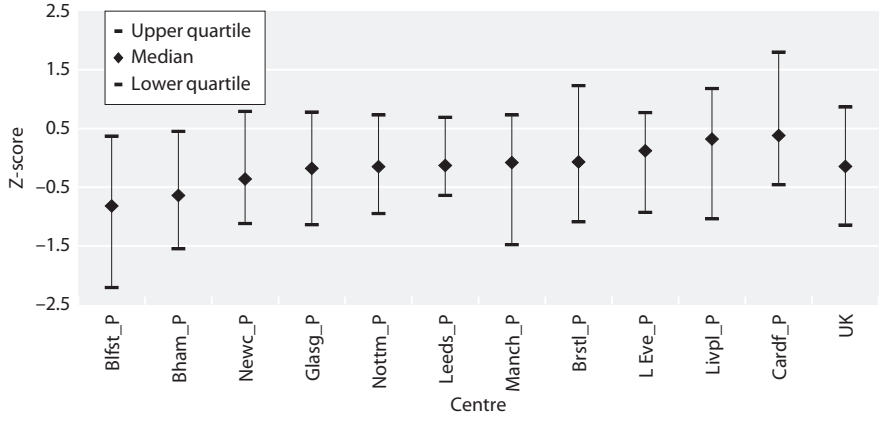

Fig. 12.2. Median weight z-scores for transplant patients in 2009

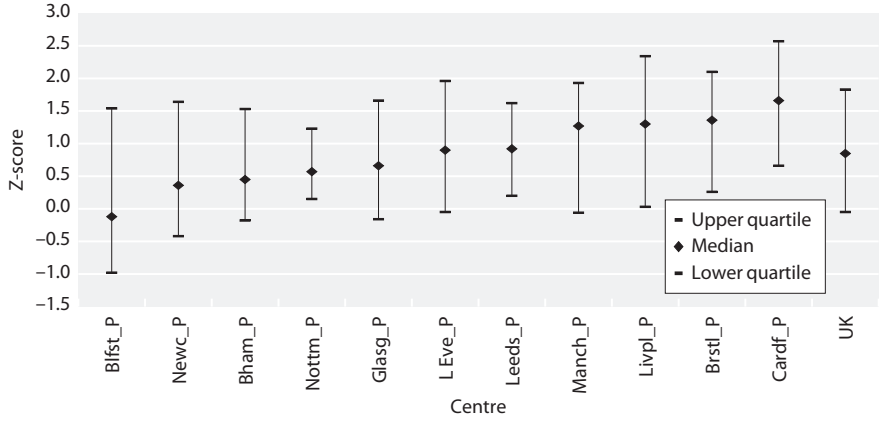

Fig. 12.3. Median BMI z-scores for transplant patients in 2009

had a systolic BP <90th percentile while only 51.7% of children receiving peritoneal dialysis achieved this (table 12.7). For children with a functioning kidney transplant 73.2% had a systolic BP <90th percentile and this was similar to last year when 77% of such children achieved the target (table12.7).

Haemoglobin

For technical reasons, data extraction of laboratory variables from Cardiff was incomplete and is therefore excluded from the following tables.

The analyses in this report show that many children receiving renal replacement therapy are anaemic.

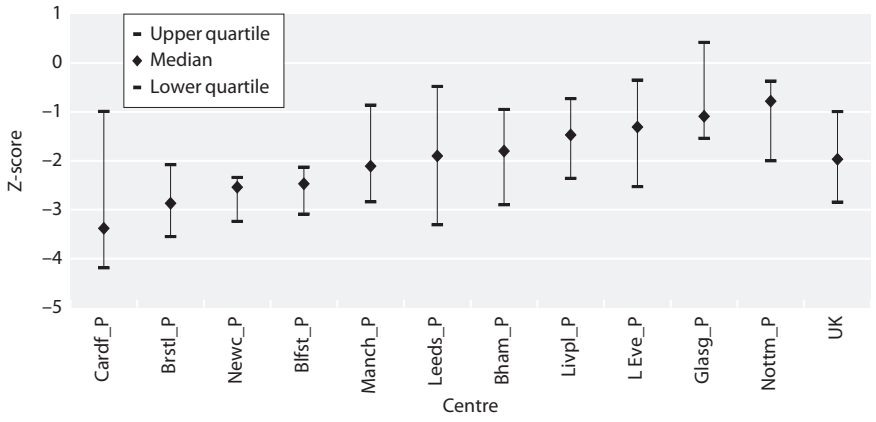

Fig. 12.4. Median height z-scores for dialysis patients in 2009
*Centres with less than 50% data completeness were excluded from the centre specific analysis but were included in the UK totals

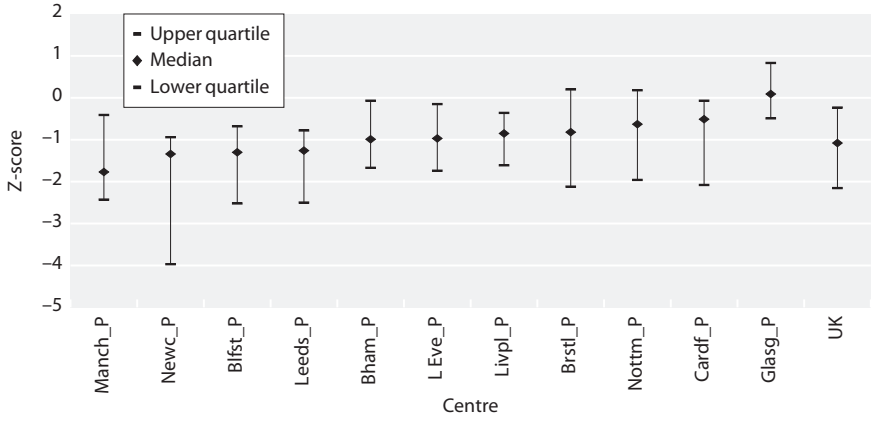

Fig. 12.5. Median weight z-scores for dialysis patients in 2009
*Centres with less than 50% data completeness were excluded from the centre specific analysis but were included in the UK totals

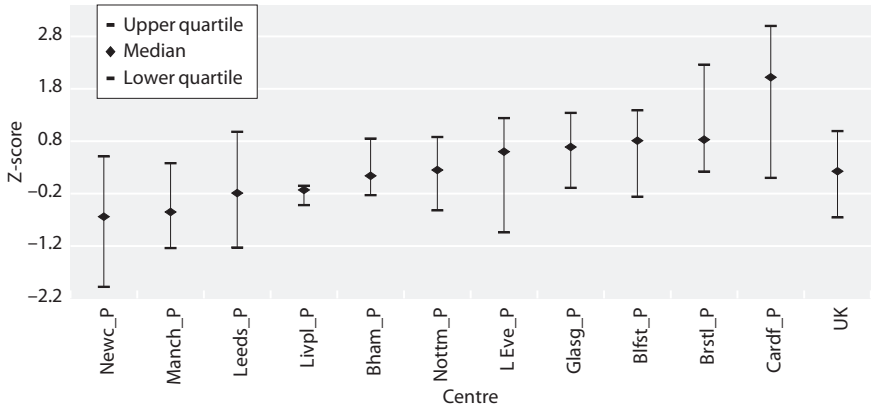

Fig. 12.6. Median BMI z-scores for dialysis patients in 2009

Forty-seven percent (range 33–61%) of children with a functioning transplant achieved the haemoglobin standard (table 12.8). However the children with poor graft function (CKD 3bT or lower) were assessed using the same standard as those with well functioning grafts rather than to the standards used for dialysis patients and so these results may look worse than centres themselves recognise. This use of different standards depending on the graft function will be incorporated separately into next year's report. Fifty-four percent of haemodialysis patients and 21% of peritoneal dialysis patients had haemoglobin below the standard. A significant percentage of children also had haemoglobin concentrations above the recommended standard (19%

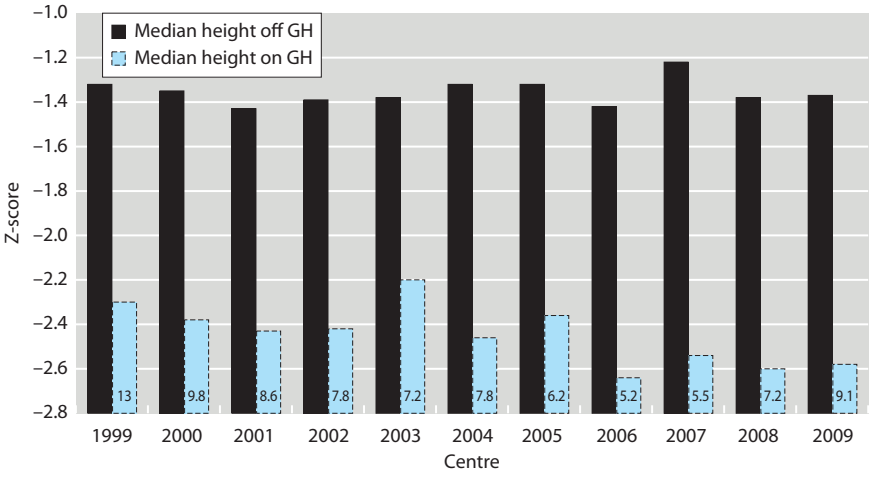

Fig. 12.7. Median height z-scores in paediatric patients receiving RRT from 1999 to 2009, with the percentage of children using growth hormone each year
Numbers represent % patients on GH

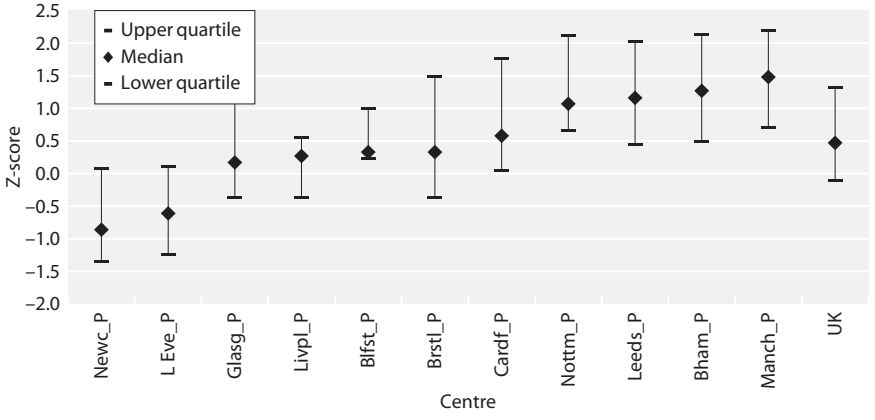

Fig. 12.8. Median systolic blood pressure z-scores for transplant patients in 2009
Centres with less than 50% data completeness were excluded from the centres specific analysis but were included in the UK totals

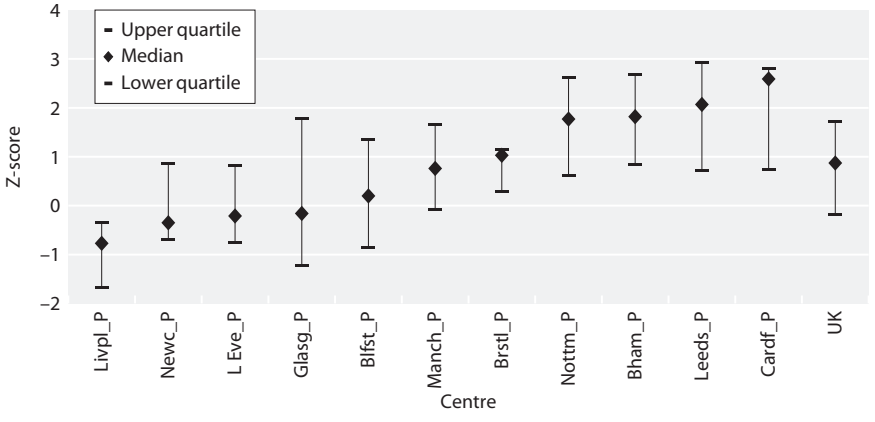

Fig. 12.9. Median systolic blood pressure z-scores for dialysis patients in 2009
Centres with less than 50% data completeness were excluded from the centres specific analysis but were included in the UK totals

for HD and 32% for PD). The importance of this in the paediatric population, with a very different spectrum of comorbidity from adults, is not known.

The 10 year trend data suggests some improvement over time with regards to anaemia and ferritin (figure 12.10), although with scope for further improvement.

The attainment of the haemoglobin standard in transplant patients was assessed for different levels of graft function (figure 12.11), in the presence of hyperparathyroidism (figure 12.12) and with the use of MMF as immunosuppressant therapy (figure 12.13). Figure 12.11 demonstrates that haemoglobin standard attainment

Table 12.7. Percentage of patients achieving the standards for systolic blood pressure in 2009

	Transplant patients		HD patients		PD patients	
Centre	Patients with data N	Below 90th percentile	Patients with data N	Below 90th percentile	Patients with data N	Below 90th percentile
Blfst_P	15	80.0	5	80.0	3	66.7
Bham_P	51	51.0	17	29.4	19	31.6
Brstl_P	34	70.6	1	100.0	4	75.0
Cardf_P	19	73.7	2	100.0	4	0.0
Glasg_P	53	94.9	4	75.0	8	62.5
L Eve_P	79	79.3	11	72.7	10	90.0
Leeds_P	58	58.6	10	50.0	6	0.0
Livpl_P	28	92.9	1	100.0	4	100.0
Manch_P	37	43.2	2	100.0	21	52.4
Newc_P	34	100.0	2	100.0	3	66.7
Nottm_P	10	60.0	4	75.0	8	25.0
UK	**418**	**73.2**	**63**	**75.6**	**92**	**51.7**

Table 12.8. Percentage of patients achieving the haemoglobin standard in 2009

	Transplant patients				Haemodialysis patients				Peritoneal dialysis patients			
Centre	Patients with data N	% achieving standard	% lower than standard	% above standard	Patients with data N	% achieving standard	% lower than standard	% above standard	Patients with data N	% achieving standard	% lower than standard	% above standard
Blfst_P	17	58.8	41.2	0.0	6	33.3	33.3	33.3	4	75.0	0.0	25.0
Bham_P	53	35.9	62.3	1.9	18	50.0	33.3	16.7	20	55.0	30.0	15.0
Brstl_P	37	46.0	54.1	0.0	2	0.0	50.0	50.0	5	0.0	40.0	60.0
L GOSH_P	138	44.9	54.4	0.7	21	38.1	28.6	33.3	20	50.0	20.0	30.0
Glasg_P	54	46.3	51.9	1.9	4	0.0	75.0	25.0	10	30.0	20.0	50.0
L Eve_P	80	50.0	47.5	2.5	11	27.3	36.4	36.4	10	30.0	40.0	30.0
Leeds_P	61	47.5	52.5	0.0	10	20.0	60.0	20.0	7	57.1	28.6	14.3
Livpl_P	28	46.4	53.6	0.0	1	0.0	100.0	0.0	4	50.0	0.0	50.0
Manch_P	37	35.1	64.9	0.0	2	0.0	100.0	0.0	21	52.4	28.6	19.1
Newc_P	34	58.8	41.2	0.0	2	100.0	0.0	0.0	4	25.0	25.0	50.0
Nottm_P	13	61.5	38.5	0.0	6	50.0	33.3	16.7	11	36.4	18.2	45.5
UK	**552**	**44.3**	**46.8**	**0.6**	**83**	**26.6**	**45.8**	**19.3**	**117**	**38.4**	**20.9**	**32.4**

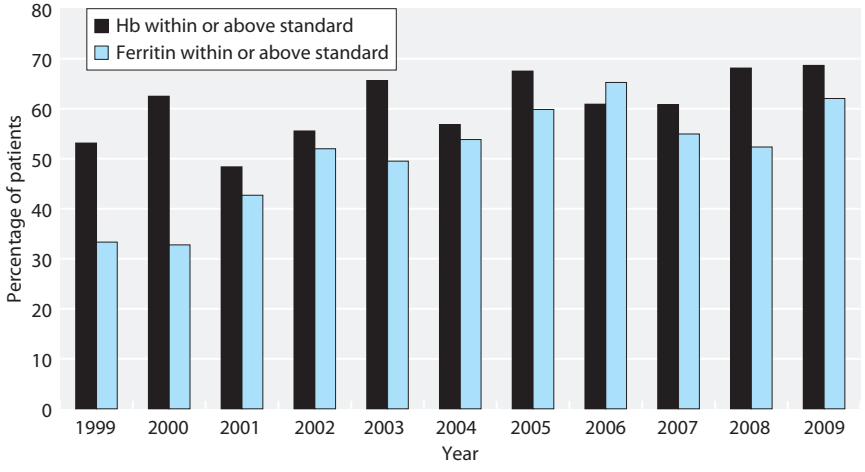

Fig. 12.10. The percentage of paediatric dialysis patients achieving the treatment standards for haemoglobin and ferritin from 1999–2009

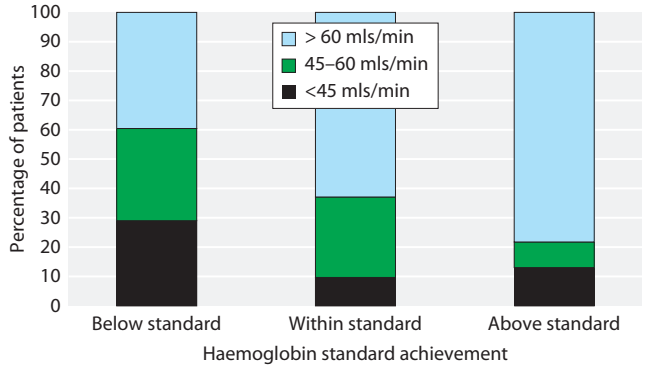

Fig. 12.11. The achievement of haemoglobin treatment standards in paediatric transplant patients, by the level of graft function
*This figures combines all data from 1999–2009

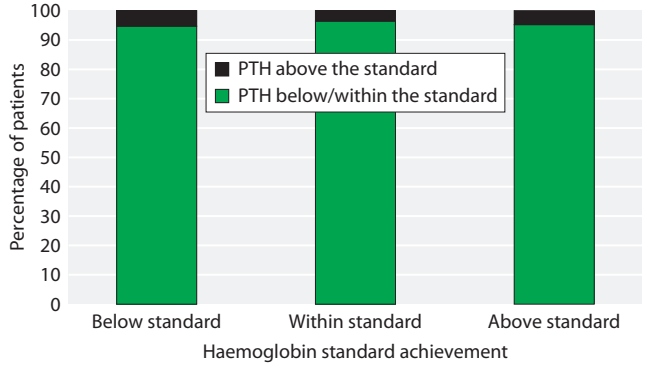

Fig. 12.12. The achievement of haemoglobin treatment standards in paediatric transplant patients, by PTH concentration
*This figure combines all data from 1999–2009

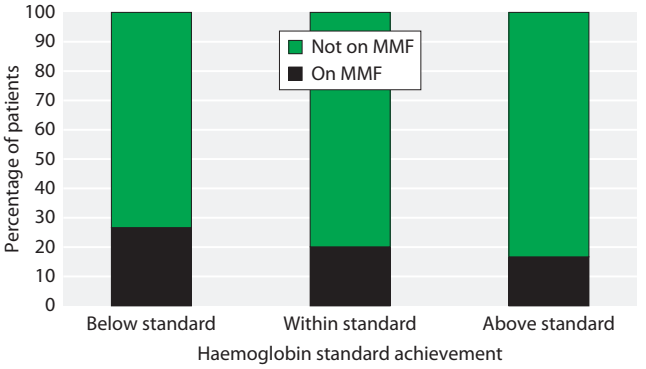

Fig. 12.13. The achievement of haemoglobin treatment standards in paediatric transplant patients, by use of MMF
*This figure combines all data from 1999–2009

was worse for patients with transplant dysfunction (29% of patients with Hb below the standard also had an eGFR <45 whilst only 10% of patients with an Hb within the standard had an eGFR <45, $p < 0.001$). PTH concentration appeared to have little effect on haemoglobin standard attainment in this analysis. However it should be borne in mind that with an observational analysis like this, the true relationship between PTH and haemoglobin concentration may be masked by unmeasured factors. Figure 12.13 shows that patients using MMF as immunosuppressant therapy were more likely to have haemoglobin concentrations below the standard, $p = 0.01$.

Calcium, phosphate and PTH

In 2009 in the UK as a whole, 49% of haemodialysis patients and 61% of peritoneal dialysis patients had a phosphate within the target range (table 12.9). The

Table 12.9. Achievement of the phosphate standard in dialysis patients in 2009

	Haemodialysis				Peritoneal dialysis			
Centre	Patients with data N	% within standard	% below standard	% above standard	Patients with data N	% within standard	% below standard	% above standard
Blfst_P	5	40	20	40	3	100	0	0
Bham_P	18	56	0	44	20	60	20	20
Brstl_P	2	100	0	0	5	40	40	20
L GOSH_P	21	38	10	52	20	55	15	30
Glasg_P	4	0	0	100	10	50	0	50
L Eve_P	11	55	18	27	10	80	0	10
Leeds_P	10	70	0	30	7	43	0	57
Livpl_P	1	0	0	100	4	50	0	50
Manch_P	2	50	0	50	21	67	5	29
Newc_P	2	0	0	100	3	33	33	33
Nottm_P	6	83	0	17	11	55	9	36
UK	**83**	**49**	**4**	**47**	**115**	**61**	**1**	**28**

Table 12.10. Achievement of the adjusted calcium standard in dialysis patients in 2009

	Haemodialysis				Peritoneal dialysis			
Centre	Patients with data N	% within standard	% below standard	% above standard	Patients with data N	% within standard	% below standard	% above standard
Blfst_P	3	60	20	20	2	100	0	0
Bham_P	18	61	6	33	20	45	0	55
Brstl_P	2	100	0	0	5	40	0	60
L GOSH_P	21	33	14	52	20	60	0	40
Glasg_P	4	75	0	25	10	60	20	20
L Eve_P	10	100	0	0	8	90	0	10
Leeds_P	10	80	0	20	7	43	14	43
Livpl_P	0	100	0	0	4	75	0	25
Manch_P	2	50	0	50	21	86	5	10
Newc_P	2	100	0	0	2	50	0	50
Nottm_P	6	67	0	33	11	73	0	27
UK	**78**	**77**	**3**	**20**	**111**	**68**	**3**	**28**

achievement of the standard for calcium was better with 77% of children on haemodialysis and 68% of children on peritoneal dialysis having a calcium level within the target range (table 12.10). Fifty-six percent of children on HD and 63% on PD had a PTH within the target range with wide inter-centre variation and a median value for the whole UK of 16 pmol/L (table 12.11). Caution should be exercised in the interpretation of

Table 12.11. Achievement of the PTH standard in dialysis patients in 2009

	Haemodialysis			Peritoneal dialysis		
Centre	Patients with data N	% within standard	% above standard	Patients with data N	% within standard	% above standard
Blfst_P	6	17	83	4	50	50
Bham_P	18	33	67	20	50	50
Brstl_P	2	100	0	5	80	20
L GOSH_P	21	62	38	20	70	30
Glasg_P	4	75	25	10	80	20
L Eve_P	11	73	27	10	60	40
Leeds_P	10	40	60	7	43	57
Livpl_P	1	0	100	4	25	75
Newc_P	2	100	0	4	100	0
Nottm_P	6	50	50	11	64	36
UK	**84**	**56**	**44**	**99**	**63**	**37**

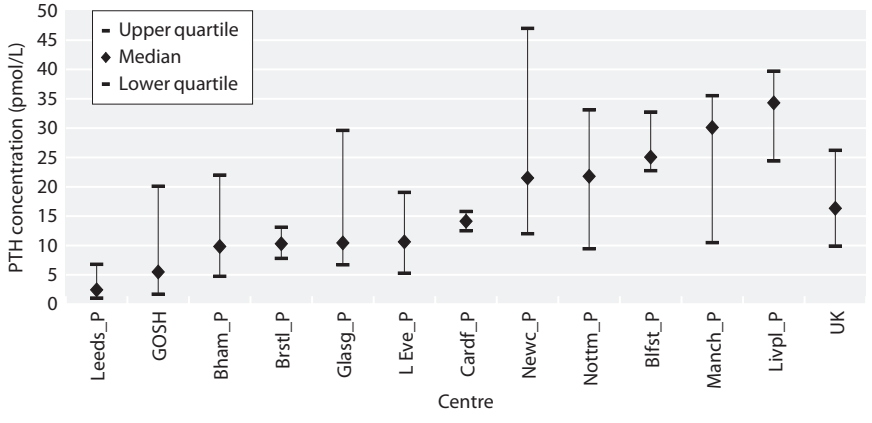

Fig. 12.14. Median PTH concentration in dialysis patients in 2009, by centre

these analyses as it was not always possible to identify which units were used to measure PTH, for instance, if bloods were taken at different laboratories and also some variation exists between the different PTH assays available.

Discussion

Whilst the move to electronic reporting with multiple data submissions per annum remained incomplete, interpretation of annual census data with regard to haematological, biochemical and blood pressure parameters, needs to be made with caution. Over the whole UK there were only a small number of children on any specific modality of dialysis at one time point and within the course of a year parameters such as calcium, phosphate and PTH may vary greatly within any individual. The ability to look at annual average values for different parameters in the future will be a great advance. That said a number of recurring themes are evident from this report.

Anthropometry

As in previous reports the paediatric renal failure population was shorter than the UK average. This is not surprising and year by year there is unlikely to be any rapid shift towards normality. Patients requiring dialysis fare worse than transplanted patients. Overall, neither malnutrition nor obesity afflicted the majority of patients in the populations. Further work needs to be undertaken to look at the effect of steroid free immunosuppression regimes on transplanted patients as increasing number of centres are using these regimes. Duration of dialysis and height attainment and the use of growth hormone also require analysis in the future – particularly with the paucity of deceased donor kidneys available. Some sub-analysis of both the dialysis populations to exclude either primary diseases or comorbid conditions leading to inevitable short stature would help clarify the situation with regard to those with isolated renal failure at the outset.

Blood pressure

Achieving targets for blood pressure remained a problem. This is one area where there are apparent centre differences. Further work to assess whether this was related to the demography of the patient group within each centre or to the zeal of the team caring for these patients may be beneficial. Looking at a trend of blood pressure readings over a year together with anti-hypertensive usage and stratifying according to primary disease will be considered in future analyses. However, an audit of blood pressure control amongst paediatric transplant patients carried out for the BAPN found no relationship between ethnicity or primary renal disease and achievement of blood pressure targets [6]. Cardiovascular disease was a major cause of mortality and morbidity in patients with renal failure and clinical teams need to continue to focus on their on-going efforts to improve overall BP control in this high risk population.

Anaemia

As with previous reports the management of anaemia remained imperfect. It appears that ferritin levels are improving and it is hoped that with time, this will lead to more patients having haemoglobin concentrations within the target range. As is already being seen to some extent, the normal distribution of haemoglobin will mean that if a shift of the curve to the right to get more patients with low haemoglobin into range will result in more patients with relatively higher haemoglobins. Whilst this is a definite risk factor in adult patients with established cardiovascular disease there is no data to say whether this will be a problem in children or not. This subject requires further study whilst accepting that trials in adult with both pre-dialysis and dialysis dependent CKD, comparing effects of treatment of anaemia to different targets, have reported higher rates of adverse events in subjects in whom higher targeted Hb levels was sought [7, 8].

Biochemistry

Bone disease remained a major problem in children with ERF. The percentage achieving desired targets remained too low. Again, more robust analysis will be possible when annual patient trends rather than isolated values can be reported. The management of renal osteodystrophy is changing – particularly with the advent of new phosphate binders and calcimimetics which may in time improve achievement of audit standards.

The data presented in this report provide a snap shot picture of the care of children receiving renal replacement therapy in the UK in 2009. In time, increased use of renal IT systems will enable greater insight to be gained by allowing the study of a greater number of time-points during the year. In addition to this it is hoped that the seamless transfer of this data within

the registry as young patients move to adult centres will soon allow the long term assessment of whether the current goals are the right ones.

Conflicts of interest: none

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