UK Renal Registry 19th Annual Report: Chapter 7 Haemoglobin, Ferritin and Erythropoietin amongst UK Adult Dialysis Patients in 2015: National and Centre-specific Analyses

Daniel Ford\textsuperscript{a}, Julie Gilg\textsuperscript{b}, Andrew J Williams\textsuperscript{c}

\textsuperscript{a}University Hospital Coventry and Warwickshire, Coventry, UK; \textsuperscript{b}UK Renal Registry, Bristol, UK; \textsuperscript{c}Morriston Hospital, Swansea, UK

Key Words
Anaemia · Chronic kidney disease · Dialysis · End stage renal disease · Epidemiology · Erythropoietin · Erythropoiesis stimulating agent · European Best Practice Guidelines · Ferritin · Haemodialysis · Haemoglobin · NICE · Peritoneal dialysis · Renal Association

Summary

In the UK in 2015:

- The median haemoglobin (Hb) of patients at the time of starting dialysis was 98 g/L with 47% of patients having a Hb $\geq 100$ g/L.
- The median Hb in patients starting haemodialysis (HD) was 96 g/L (IQR 87–105) and in patients starting peritoneal dialysis (PD) was 107 g/L (IQR 98–116).
- At the start of dialysis 51% of patients presenting early had Hb $\geq 100$ g/L compared with only 34% of patients presenting late.
- The median Hb of prevalent patients on HD was 110 g/L (IQR 101–119).
- The median Hb of prevalent patients on PD was 112 g/L (IQR 103–120).
- 79% of HD patients and 81% of PD patients had Hb $\geq 100$ g/L.
- 59% of HD patients and 57% of PD patients had Hb $\geq 100$ and $\leq 120$ g/L.
- The median serum ferritin in HD patients was 415 mg/L and 94% of HD patients had a ferritin $\geq 100$ mg/L.
- The median serum ferritin in PD patients was 295 mg/L and 88% of PD patients had a ferritin $\geq 100$ mg/L.

In England, Wales and Northern Ireland in 2015:

- The median erythropoiesis stimulating agent (ESA) dose in HD patients was 7,500 IU/week.
- The median ESA dose in PD patients was 4,000 IU/week.
Introduction

Anaemia is a common feature of chronic kidney disease (CKD) and when untreated is strongly associated with poor outcomes resulting in increased hospitalisations and mortality. This chapter describes analyses of the management of anaemia in dialysis patients in the UK in 2015.

A number of clinical practice guidelines exist for the management of anaemia in patients with CKD. The Kidney Disease Improving Global Outcomes (KDIGO) Clinical Practice Guideline for Anemia in Chronic Kidney Disease was published in August 2012 [1]. Commentaries and position statements on this document were made by both the Kidney Disease Outcomes Quality Initiative (KDOQI), and the European Renal Best Practice Guidelines Group (ERBP) [2, 3]. The Renal Association Clinical Practice Guideline for Anaemia of CKD (5th edition) was published in 2010 with the 6th edition expected in 2017 [4]. The National Institute for Health and Care Excellence (NICE) Clinical Guideline on Chronic Kidney Disease: Managing Anaemia was published in June 2015, mid-way through the data collection period [5].

This chapter reports on the analyses of data items collected by the UK Renal Registry (UKRR) measured against the audit parameters set in the Renal Association Clinical Practice Guideline (5th edition) [4]. Table 7.1 lists the audit measures recommended in these guidelines alongside those parameters measured in this chapter and reasons for exclusion.

Methods

Most of the analyses in this chapter use the incident or prevalent renal replacement therapy (RRT) cohorts for 2015. Some analyses use data from earlier years. Haemoglobin levels are given in g/L as the majority of UK laboratories have now switched to reporting using these units rather than g/dl.

### Table 7.1. Summary of recommended Renal Association audit measures

<table>
<thead>
<tr>
<th>RA audit measure</th>
<th>Included in UKRR annual report?</th>
<th>Reason for exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Proportion of CKD patients with eGFR &lt;30 ml/min by 4 variable MDRD method with an annual Hb level</td>
<td>No</td>
<td>Data not available for the period covered by this report</td>
</tr>
<tr>
<td>2. Proportion of patients starting an ESA without prior measurement of serum ferritin and/or TSAT</td>
<td>No</td>
<td>UKRR does not know when all patients start ESA treatment. UKRR does not collect TSAT data</td>
</tr>
<tr>
<td>3. Proportion of patients on renal replacement therapy with Hb level &lt;10 who are not prescribed an ESA</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>4. Each renal unit should audit the type, route and frequency of administration and weekly dose of ESA prescribed</td>
<td>UKRR reports the completeness of these data items</td>
<td></td>
</tr>
<tr>
<td>5. The proportion of CKD stage 4–5 patients with Hb 10–12 g/dl</td>
<td>No</td>
<td>Data not available for the period covered by this report</td>
</tr>
<tr>
<td>6. The proportion of patients treated with an ESA with Hb &gt;12 g/dl</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>7. Each renal unit should monitor ESA dose adjustments</td>
<td>No</td>
<td>UKRR does not collect this data</td>
</tr>
<tr>
<td>8. Proportion of patients with serum ferritin levels &lt;100 ng/ml at start of treatment with ESA</td>
<td>No</td>
<td>UKRR does not know when all patients start ESA treatment</td>
</tr>
<tr>
<td>9. Proportion of pre-dialysis and PD patients receiving iron therapy; type: oral vs. parenteral</td>
<td>No</td>
<td>Data not available for the period covered by this report/poor data completeness</td>
</tr>
<tr>
<td>10. Proportion of HD patients receiving IV iron</td>
<td>No</td>
<td>Poor data completeness</td>
</tr>
<tr>
<td>11. Prevalence of resistance to ESA among renal replacement therapy patients</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>12. Proportion of HD patients who received a blood transfusion within the past year</td>
<td>No</td>
<td>Data held at NHS Blood and Transplant</td>
</tr>
</tbody>
</table>
The UKRR extracted quarterly data electronically from renal centres in England, Wales and Northern Ireland (E,W&NI) taking the latest available result from each quarter. Data from Scotland were provided by the Scottish Renal Registry (SRR).

For the analyses of Hb for incident patients, those patients commencing RRT on PD or HD were included whilst those receiving a pre-emptive transplant were excluded. Hb measurements from after starting dialysis but still within the same quarter of the year were used. Therefore, depending on when in the quarter a patient started RRT the Hb data could be from zero to 90 days later. Due to possible deficiencies with extract routines it is possible that a small number of the values extracted electronically may actually be from before the person started dialysis. This problem will not occur for Scottish data. Patients who died within the first 90 days on treatment were excluded. Results are also shown with the cohort subdivided into early and late presenters (date first seen by a nephrologist, 90 or more days and less than 90 days before starting dialysis respectively). For these analyses only centres with at least 75% completeness of presentation time data were included.

For the analyses of prevalent dialysis patients those patients receiving dialysis on 31st December 2015 were included if they had been on the same modality of dialysis in the same centre for at least three months. In order to improve completeness, the last available measurement for each patient from the last two quarters was used for Hb and from the last three quarters for ferritin.

The completeness of data items was analysed at both centre and country level. All patients were included in analyses but centres with less than 50% completeness were excluded from the caterpillar and funnel plots showing centre level results. Centres providing relevant data from less than 10 patients were also excluded from the plots. The number preceding the centre name in the caterpillar plots is the percentage of patients who have data missing.

Summary statistics including minimum, maximum, inter quartile ranges (IQR), averages (mean and median) and standard deviations were calculated. The median values and the IQRs are shown using caterpillar plots. The percentages achieving standards were also calculated and these are displayed using caterpillar plots with the percentages meeting the targets and 95% confidence intervals (CIs) shown. Funnel plots show the distribution of the percentages meeting the targets and also whether any of the centres were significantly different from the average. Longitudinal analyses were performed to show overall changes in achievement of standards over time.

Erythropoietin data from the last quarter of 2015 were used to define which patients were receiving erythropoietin stimulating agents (ESAs). Scotland was excluded from this analysis as data about ESAs were only available for May (and average doses over the year were used here – see later). Each individual was defined as being on ESA if a drug type and/or a dose was present in the data. Centres reporting fewer than 60% of HD patients or fewer than 40% of PD patients being treated with ESAs were considered to have incomplete data and were excluded from further analysis. It is recognised that these exclusion criteria are relatively arbitrary but they are in part based upon the frequency distribution graph of centres’ ESA use as it appears in the data. The percentage of patients on ESAs was calculated from these data and incomplete data returns risk seriously impacting on any conclusions drawn.

For analyses of ESA dose, values are presented as weekly erythropoietin dose. Doses of less than 150 IU/week (likely to be darbepoietin) were harmonised with erythropoietin data by multiplying by 200. No adjustments were made with respect to route of administration. Patients who were not receiving ESAs were not included in analyses of dose (rather than being included with dose = 0). Many centres provided data on ESA dose but not on ESA frequency. The ESA dose field is defined as the weekly dose and the dose is presumed to have been converted accordingly on submission to the UKRR. This may be an incorrect assumption for a number of patients and this needs to be considered when interpreting the ESA information.

Starting with the cohort of patients receiving ESAs in the final quarter of the year and having a dose value present for that quarter, any further dose values available from the earlier three quarters of the year were used (provided the patient was on the same treatment and receiving the same drug in those quarters). The average (mean) of the available values was then used in analyses rather than the dose in the final quarter.

The ESA data were collected electronically from renal IT systems but in contrast to laboratory linked variables the ESA data required manual data entry. The reliability depended upon the data source, whether the entry was linked to the prescription or whether the prescriptions were provided by the primary care physician. In the latter case, doses may not be as reliably updated as the link between data entry and prescription is indirect.

Results

Anaemia management in incident dialysis patients
Haemoglobin in incident dialysis patients

As the UKRR does not collect comprehensive data on patients who are not yet receiving RRT Hb at the time of starting RRT is the only indication of concordance with anaemia clinical practice guidelines in the pre-dialysis (CKD not (yet) on dialysis) group. The percentage data returned and outcome Hb are listed in table 7.2. Cambridge was unable to submit any data prior to closing the database. About 33% of Sheffield’s incident patients’ data were entirely missing from the data extracts, including all their late presenters, so the cohort included is possibly not representative of all their incident dialysis patients. Stevenage did not submit any Hb data except for the first quarter of the year. The cause of this extraction problem has now been resolved and Stevenage are submitting Hb data for 2016.

The median Hb of patients at the time of starting dialysis in the UK in 2015 was 98 g/L. The median Hb for patients at the time of starting dialysis by renal centre is shown in figure 7.1. The percentage of patients starting dialysis with Hb ≥ 100 g/L is shown in figure 7.2. Using data from centres with adequate completeness for date of first presentation the difference in median Hb between early (100 g/L) and late (92 g/L) presenters is shown in
Table 7.2. Haemoglobin data for incident patients starting RRT on haemodialysis or peritoneal dialysis during 2015, both overall and by presentation time

<table>
<thead>
<tr>
<th>Centre</th>
<th>% data return</th>
<th>Median Hb g/L</th>
<th>% Hb ≥ 100 g/L</th>
<th>Median Hb g/L</th>
<th>% Hb ≥ 100 g/L</th>
<th>Median Hb g/L</th>
<th>% Hb ≥ 100 g/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Heart</td>
<td>100</td>
<td>94</td>
<td>34</td>
<td>94</td>
<td>34</td>
<td>95</td>
<td>43</td>
</tr>
<tr>
<td>B QEH</td>
<td>100</td>
<td>99</td>
<td>48</td>
<td>99</td>
<td>49</td>
<td>95</td>
<td>43</td>
</tr>
<tr>
<td>Basldn</td>
<td>98</td>
<td>89</td>
<td>25</td>
<td>98</td>
<td>33</td>
<td>96</td>
<td>38</td>
</tr>
<tr>
<td>Brad fd</td>
<td>91</td>
<td>96</td>
<td>37</td>
<td>96</td>
<td>38</td>
<td>96</td>
<td>38</td>
</tr>
<tr>
<td>Brighton</td>
<td>100</td>
<td>101</td>
<td>51</td>
<td>101</td>
<td>51</td>
<td>104</td>
<td>79</td>
</tr>
<tr>
<td>Bristol</td>
<td>100</td>
<td>105</td>
<td>78</td>
<td>104</td>
<td>79</td>
<td>104</td>
<td>79</td>
</tr>
<tr>
<td>Camb n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carls</td>
<td>100</td>
<td>109</td>
<td>72</td>
<td>110</td>
<td>77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carsh</td>
<td>100</td>
<td>97</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chelms</td>
<td>100</td>
<td>106</td>
<td>66</td>
<td>107</td>
<td>67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colchr</td>
<td>72</td>
<td>97</td>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covnt</td>
<td>98</td>
<td>96</td>
<td>47</td>
<td>100</td>
<td>50</td>
<td>95</td>
<td>39</td>
</tr>
<tr>
<td>Derby</td>
<td>98</td>
<td>100</td>
<td>51</td>
<td>100</td>
<td>53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donc</td>
<td>100</td>
<td>100</td>
<td>53</td>
<td>105</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dorset</td>
<td>97</td>
<td>103</td>
<td>54</td>
<td>105</td>
<td>67</td>
<td>87</td>
<td>8</td>
</tr>
<tr>
<td>Dudley</td>
<td>95</td>
<td>103</td>
<td>56</td>
<td>104</td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exeter</td>
<td>100</td>
<td>106</td>
<td>80</td>
<td>106</td>
<td>80</td>
<td>104</td>
<td>73</td>
</tr>
<tr>
<td>Glouc</td>
<td>98</td>
<td>103</td>
<td>58</td>
<td>103</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hull</td>
<td>77</td>
<td>100</td>
<td>51</td>
<td>102</td>
<td>55</td>
<td>94</td>
<td>39</td>
</tr>
<tr>
<td>Ipswi</td>
<td>93</td>
<td>99</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kent</td>
<td>99</td>
<td>95</td>
<td>37</td>
<td>95</td>
<td>38</td>
<td>87</td>
<td>27</td>
</tr>
<tr>
<td>L Barts</td>
<td>100</td>
<td>98</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L Guys</td>
<td>100</td>
<td>92</td>
<td>25</td>
<td>94</td>
<td>30</td>
<td>85</td>
<td>0</td>
</tr>
<tr>
<td>L Kings</td>
<td>97</td>
<td>96</td>
<td>38</td>
<td>97</td>
<td>41</td>
<td>91</td>
<td>26</td>
</tr>
<tr>
<td>L Rfree</td>
<td>98</td>
<td>100</td>
<td>50</td>
<td>100</td>
<td>52</td>
<td>96</td>
<td>41</td>
</tr>
<tr>
<td>L St.G</td>
<td>86</td>
<td>92</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L West</td>
<td>90</td>
<td>104</td>
<td>62</td>
<td>105</td>
<td>66</td>
<td>97</td>
<td>44</td>
</tr>
<tr>
<td>Leeds</td>
<td>97</td>
<td>94</td>
<td>34</td>
<td>95</td>
<td>37</td>
<td>85</td>
<td>14</td>
</tr>
<tr>
<td>Leic</td>
<td>99</td>
<td>95</td>
<td>38</td>
<td>96</td>
<td>39</td>
<td>89</td>
<td>32</td>
</tr>
<tr>
<td>Liv Ain</td>
<td>97</td>
<td>99</td>
<td>48</td>
<td>102</td>
<td>52</td>
<td>93</td>
<td>30</td>
</tr>
<tr>
<td>Liv Roy</td>
<td>99</td>
<td>98</td>
<td>48</td>
<td>100</td>
<td>51</td>
<td>93</td>
<td>35</td>
</tr>
<tr>
<td>M RI</td>
<td>97</td>
<td>97</td>
<td>44</td>
<td>99</td>
<td>48</td>
<td>91</td>
<td>29</td>
</tr>
<tr>
<td>Middlbr</td>
<td>99</td>
<td>99</td>
<td>49</td>
<td>100</td>
<td>53</td>
<td>86</td>
<td>33</td>
</tr>
<tr>
<td>Newc</td>
<td>99</td>
<td>99</td>
<td>44</td>
<td>99</td>
<td>48</td>
<td>92</td>
<td>24</td>
</tr>
<tr>
<td>Norwch</td>
<td>99</td>
<td>96</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nottm</td>
<td>99</td>
<td>92</td>
<td>32</td>
<td>92</td>
<td>33</td>
<td>81</td>
<td>8</td>
</tr>
<tr>
<td>Oxford</td>
<td>100</td>
<td>97</td>
<td>44</td>
<td>99</td>
<td>48</td>
<td>87</td>
<td>20</td>
</tr>
<tr>
<td>Plymth</td>
<td>100</td>
<td>100</td>
<td>52</td>
<td>108</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ports</td>
<td>99</td>
<td>100</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prestn</td>
<td>100</td>
<td>99</td>
<td>46</td>
<td>99</td>
<td>49</td>
<td>97</td>
<td>35</td>
</tr>
<tr>
<td>Redng</td>
<td>99</td>
<td>100</td>
<td>53</td>
<td>102</td>
<td>63</td>
<td>83</td>
<td>8</td>
</tr>
<tr>
<td>Salford</td>
<td>100</td>
<td>96</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheff*</td>
<td>100</td>
<td>100</td>
<td>51</td>
<td>100</td>
<td>51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrew</td>
<td>98</td>
<td>102</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stevng</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stend</td>
<td>100</td>
<td>96</td>
<td>43</td>
<td>97</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stoke</td>
<td>97</td>
<td>101</td>
<td>56</td>
<td>102</td>
<td>59</td>
<td>94</td>
<td>38</td>
</tr>
<tr>
<td>Sund</td>
<td>97</td>
<td>99</td>
<td>48</td>
<td>99</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truro</td>
<td>100</td>
<td>103</td>
<td>59</td>
<td>103</td>
<td>64</td>
<td>96</td>
<td>47</td>
</tr>
<tr>
<td>Wirral</td>
<td>96</td>
<td>99</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wolve</td>
<td>96</td>
<td>93</td>
<td>40</td>
<td>97</td>
<td>44</td>
<td>80</td>
<td>21</td>
</tr>
<tr>
<td>York</td>
<td>92</td>
<td>97</td>
<td>43</td>
<td>98</td>
<td>47</td>
<td>95</td>
<td>30</td>
</tr>
</tbody>
</table>
Table 7.2. Continued

<table>
<thead>
<tr>
<th>Centre</th>
<th>% data return</th>
<th>Median Hb g/L</th>
<th>% Hb ≥ 100 g/L</th>
<th>Median Hb g/L</th>
<th>% Hb ≥ 100 g/L</th>
<th>Median Hb g/L</th>
<th>% Hb ≥ 100 g/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Ireland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antrim</td>
<td>100</td>
<td>103</td>
<td>63</td>
<td>103</td>
<td>59</td>
<td>107</td>
<td>70</td>
</tr>
<tr>
<td>Belfast</td>
<td>96</td>
<td>104</td>
<td>60</td>
<td>103</td>
<td>54</td>
<td>107</td>
<td>70</td>
</tr>
<tr>
<td>Newry</td>
<td>96</td>
<td>103</td>
<td>56</td>
<td>103</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulster</td>
<td>100</td>
<td>107</td>
<td>63</td>
<td>105</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West NI</td>
<td>100</td>
<td>100</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airdrie</td>
<td>67</td>
<td>94</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D&amp;Gall</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dundee</td>
<td>83</td>
<td>99</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edinb</td>
<td>61</td>
<td>95</td>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glasgw</td>
<td>72</td>
<td>96</td>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inverns</td>
<td>97</td>
<td>102</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilmarnk</td>
<td>67</td>
<td>97</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Krkcdy</td>
<td>74</td>
<td>99</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangor</td>
<td>100</td>
<td>99</td>
<td>44</td>
<td>99</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiff</td>
<td>98</td>
<td>101</td>
<td>54</td>
<td>101</td>
<td>53</td>
<td>95</td>
<td>41</td>
</tr>
<tr>
<td>Chwyd</td>
<td>96</td>
<td>100</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swanse</td>
<td>97</td>
<td>97</td>
<td>47</td>
<td>99</td>
<td>49</td>
<td>96</td>
<td>36</td>
</tr>
<tr>
<td>Wrexm</td>
<td>97</td>
<td>99</td>
<td>47</td>
<td>102</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>England</td>
<td>96</td>
<td>98</td>
<td>47</td>
<td>100</td>
<td>51</td>
<td>92</td>
<td>33</td>
</tr>
<tr>
<td>N Ireland</td>
<td>98</td>
<td>103</td>
<td>59</td>
<td>103</td>
<td>58</td>
<td>108</td>
<td>65</td>
</tr>
<tr>
<td>Scotland</td>
<td>74</td>
<td>97</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td>98</td>
<td>100</td>
<td>50</td>
<td>100</td>
<td>52</td>
<td>95</td>
<td>33</td>
</tr>
<tr>
<td>UK</td>
<td>94</td>
<td>98</td>
<td>47</td>
<td>100</td>
<td>51</td>
<td>92</td>
<td>34</td>
</tr>
</tbody>
</table>

n/a: not available
Blank cells: centres excluded from the analysis due to poor data completeness or low patient numbers
*Sheffield: approximately 33% of their incident patients were missing from the analysis, including all late presenters so the group analysed may not be representative of their whole cohort

Fig. 7.1. Median haemoglobin for incident dialysis patients at start of dialysis treatment in 2015
Of early presenters, 51% had a Hb $\geq 100$ g/L compared with 34% of late presenters. Again, there is a substantial difference between Hb at the time of starting dialysis by modality. Patients starting on HD had a median Hb of 96 g/L (IQR 87–105) whilst those starting on PD had a median Hb of 107 g/L (IQR 98–116). Of HD patients, 40% started dialysis with a Hb $\geq 100$ g/L compared with 73% of PD patients.

Incident dialysis patients from 2014 were followed for one year and the median haemoglobin and percentage with $\geq 100$ g/L in survivors on the same treatment at the same centre were calculated for each quarter. Only patients with Hb data for each of the four time points were included in this analysis. Results by modality and length of pre-dialysis care are shown in figures 7.3 and 7.4. The ‘PD-late’ group consisted of only 30 patients so care should be taken in interpreting the results.

The distribution of Hb ranges in incident dialysis patients by year of start is shown in figure 7.5. The proportion of incident dialysis patients with Hb $\geq 120$ g/L has fallen from 17.2% in 2006 to 8.4% in 2015. In contrast, the proportion of patients starting dialysis with Hb $<100$ g/L has increased from 40.0% in 2006 to 53.2% in 2015.

The proportion of patients receiving an ESA by length of time on dialysis for patients starting dialysis in 2014 is shown in figure 7.6. The difference in ESA use between early and late starters was reduced substantially after six months of treatment. Only 11 patients presenting late to dialysis and starting on PD had ESA data so this group has not been included in the analysis.

### Table 7.2

<table>
<thead>
<tr>
<th>Centre</th>
<th>Percentage of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exeter</td>
<td>0</td>
</tr>
<tr>
<td>Bristol</td>
<td>0</td>
</tr>
<tr>
<td>Carlisle</td>
<td>0</td>
</tr>
<tr>
<td>Chelmsford</td>
<td>0</td>
</tr>
<tr>
<td>Ulster</td>
<td>0</td>
</tr>
<tr>
<td>Antrim</td>
<td>0</td>
</tr>
<tr>
<td>raining</td>
<td>0</td>
</tr>
<tr>
<td>Truro</td>
<td>0</td>
</tr>
<tr>
<td>Gloucester</td>
<td>2</td>
</tr>
<tr>
<td>Shrewsbury</td>
<td>5</td>
</tr>
<tr>
<td>Dudley</td>
<td>3</td>
</tr>
<tr>
<td>Stoke</td>
<td>4</td>
</tr>
<tr>
<td>Newry</td>
<td>3</td>
</tr>
<tr>
<td>Dorset</td>
<td>3</td>
</tr>
<tr>
<td>Cardiff</td>
<td>2</td>
</tr>
<tr>
<td>Reading</td>
<td>0</td>
</tr>
<tr>
<td>Doncaster</td>
<td>4</td>
</tr>
<tr>
<td>Clwyd</td>
<td>2</td>
</tr>
<tr>
<td>West NI</td>
<td>0</td>
</tr>
<tr>
<td>Plymouth</td>
<td>0</td>
</tr>
<tr>
<td>Brighton</td>
<td>0</td>
</tr>
<tr>
<td>West Midlands</td>
<td>23</td>
</tr>
<tr>
<td>Hull</td>
<td>0</td>
</tr>
<tr>
<td>Sheffield</td>
<td>2</td>
</tr>
<tr>
<td>Derby</td>
<td>2</td>
</tr>
<tr>
<td>Leeds</td>
<td>0</td>
</tr>
<tr>
<td>LPatients</td>
<td>4</td>
</tr>
<tr>
<td>West NI</td>
<td>0</td>
</tr>
<tr>
<td>Plymth</td>
<td>0</td>
</tr>
<tr>
<td>Brightn</td>
<td>0</td>
</tr>
<tr>
<td>Hull</td>
<td>0</td>
</tr>
<tr>
<td>Exeter</td>
<td>10</td>
</tr>
<tr>
<td>Bristol</td>
<td>4</td>
</tr>
<tr>
<td>Carlisle</td>
<td>3</td>
</tr>
<tr>
<td>Chelmsford</td>
<td>0</td>
</tr>
<tr>
<td>Ulster</td>
<td>0</td>
</tr>
<tr>
<td>Antrim</td>
<td>10</td>
</tr>
<tr>
<td>raining</td>
<td>0</td>
</tr>
<tr>
<td>Truro</td>
<td>4</td>
</tr>
<tr>
<td>Gloucester</td>
<td>26</td>
</tr>
<tr>
<td>Shrewsbury</td>
<td>0</td>
</tr>
<tr>
<td>Dudley</td>
<td>3</td>
</tr>
<tr>
<td>Stoke</td>
<td>2</td>
</tr>
<tr>
<td>Newry</td>
<td>4</td>
</tr>
<tr>
<td>Dorset</td>
<td>3</td>
</tr>
<tr>
<td>Cardiff</td>
<td>2</td>
</tr>
<tr>
<td>Reading</td>
<td>1</td>
</tr>
<tr>
<td>Doncaster</td>
<td>1</td>
</tr>
<tr>
<td>Clwyd</td>
<td>1</td>
</tr>
<tr>
<td>West NI</td>
<td>0</td>
</tr>
<tr>
<td>Plymouth</td>
<td>0</td>
</tr>
<tr>
<td>Brighton</td>
<td>0</td>
</tr>
<tr>
<td>West Midlands</td>
<td>23</td>
</tr>
<tr>
<td>Hull</td>
<td>0</td>
</tr>
<tr>
<td>Sheffield</td>
<td>28</td>
</tr>
<tr>
<td>Derby</td>
<td>28</td>
</tr>
<tr>
<td>Leeds</td>
<td>3</td>
</tr>
<tr>
<td>LPatients</td>
<td>4</td>
</tr>
<tr>
<td>West NI</td>
<td>0</td>
</tr>
<tr>
<td>Plymth</td>
<td>0</td>
</tr>
<tr>
<td>Brightn</td>
<td>0</td>
</tr>
<tr>
<td>Hull</td>
<td>0</td>
</tr>
<tr>
<td>Exeter</td>
<td>26</td>
</tr>
<tr>
<td>Bristol</td>
<td>33</td>
</tr>
<tr>
<td>Carlisle</td>
<td>39</td>
</tr>
<tr>
<td>Chelmsford</td>
<td>0</td>
</tr>
<tr>
<td>Ulster</td>
<td>0</td>
</tr>
<tr>
<td>Antrim</td>
<td>3</td>
</tr>
<tr>
<td>raining</td>
<td>0</td>
</tr>
<tr>
<td>Truro</td>
<td>8</td>
</tr>
<tr>
<td>Gloucester</td>
<td>10</td>
</tr>
<tr>
<td>Shrewsbury</td>
<td>3</td>
</tr>
<tr>
<td>Dudley</td>
<td>33</td>
</tr>
<tr>
<td>Stoke</td>
<td>14</td>
</tr>
<tr>
<td>Newry</td>
<td>3</td>
</tr>
<tr>
<td>Dorset</td>
<td>3</td>
</tr>
<tr>
<td>Cardiff</td>
<td>2</td>
</tr>
<tr>
<td>Reading</td>
<td>1</td>
</tr>
<tr>
<td>Doncaster</td>
<td>3</td>
</tr>
<tr>
<td>Clwyd</td>
<td>1</td>
</tr>
<tr>
<td>West NI</td>
<td>0</td>
</tr>
<tr>
<td>Plymouth</td>
<td>0</td>
</tr>
<tr>
<td>Brighton</td>
<td>0</td>
</tr>
<tr>
<td>West Midlands</td>
<td>33</td>
</tr>
<tr>
<td>Hull</td>
<td>0</td>
</tr>
<tr>
<td>Sheffield</td>
<td>26</td>
</tr>
<tr>
<td>Derby</td>
<td>29</td>
</tr>
<tr>
<td>Leeds</td>
<td>1</td>
</tr>
<tr>
<td>LPatients</td>
<td>4</td>
</tr>
<tr>
<td>West NI</td>
<td>0</td>
</tr>
<tr>
<td>Plymth</td>
<td>0</td>
</tr>
<tr>
<td>Brightn</td>
<td>0</td>
</tr>
<tr>
<td>Hull</td>
<td>0</td>
</tr>
<tr>
<td>Exeter</td>
<td>10</td>
</tr>
<tr>
<td>Bristol</td>
<td>20</td>
</tr>
<tr>
<td>Carlisle</td>
<td>30</td>
</tr>
<tr>
<td>Chelmsford</td>
<td>40</td>
</tr>
<tr>
<td>Ulster</td>
<td>50</td>
</tr>
<tr>
<td>Antrim</td>
<td>60</td>
</tr>
<tr>
<td>raining</td>
<td>70</td>
</tr>
<tr>
<td>Truro</td>
<td>80</td>
</tr>
<tr>
<td>Gloucester</td>
<td>90</td>
</tr>
<tr>
<td>Shrewsbury</td>
<td>100</td>
</tr>
</tbody>
</table>

### Figures

**Fig. 7.2.** Percentage of incident dialysis patients with Hb $\geq 100$ g/L at start of dialysis treatment in 2015

**Fig. 7.3.** Median haemoglobin, by time on dialysis and length of pre-RRT care, for incident dialysis patients in 2014

**Fig. 7.4.** Percentage of incident dialysis patients in 2014 with Hb $\geq 100$ g/L by time on dialysis and by length of pre-RRT care
Compliance with data returns for Hb and serum ferritin are shown in Table 7.3. Data completeness was generally good for Hb and ferritin. Cambridge did not submit any data prior to closing the database. Stevenage did not submit any Hb data except for the first quarter of the year. This Q1 data has been shown in Tables 7.4 and 7.5 but not used in the figures. Salford did not submit any ferritin data. Percentages of patients reportedly receiving ESAs are shown in Table 7.3. These are as

Table 7.3. Percentage completeness of data returns for haemoglobin and serum ferritin and percentages on ESA for prevalent HD and PD patients in 2015

<table>
<thead>
<tr>
<th>Centre</th>
<th>HD</th>
<th></th>
<th>PD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Hb</td>
<td>Ferritin</td>
<td>% on ESA</td>
</tr>
<tr>
<td>England</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Heart</td>
<td>397</td>
<td>100</td>
<td>99</td>
<td>78</td>
</tr>
<tr>
<td>B QEH</td>
<td>933</td>
<td>100</td>
<td>99</td>
<td>88</td>
</tr>
<tr>
<td>Basldn</td>
<td>153</td>
<td>99</td>
<td>99</td>
<td>92</td>
</tr>
<tr>
<td>Bradfl</td>
<td>217</td>
<td>100</td>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>Brightn</td>
<td>402</td>
<td>100</td>
<td>99</td>
<td>83</td>
</tr>
<tr>
<td>Bristol</td>
<td>489</td>
<td>100</td>
<td>100</td>
<td>93</td>
</tr>
<tr>
<td>Camb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carlis</td>
<td>74</td>
<td>100</td>
<td>100</td>
<td>69</td>
</tr>
<tr>
<td>Carsh</td>
<td>761</td>
<td>100</td>
<td>99</td>
<td>13</td>
</tr>
<tr>
<td>Chelms</td>
<td>139</td>
<td>99</td>
<td>99</td>
<td>92</td>
</tr>
<tr>
<td>Colchr</td>
<td>111</td>
<td>95</td>
<td>94</td>
<td>5</td>
</tr>
<tr>
<td>Covnt</td>
<td>332</td>
<td>100</td>
<td>100</td>
<td>84</td>
</tr>
<tr>
<td>Derby</td>
<td>222</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Donc</td>
<td>163</td>
<td>100</td>
<td>100</td>
<td>89</td>
</tr>
<tr>
<td>Dorset</td>
<td>270</td>
<td>100</td>
<td>100</td>
<td>93</td>
</tr>
<tr>
<td>Dudley</td>
<td>155</td>
<td>100</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Exeter</td>
<td>403</td>
<td>100</td>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>Glouc</td>
<td>216</td>
<td>100</td>
<td>96</td>
<td>90</td>
</tr>
<tr>
<td>Hull</td>
<td>327</td>
<td>100</td>
<td>100</td>
<td>62</td>
</tr>
<tr>
<td>Ipswi</td>
<td>129</td>
<td>100</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>Kent</td>
<td>397</td>
<td>100</td>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>L Barts</td>
<td>928</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>L Guys</td>
<td>629</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>L Kings</td>
<td>522</td>
<td>100</td>
<td>98</td>
<td>92</td>
</tr>
<tr>
<td>L Rfree</td>
<td>665</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>L StG</td>
<td>311</td>
<td>97</td>
<td>96</td>
<td>0</td>
</tr>
</tbody>
</table>

Fig. 7.5. Distribution of haemoglobin in incident dialysis patients by year of start

Anaemia management in prevalent dialysis patients

Compliance with data returns for Hb and serum ferritin are shown in Table 7.3. Data completeness was generally good for Hb and ferritin. Cambridge did not submit any data prior to closing the database. Stevenage did not submit any Hb data except for the first quarter of the year. This Q1 data has been shown in Tables 7.4 and 7.5 but not used in the figures. Salford did not submit any ferritin data. Percentages of patients reportedly receiving ESAs are shown in Table 7.3. These are as

Fig. 7.6. Percentage of incident dialysis patients in 2014 on ESA, by time on dialysis and by length of pre-RRT care

Table 7.3. Percentage completeness of data returns for haemoglobin and serum ferritin and percentages on ESA for prevalent HD and PD patients in 2015
Table 7.3. Continued

<table>
<thead>
<tr>
<th>Centre</th>
<th>N</th>
<th>Hb</th>
<th>Ferritin</th>
<th>% on ESA</th>
<th>N</th>
<th>Hb</th>
<th>Ferritin</th>
<th>% on ESA</th>
</tr>
</thead>
<tbody>
<tr>
<td>L West</td>
<td>1372</td>
<td>92</td>
<td>91</td>
<td>0</td>
<td>60</td>
<td>88</td>
<td>87</td>
<td>0</td>
</tr>
<tr>
<td>Leeds</td>
<td>470</td>
<td>100</td>
<td>100</td>
<td>92</td>
<td>50</td>
<td>100</td>
<td>100</td>
<td>82</td>
</tr>
<tr>
<td>Leic</td>
<td>839</td>
<td>100</td>
<td>100</td>
<td>97</td>
<td>95</td>
<td>100</td>
<td>98</td>
<td>84</td>
</tr>
<tr>
<td>Liv Ain</td>
<td>158</td>
<td>98</td>
<td>97</td>
<td>0</td>
<td>28</td>
<td>96</td>
<td>96</td>
<td>0</td>
</tr>
<tr>
<td>Liv Roy</td>
<td>356</td>
<td>100</td>
<td>99</td>
<td>0</td>
<td>61</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>M RI</td>
<td>475</td>
<td>94</td>
<td>83</td>
<td>0</td>
<td>58</td>
<td>98</td>
<td>97</td>
<td>0</td>
</tr>
<tr>
<td>Middlbr</td>
<td>323</td>
<td>100</td>
<td>99</td>
<td>72</td>
<td>15</td>
<td>93</td>
<td>93</td>
<td>53</td>
</tr>
<tr>
<td>Newc</td>
<td>285</td>
<td>100</td>
<td>100</td>
<td>67</td>
<td>38</td>
<td>100</td>
<td>95</td>
<td>0</td>
</tr>
<tr>
<td>Norwch</td>
<td>312</td>
<td>100</td>
<td>99</td>
<td>91</td>
<td>28</td>
<td>100</td>
<td>100</td>
<td>79</td>
</tr>
<tr>
<td>Nottm</td>
<td>350</td>
<td>99</td>
<td>100</td>
<td>87</td>
<td>64</td>
<td>100</td>
<td>100</td>
<td>73</td>
</tr>
<tr>
<td>Oxford</td>
<td>398</td>
<td>100</td>
<td>99</td>
<td>92</td>
<td>78</td>
<td>100</td>
<td>97</td>
<td>87</td>
</tr>
<tr>
<td>Plymth</td>
<td>129</td>
<td>99</td>
<td>97</td>
<td>2</td>
<td>28</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Ports</td>
<td>617</td>
<td>100</td>
<td>99</td>
<td>7</td>
<td>60</td>
<td>100</td>
<td>97</td>
<td>7</td>
</tr>
<tr>
<td>Preston</td>
<td>531</td>
<td>100</td>
<td>96</td>
<td>92</td>
<td>49</td>
<td>100</td>
<td>98</td>
<td>67</td>
</tr>
<tr>
<td>Redng</td>
<td>283</td>
<td>100</td>
<td>99</td>
<td>87</td>
<td>59</td>
<td>100</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>Salford</td>
<td>367</td>
<td>100</td>
<td>0</td>
<td>19</td>
<td>82</td>
<td>100</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Sheff</td>
<td>517</td>
<td>100</td>
<td>100</td>
<td>88</td>
<td>53</td>
<td>100</td>
<td>96</td>
<td>42</td>
</tr>
<tr>
<td>Shrew</td>
<td>193</td>
<td>99</td>
<td>100</td>
<td>0</td>
<td>27</td>
<td>100</td>
<td>96</td>
<td>0</td>
</tr>
<tr>
<td>Steving</td>
<td>468</td>
<td>0</td>
<td>99</td>
<td>0</td>
<td>13</td>
<td>0</td>
<td>85</td>
<td>0</td>
</tr>
<tr>
<td>Shend</td>
<td>108</td>
<td>100</td>
<td>100</td>
<td>95</td>
<td>15</td>
<td>100</td>
<td>100</td>
<td>73</td>
</tr>
<tr>
<td>Stoke</td>
<td>308</td>
<td>98</td>
<td>97</td>
<td>1</td>
<td>70</td>
<td>100</td>
<td>99</td>
<td>0</td>
</tr>
<tr>
<td>Sund</td>
<td>206</td>
<td>100</td>
<td>75</td>
<td>90</td>
<td>14</td>
<td>93</td>
<td>57</td>
<td>71</td>
</tr>
<tr>
<td>Truro</td>
<td>145</td>
<td>100</td>
<td>99</td>
<td>0</td>
<td>19</td>
<td>100</td>
<td>89</td>
<td>0</td>
</tr>
<tr>
<td>Wirral</td>
<td>177</td>
<td>99</td>
<td>99</td>
<td>82</td>
<td>17</td>
<td>100</td>
<td>100</td>
<td>88</td>
</tr>
<tr>
<td>Wolve</td>
<td>286</td>
<td>100</td>
<td>99</td>
<td>85</td>
<td>68</td>
<td>99</td>
<td>99</td>
<td>62</td>
</tr>
<tr>
<td>York</td>
<td>145</td>
<td>100</td>
<td>100</td>
<td>91</td>
<td>22</td>
<td>95</td>
<td>95</td>
<td>73</td>
</tr>
<tr>
<td>N Ireland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antrim</td>
<td>114</td>
<td>100</td>
<td>100</td>
<td>94</td>
<td>17</td>
<td>100</td>
<td>100</td>
<td>76</td>
</tr>
<tr>
<td>Belfast</td>
<td>169</td>
<td>100</td>
<td>100</td>
<td>92</td>
<td>19</td>
<td>100</td>
<td>100</td>
<td>84</td>
</tr>
<tr>
<td>Newry</td>
<td>84</td>
<td>95</td>
<td>100</td>
<td>88</td>
<td>18</td>
<td>100</td>
<td>100</td>
<td>56</td>
</tr>
<tr>
<td>Ulster</td>
<td>97</td>
<td>100</td>
<td>100</td>
<td>91</td>
<td>6</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>West NI</td>
<td>113</td>
<td>100</td>
<td>100</td>
<td>93</td>
<td>9</td>
<td>100</td>
<td>100</td>
<td>89</td>
</tr>
<tr>
<td>Scotland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abrdn</td>
<td>205</td>
<td>100</td>
<td>97</td>
<td></td>
<td>21</td>
<td>100</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Airdrie</td>
<td>174</td>
<td>100</td>
<td>98</td>
<td></td>
<td>8</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>D&amp;Gall</td>
<td>52</td>
<td>96</td>
<td>96</td>
<td></td>
<td>10</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Dundee</td>
<td>173</td>
<td>99</td>
<td>98</td>
<td></td>
<td>16</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Edinb</td>
<td>252</td>
<td>100</td>
<td>99</td>
<td></td>
<td>19</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Glasgow</td>
<td>545</td>
<td>100</td>
<td>100</td>
<td></td>
<td>44</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Inverns</td>
<td>78</td>
<td>99</td>
<td>87</td>
<td></td>
<td>18</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Kilmarnk</td>
<td>124</td>
<td>100</td>
<td>100</td>
<td></td>
<td>33</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Kkrkldy</td>
<td>132</td>
<td>100</td>
<td>98</td>
<td></td>
<td>16</td>
<td>100</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangor</td>
<td>78</td>
<td>100</td>
<td>100</td>
<td>81</td>
<td>13</td>
<td>100</td>
<td>100</td>
<td>15</td>
</tr>
<tr>
<td>Cardiff</td>
<td>460</td>
<td>100</td>
<td>100</td>
<td>43</td>
<td>72</td>
<td>100</td>
<td>81</td>
<td>15</td>
</tr>
<tr>
<td>Clwyd</td>
<td>76</td>
<td>100</td>
<td>100</td>
<td>47</td>
<td>13</td>
<td>100</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>Swansea</td>
<td>342</td>
<td>100</td>
<td>100</td>
<td>93</td>
<td>55</td>
<td>100</td>
<td>93</td>
<td>62</td>
</tr>
<tr>
<td>Wrexm</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>30</td>
<td>33</td>
<td>100</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>England</td>
<td>19,163</td>
<td>97</td>
<td>96</td>
<td></td>
<td>2,604</td>
<td>99</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>N Ireland</td>
<td>577</td>
<td>99</td>
<td>100</td>
<td></td>
<td>69</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td>1,735</td>
<td>100</td>
<td>98</td>
<td></td>
<td>180</td>
<td>99</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td>1,055</td>
<td>100</td>
<td>100</td>
<td></td>
<td>186</td>
<td>100</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>22,530</td>
<td>97</td>
<td>96</td>
<td></td>
<td>3,039</td>
<td>99</td>
<td>94</td>
<td></td>
</tr>
</tbody>
</table>

Blank cells denote centres with no PD patients or because data were not available. PERCENTAGES OF PATIENTS RECEIVING ESA ARE SHOWN BUT CENTRES WITH LESS THAN 60% HD PATIENTS OR 40% PD PATIENTS ON ESA HAVE BEEN EXCLUDED (SEE TEXT). Therefore, country averages are not shown – these can be found in tables 7.4 and 7.5.
### Table 7.4. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent HD patients in 2015

<table>
<thead>
<tr>
<th>Centre</th>
<th>N with Hb data</th>
<th>Median Hb g/L</th>
<th>% Hb ≥ 100 g/L</th>
<th>Median Hb 100–120 g/L</th>
<th>Median ferritin µg/L</th>
<th>% ferritin ≥ 200 and ≤ 500 µg/L</th>
<th>% on ESA</th>
<th>Median ESA dose (IU/week)</th>
<th>% with Hb ≥ 100 g/L and not on ESA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>England</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Heart</td>
<td>396</td>
<td>109</td>
<td>76</td>
<td>57</td>
<td>295</td>
<td>92</td>
<td>58</td>
<td>78</td>
<td>6,667</td>
</tr>
<tr>
<td>B QEH</td>
<td>929</td>
<td>109</td>
<td>75</td>
<td>61</td>
<td>392</td>
<td>95</td>
<td>61</td>
<td>88</td>
<td>6,000</td>
</tr>
<tr>
<td>Basldn</td>
<td>152</td>
<td>110</td>
<td>77</td>
<td>60</td>
<td>294</td>
<td>91</td>
<td>72</td>
<td>72</td>
<td>7,000</td>
</tr>
<tr>
<td>Brightn</td>
<td>217</td>
<td>109</td>
<td>77</td>
<td>54</td>
<td>474</td>
<td>95</td>
<td>42</td>
<td>94</td>
<td>7,000</td>
</tr>
<tr>
<td>Bristol</td>
<td>489</td>
<td>112</td>
<td>92</td>
<td>69</td>
<td>540</td>
<td>95</td>
<td>35</td>
<td>93</td>
<td>8,000</td>
</tr>
<tr>
<td>Camb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carls</td>
<td>74</td>
<td>114</td>
<td>85</td>
<td>53</td>
<td>745</td>
<td>95</td>
<td>16</td>
<td>69</td>
<td>5,333</td>
</tr>
<tr>
<td>Carsh</td>
<td>760</td>
<td>109</td>
<td>79</td>
<td>65</td>
<td>330</td>
<td>93</td>
<td>65</td>
<td>65</td>
<td>6,125</td>
</tr>
<tr>
<td>Chelms</td>
<td>138</td>
<td>113</td>
<td>87</td>
<td>60</td>
<td>614</td>
<td>97</td>
<td>22</td>
<td>92</td>
<td>10,625</td>
</tr>
<tr>
<td>Colchr</td>
<td>105</td>
<td>112</td>
<td>90</td>
<td>68</td>
<td>532</td>
<td>96</td>
<td>38</td>
<td>96</td>
<td>9,000</td>
</tr>
<tr>
<td>Covnt</td>
<td>332</td>
<td>106</td>
<td>69</td>
<td>59</td>
<td>396</td>
<td>96</td>
<td>61</td>
<td>84</td>
<td>9,000</td>
</tr>
<tr>
<td>Derby</td>
<td>221</td>
<td>115</td>
<td>86</td>
<td>59</td>
<td>485</td>
<td>96</td>
<td>38</td>
<td>96</td>
<td>9,000</td>
</tr>
<tr>
<td>Donc</td>
<td>163</td>
<td>108</td>
<td>70</td>
<td>56</td>
<td>403</td>
<td>94</td>
<td>50</td>
<td>94</td>
<td>6,000</td>
</tr>
<tr>
<td>Dorset</td>
<td>270</td>
<td>112</td>
<td>86</td>
<td>64</td>
<td>452</td>
<td>99</td>
<td>55</td>
<td>99</td>
<td>7,000</td>
</tr>
<tr>
<td>Dudley</td>
<td>155</td>
<td>115</td>
<td>85</td>
<td>55</td>
<td>325</td>
<td>94</td>
<td>61</td>
<td>94</td>
<td>6,500</td>
</tr>
<tr>
<td>Exeter</td>
<td>403</td>
<td>112</td>
<td>95</td>
<td>73</td>
<td>296</td>
<td>92</td>
<td>60</td>
<td>94</td>
<td>6,500</td>
</tr>
<tr>
<td>Glouc</td>
<td>216</td>
<td>109</td>
<td>79</td>
<td>65</td>
<td>421</td>
<td>91</td>
<td>45</td>
<td>90</td>
<td>7,385</td>
</tr>
<tr>
<td>Hull</td>
<td>326</td>
<td>113</td>
<td>81</td>
<td>55</td>
<td>389</td>
<td>96</td>
<td>58</td>
<td>62</td>
<td>5,000</td>
</tr>
<tr>
<td>Ipswi</td>
<td>129</td>
<td>112</td>
<td>82</td>
<td>67</td>
<td>539</td>
<td>96</td>
<td>36</td>
<td>67</td>
<td>7,835</td>
</tr>
<tr>
<td>Kent</td>
<td>395</td>
<td>109</td>
<td>76</td>
<td>56</td>
<td>418</td>
<td>90</td>
<td>37</td>
<td>94</td>
<td>8,875</td>
</tr>
<tr>
<td>L Barts</td>
<td>928</td>
<td>111</td>
<td>82</td>
<td>64</td>
<td>635</td>
<td>96</td>
<td>23</td>
<td>96</td>
<td>8,500</td>
</tr>
<tr>
<td>L Guys</td>
<td>629</td>
<td>109</td>
<td>75</td>
<td>61</td>
<td>481</td>
<td>93</td>
<td>35</td>
<td>93</td>
<td>8,000</td>
</tr>
<tr>
<td>L Kings</td>
<td>522</td>
<td>107</td>
<td>76</td>
<td>64</td>
<td>452</td>
<td>94</td>
<td>38</td>
<td>92</td>
<td>8,000</td>
</tr>
<tr>
<td>L Rfree</td>
<td>665</td>
<td>109</td>
<td>77</td>
<td>61</td>
<td>527</td>
<td>95</td>
<td>36</td>
<td>95</td>
<td>7,500</td>
</tr>
<tr>
<td>L St.G</td>
<td>302</td>
<td>107</td>
<td>73</td>
<td>60</td>
<td>429</td>
<td>94</td>
<td>50</td>
<td>94</td>
<td>7,000</td>
</tr>
<tr>
<td>L West</td>
<td>1,266</td>
<td>113</td>
<td>86</td>
<td>65</td>
<td>321</td>
<td>94</td>
<td>59</td>
<td>94</td>
<td>5,250</td>
</tr>
<tr>
<td>Leeds</td>
<td>470</td>
<td>108</td>
<td>74</td>
<td>61</td>
<td>482</td>
<td>95</td>
<td>42</td>
<td>92</td>
<td>5,250</td>
</tr>
<tr>
<td>Leic</td>
<td>839</td>
<td>111</td>
<td>77</td>
<td>51</td>
<td>338</td>
<td>94</td>
<td>62</td>
<td>97</td>
<td>6,000</td>
</tr>
<tr>
<td>Liv Ain</td>
<td>155</td>
<td>108</td>
<td>70</td>
<td>54</td>
<td>407</td>
<td>86</td>
<td>34</td>
<td>86</td>
<td>5,000</td>
</tr>
<tr>
<td>Liv Roy</td>
<td>355</td>
<td>112</td>
<td>81</td>
<td>55</td>
<td>332</td>
<td>88</td>
<td>43</td>
<td>88</td>
<td>5,000</td>
</tr>
<tr>
<td>M RI</td>
<td>448</td>
<td>111</td>
<td>76</td>
<td>54</td>
<td>347</td>
<td>94</td>
<td>56</td>
<td>94</td>
<td>5,000</td>
</tr>
<tr>
<td>Middlb</td>
<td>323</td>
<td>111</td>
<td>78</td>
<td>57</td>
<td>939</td>
<td>97</td>
<td>18</td>
<td>72</td>
<td>5,250</td>
</tr>
<tr>
<td>Newc</td>
<td>285</td>
<td>111</td>
<td>79</td>
<td>55</td>
<td>347</td>
<td>90</td>
<td>43</td>
<td>67</td>
<td>13,267</td>
</tr>
<tr>
<td>Norwch</td>
<td>312</td>
<td>115</td>
<td>80</td>
<td>49</td>
<td>484</td>
<td>91</td>
<td>34</td>
<td>91</td>
<td>9,500</td>
</tr>
<tr>
<td>Nottn</td>
<td>346</td>
<td>110</td>
<td>80</td>
<td>61</td>
<td>496</td>
<td>97</td>
<td>44</td>
<td>87</td>
<td>7,500</td>
</tr>
<tr>
<td>Oxford</td>
<td>396</td>
<td>108</td>
<td>72</td>
<td>56</td>
<td>291</td>
<td>89</td>
<td>51</td>
<td>92</td>
<td>12,000</td>
</tr>
<tr>
<td>Plymouth</td>
<td>128</td>
<td>111</td>
<td>78</td>
<td>57</td>
<td>741</td>
<td>93</td>
<td>21</td>
<td>93</td>
<td>7,500</td>
</tr>
<tr>
<td>Ports</td>
<td>616</td>
<td>113</td>
<td>81</td>
<td>54</td>
<td>394</td>
<td>93</td>
<td>51</td>
<td>93</td>
<td>7,500</td>
</tr>
<tr>
<td>Prestn</td>
<td>531</td>
<td>109</td>
<td>76</td>
<td>56</td>
<td>594</td>
<td>95</td>
<td>29</td>
<td>92</td>
<td>5,500</td>
</tr>
<tr>
<td>Redng</td>
<td>283</td>
<td>114</td>
<td>78</td>
<td>49</td>
<td>477</td>
<td>98</td>
<td>43</td>
<td>87</td>
<td>13,154</td>
</tr>
<tr>
<td>Salford</td>
<td>366</td>
<td>110</td>
<td>77</td>
<td>57</td>
<td>54</td>
<td>95</td>
<td>46</td>
<td>88</td>
<td>7,500</td>
</tr>
<tr>
<td>Sheff</td>
<td>515</td>
<td>111</td>
<td>76</td>
<td>51</td>
<td>468</td>
<td>95</td>
<td>46</td>
<td>88</td>
<td>7,500</td>
</tr>
<tr>
<td>Shrew</td>
<td>192</td>
<td>116</td>
<td>86</td>
<td>52</td>
<td>348</td>
<td>94</td>
<td>61</td>
<td>94</td>
<td>7,500</td>
</tr>
<tr>
<td>Stevng</td>
<td>108</td>
<td>76</td>
<td>61</td>
<td>667</td>
<td>98</td>
<td>23</td>
<td>98</td>
<td>7,000</td>
<td>6</td>
</tr>
<tr>
<td>Shend</td>
<td>108</td>
<td>108</td>
<td>80</td>
<td>71</td>
<td>315</td>
<td>95</td>
<td>81</td>
<td>95</td>
<td>9,250</td>
</tr>
<tr>
<td>Stoke</td>
<td>301</td>
<td>111</td>
<td>80</td>
<td>58</td>
<td>267</td>
<td>90</td>
<td>45</td>
<td>90</td>
<td>9,250</td>
</tr>
<tr>
<td>Sund</td>
<td>205</td>
<td>112</td>
<td>77</td>
<td>51</td>
<td>344</td>
<td>94</td>
<td>40</td>
<td>90</td>
<td>9,615</td>
</tr>
<tr>
<td>Truro</td>
<td>145</td>
<td>106</td>
<td>76</td>
<td>66</td>
<td>408</td>
<td>99</td>
<td>59</td>
<td>99</td>
<td>9,000</td>
</tr>
<tr>
<td>Wirral</td>
<td>176</td>
<td>109</td>
<td>83</td>
<td>68</td>
<td>432</td>
<td>95</td>
<td>52</td>
<td>82</td>
<td>9,000</td>
</tr>
<tr>
<td>Wolve</td>
<td>285</td>
<td>114</td>
<td>84</td>
<td>50</td>
<td>459</td>
<td>92</td>
<td>43</td>
<td>85</td>
<td>8,000</td>
</tr>
<tr>
<td>York</td>
<td>145</td>
<td>110</td>
<td>81</td>
<td>68</td>
<td>400</td>
<td>96</td>
<td>70</td>
<td>91</td>
<td>4,833</td>
</tr>
<tr>
<td><strong>N Ireland</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antrim</td>
<td>114</td>
<td>108</td>
<td>75</td>
<td>64</td>
<td>392</td>
<td>92</td>
<td>51</td>
<td>94</td>
<td>7,000</td>
</tr>
<tr>
<td>Belfast</td>
<td>169</td>
<td>110</td>
<td>80</td>
<td>56</td>
<td>465</td>
<td>92</td>
<td>37</td>
<td>92</td>
<td>8,000</td>
</tr>
<tr>
<td>Newry</td>
<td>80</td>
<td>109</td>
<td>76</td>
<td>60</td>
<td>384</td>
<td>93</td>
<td>49</td>
<td>88</td>
<td>5,750</td>
</tr>
<tr>
<td>Ulster</td>
<td>97</td>
<td>114</td>
<td>87</td>
<td>57</td>
<td>672</td>
<td>98</td>
<td>14</td>
<td>91</td>
<td>5,000</td>
</tr>
<tr>
<td>West NI</td>
<td>113</td>
<td>111</td>
<td>85</td>
<td>62</td>
<td>535</td>
<td>95</td>
<td>32</td>
<td>93</td>
<td>6,667</td>
</tr>
</tbody>
</table>
### Table 7.4. Continued

<table>
<thead>
<tr>
<th>Centre</th>
<th>N with Hb data</th>
<th>Median Hb g/L</th>
<th>% Hb ≥100 g/L</th>
<th>% Hb 100–120 g/L</th>
<th>Median ferritin µg/L</th>
<th>% ferritin ≥100 µg/L</th>
<th>% ferritin ≥200 and ≤500 µg/L</th>
<th>% on ESA</th>
<th>Median ESA dose (IU/week)</th>
<th>% with Hb ≥100 g/L and not on ESA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scotland</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdn</td>
<td>205</td>
<td>111</td>
<td>83</td>
<td>67</td>
<td>602</td>
<td>99</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airdrie</td>
<td>174</td>
<td>113</td>
<td>80</td>
<td>60</td>
<td>754</td>
<td>96</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D&amp;Gall</td>
<td>50</td>
<td>111</td>
<td>76</td>
<td>50</td>
<td>583</td>
<td>100</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dundee</td>
<td>171</td>
<td>111</td>
<td>86</td>
<td>66</td>
<td>306</td>
<td>85</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edinb</td>
<td>251</td>
<td>115</td>
<td>88</td>
<td>55</td>
<td>421</td>
<td>91</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glasgow</td>
<td>544</td>
<td>111</td>
<td>77</td>
<td>54</td>
<td>458</td>
<td>92</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inverns</td>
<td>77</td>
<td>111</td>
<td>87</td>
<td>69</td>
<td>373</td>
<td>93</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilmarnk</td>
<td>124</td>
<td>110</td>
<td>77</td>
<td>59</td>
<td>282</td>
<td>89</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Krkcyd</td>
<td>132</td>
<td>113</td>
<td>80</td>
<td>48</td>
<td>436</td>
<td>87</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangor</td>
<td>78</td>
<td>113</td>
<td>82</td>
<td>62</td>
<td>514</td>
<td>95</td>
<td>36</td>
<td>81</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Cardiff</td>
<td>459</td>
<td>111</td>
<td>78</td>
<td>55</td>
<td>316</td>
<td>94</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chwyd</td>
<td>76</td>
<td>112</td>
<td>84</td>
<td>57</td>
<td>350</td>
<td>99</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swansea</td>
<td>342</td>
<td>108</td>
<td>76</td>
<td>66</td>
<td>283</td>
<td>85</td>
<td>46</td>
<td>93</td>
<td>10,000</td>
<td>6</td>
</tr>
<tr>
<td>Wrexm</td>
<td>99</td>
<td>110</td>
<td>84</td>
<td>63</td>
<td>508</td>
<td>98</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>England</strong></td>
<td>18,511</td>
<td>110</td>
<td>79</td>
<td>59</td>
<td>416</td>
<td>94</td>
<td>46</td>
<td>88</td>
<td>7,500</td>
<td>11</td>
</tr>
<tr>
<td>N Ireland</td>
<td>573</td>
<td>110</td>
<td>81</td>
<td>60</td>
<td>487</td>
<td>94</td>
<td>37</td>
<td>92</td>
<td>6,500</td>
<td>8</td>
</tr>
<tr>
<td><strong>Scotland</strong></td>
<td>1,728</td>
<td>112</td>
<td>81</td>
<td>58</td>
<td>447</td>
<td>92</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wales</strong></td>
<td>1,054</td>
<td>110</td>
<td>79</td>
<td>60</td>
<td>330</td>
<td>92</td>
<td>50</td>
<td>91</td>
<td>10,000</td>
<td>8</td>
</tr>
<tr>
<td><strong>UK</strong></td>
<td>21,866</td>
<td>110</td>
<td>79</td>
<td>59</td>
<td>415</td>
<td>94</td>
<td>46</td>
<td>88</td>
<td>7,500</td>
<td>11</td>
</tr>
</tbody>
</table>

Blank cells denote centres excluded from analyses due to poor data completeness or low patient numbers or because the data item was not available

*Data from Q1 only

ESA summary results are for E, W & NI (not UK)

ESA data only shown for those centres where the percentage on ESA was 60% or more

### Table 7.5. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent PD patients in 2015

<table>
<thead>
<tr>
<th>Centre</th>
<th>N with Hb data</th>
<th>Median Hb g/L</th>
<th>% Hb ≥100 g/L</th>
<th>% Hb 100–120 g/L</th>
<th>Median ferritin µg/L</th>
<th>% ferritin ≥100 µg/L</th>
<th>% ferritin ≥200 and ≤500 µg/L</th>
<th>% on ESA</th>
<th>Median ESA dose (IU/week)</th>
<th>% with Hb ≥100 g/L and not on ESA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>England</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Heart</td>
<td>40</td>
<td>107</td>
<td>78</td>
<td>65</td>
<td>208</td>
<td>81</td>
<td>72</td>
<td>55</td>
<td>6,000</td>
<td>35</td>
</tr>
<tr>
<td>B QEH</td>
<td>121</td>
<td>111</td>
<td>76</td>
<td>55</td>
<td>327</td>
<td>91</td>
<td>72</td>
<td>64</td>
<td>4,000</td>
<td>35</td>
</tr>
<tr>
<td>Basldn</td>
<td>27</td>
<td>104</td>
<td>78</td>
<td>78</td>
<td>185</td>
<td>81</td>
<td>70</td>
<td>89</td>
<td>4,250</td>
<td>11</td>
</tr>
<tr>
<td>Bradfl</td>
<td>14</td>
<td>109</td>
<td>79</td>
<td>64</td>
<td>237</td>
<td>85</td>
<td>46</td>
<td>86</td>
<td>8,000</td>
<td>14</td>
</tr>
<tr>
<td>Brighton</td>
<td>65</td>
<td>113</td>
<td>92</td>
<td>65</td>
<td>381</td>
<td>90</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bristol</td>
<td>47</td>
<td>112</td>
<td>89</td>
<td>66</td>
<td>400</td>
<td>98</td>
<td>62</td>
<td>74</td>
<td>4,923</td>
<td>23</td>
</tr>
<tr>
<td>Camb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carls</td>
<td>30</td>
<td>113</td>
<td>87</td>
<td>63</td>
<td>291</td>
<td>83</td>
<td>62</td>
<td>63</td>
<td>3,333</td>
<td>37</td>
</tr>
<tr>
<td>Carsh</td>
<td>96</td>
<td>108</td>
<td>79</td>
<td>59</td>
<td>186</td>
<td>81</td>
<td>73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chelms</td>
<td>22</td>
<td>116</td>
<td>91</td>
<td>55</td>
<td>156</td>
<td>55</td>
<td>50</td>
<td>65</td>
<td>2,500</td>
<td>36</td>
</tr>
<tr>
<td>Colchr</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covnt</td>
<td>75</td>
<td>109</td>
<td>72</td>
<td>55</td>
<td>238</td>
<td>86</td>
<td>66</td>
<td>61</td>
<td>8,000</td>
<td>32</td>
</tr>
<tr>
<td>Derby</td>
<td>73</td>
<td>112</td>
<td>79</td>
<td>55</td>
<td>408</td>
<td>97</td>
<td>58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donc</td>
<td>18</td>
<td>116</td>
<td>89</td>
<td>50</td>
<td>338</td>
<td>89</td>
<td>78</td>
<td>67</td>
<td>4,125</td>
<td>33</td>
</tr>
<tr>
<td>Dorset</td>
<td>35</td>
<td>113</td>
<td>74</td>
<td>54</td>
<td>322</td>
<td>97</td>
<td>73</td>
<td>80</td>
<td>4,000</td>
<td>20</td>
</tr>
<tr>
<td>Dudley</td>
<td>52</td>
<td>114</td>
<td>81</td>
<td>54</td>
<td>135</td>
<td>63</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exeter</td>
<td>70</td>
<td>115</td>
<td>94</td>
<td>64</td>
<td>232</td>
<td>87</td>
<td>75</td>
<td>76</td>
<td>4,000</td>
<td>24</td>
</tr>
<tr>
<td>Glouce</td>
<td>28</td>
<td>111</td>
<td>86</td>
<td>54</td>
<td>147</td>
<td>62</td>
<td>46</td>
<td>61</td>
<td>4,000</td>
<td>29</td>
</tr>
<tr>
<td>Hull</td>
<td>65</td>
<td>111</td>
<td>88</td>
<td>75</td>
<td>332</td>
<td>97</td>
<td>77</td>
<td>47</td>
<td>4,000</td>
<td>49</td>
</tr>
<tr>
<td>Ipswi</td>
<td>27</td>
<td>109</td>
<td>67</td>
<td>37</td>
<td>346</td>
<td>85</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kent</td>
<td>54</td>
<td>109</td>
<td>81</td>
<td>67</td>
<td>274</td>
<td>94</td>
<td>77</td>
<td>46</td>
<td>4,000</td>
<td>43</td>
</tr>
<tr>
<td>L Barts</td>
<td>180</td>
<td>110</td>
<td>80</td>
<td>56</td>
<td>280</td>
<td>87</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L Guys</td>
<td>29</td>
<td>102</td>
<td>52</td>
<td>41</td>
<td>207</td>
<td>89</td>
<td>78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L Kings</td>
<td>80</td>
<td>109</td>
<td>76</td>
<td>56</td>
<td>215</td>
<td>90</td>
<td>81</td>
<td>78</td>
<td>4,000</td>
<td>21</td>
</tr>
<tr>
<td>L Rifree</td>
<td>134</td>
<td>109</td>
<td>79</td>
<td>56</td>
<td>613</td>
<td>94</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 7.5. Continued

<table>
<thead>
<tr>
<th>Centre</th>
<th>N with Hb data</th>
<th>Median Hb g/L</th>
<th>Median Hb 100–120 g/L</th>
<th>Median ferritin μg/L ≥100 μg/L</th>
<th>% ferritin 100 and ≥500 μg/L</th>
<th>% on ESA</th>
<th>Median ESA dose (IU/week)</th>
<th>% with Hb 100 g/L and not on ESA</th>
</tr>
</thead>
<tbody>
<tr>
<td>L St. G</td>
<td>44</td>
<td>109</td>
<td>66</td>
<td>50</td>
<td>335</td>
<td>93</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>L West</td>
<td>53</td>
<td>113</td>
<td>83</td>
<td>66</td>
<td>262</td>
<td>90</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Leeds</td>
<td>50</td>
<td>115</td>
<td>88</td>
<td>60</td>
<td>365</td>
<td>92</td>
<td>70</td>
<td>82, 4,585, 18</td>
</tr>
<tr>
<td>Leic</td>
<td>95</td>
<td>111</td>
<td>84</td>
<td>64</td>
<td>301</td>
<td>94</td>
<td>72</td>
<td>84, 3,000, 15</td>
</tr>
<tr>
<td>Liv AIN</td>
<td>27</td>
<td>116</td>
<td>89</td>
<td>44</td>
<td>492</td>
<td>89</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Liv Roy</td>
<td>61</td>
<td>113</td>
<td>75</td>
<td>43</td>
<td>243</td>
<td>92</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>M RI</td>
<td>57</td>
<td>116</td>
<td>84</td>
<td>44</td>
<td>220</td>
<td>91</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>Middlr</td>
<td>14</td>
<td>118</td>
<td>100</td>
<td>71</td>
<td>388</td>
<td>93</td>
<td>64</td>
<td>53, 43</td>
</tr>
<tr>
<td>Newc</td>
<td>38</td>
<td>111</td>
<td>82</td>
<td>58</td>
<td>455</td>
<td>92</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Norwch</td>
<td>28</td>
<td>119</td>
<td>86</td>
<td>39</td>
<td>306</td>
<td>82</td>
<td>54</td>
<td>79, 4,000, 21</td>
</tr>
<tr>
<td>Nottm</td>
<td>64</td>
<td>108</td>
<td>69</td>
<td>52</td>
<td>539</td>
<td>97</td>
<td>34</td>
<td>73, 3,200, 23</td>
</tr>
<tr>
<td>Oxford</td>
<td>78</td>
<td>110</td>
<td>85</td>
<td>67</td>
<td>256</td>
<td>89</td>
<td>76</td>
<td>87, 6,000, 13</td>
</tr>
<tr>
<td>Plymth</td>
<td>28</td>
<td>115</td>
<td>82</td>
<td>46</td>
<td>531</td>
<td>96</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Ports</td>
<td>60</td>
<td>113</td>
<td>92</td>
<td>63</td>
<td>412</td>
<td>98</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Prestn</td>
<td>49</td>
<td>117</td>
<td>88</td>
<td>57</td>
<td>433</td>
<td>96</td>
<td>48</td>
<td>67, 33</td>
</tr>
<tr>
<td>Redng</td>
<td>59</td>
<td>113</td>
<td>80</td>
<td>56</td>
<td>385</td>
<td>95</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Salford</td>
<td>82</td>
<td>114</td>
<td>88</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrew</td>
<td>27</td>
<td>108</td>
<td>70</td>
<td>52</td>
<td>182</td>
<td>85</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>Steynga</td>
<td>111</td>
<td>82a</td>
<td>59a</td>
<td></td>
<td>260</td>
<td>91</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Stend</td>
<td>15</td>
<td>116</td>
<td>80</td>
<td>60</td>
<td>244</td>
<td>87</td>
<td>73</td>
<td>73, 27</td>
</tr>
<tr>
<td>Stoke</td>
<td>70</td>
<td>114</td>
<td>80</td>
<td>50</td>
<td>266</td>
<td>93</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Sund</td>
<td>13</td>
<td>110</td>
<td>85</td>
<td>54</td>
<td></td>
<td></td>
<td>71</td>
<td>2,769, 31</td>
</tr>
<tr>
<td>Truro</td>
<td>19</td>
<td>117</td>
<td>79</td>
<td>37</td>
<td>206</td>
<td>88</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Wirral</td>
<td>17</td>
<td>109</td>
<td>71</td>
<td>71</td>
<td>453</td>
<td>100</td>
<td>65</td>
<td>88, 6,000, 12</td>
</tr>
<tr>
<td>Wolfe</td>
<td>67</td>
<td>110</td>
<td>72</td>
<td>46</td>
<td>158</td>
<td>61</td>
<td>55</td>
<td>62, 5,550, 31</td>
</tr>
<tr>
<td>York</td>
<td>21</td>
<td>109</td>
<td>67</td>
<td>52</td>
<td>362</td>
<td>90</td>
<td>71</td>
<td>73, 3,750, 19</td>
</tr>
<tr>
<td>N Ireland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antrim</td>
<td>17</td>
<td>109</td>
<td>76</td>
<td>76</td>
<td>325</td>
<td>94</td>
<td>71</td>
<td>76, 3,000, 18</td>
</tr>
<tr>
<td>Belfast</td>
<td>19</td>
<td>114</td>
<td>95</td>
<td>74</td>
<td>361</td>
<td>95</td>
<td>63</td>
<td>84, 3,875, 16</td>
</tr>
<tr>
<td>Newry</td>
<td>18</td>
<td>109</td>
<td>78</td>
<td>56</td>
<td>371</td>
<td>100</td>
<td>78</td>
<td>56, 4,000, 44</td>
</tr>
<tr>
<td>Ulster</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West NI</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abrdn</td>
<td>21</td>
<td>116</td>
<td>76</td>
<td>43</td>
<td>222</td>
<td>90</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Airdrie</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D&amp;Gall</td>
<td>10</td>
<td>116</td>
<td>100</td>
<td>70</td>
<td>321</td>
<td>100</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Dundee</td>
<td>16</td>
<td>117</td>
<td>94</td>
<td>50</td>
<td>442</td>
<td>94</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Edinb</td>
<td>18</td>
<td>113</td>
<td>78</td>
<td>33</td>
<td>205</td>
<td>83</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Glasgw</td>
<td>44</td>
<td>117</td>
<td>84</td>
<td>50</td>
<td>191</td>
<td>80</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Inverns</td>
<td>13</td>
<td>106</td>
<td>77</td>
<td>46</td>
<td>210</td>
<td>92</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>Kilmarnk</td>
<td>33</td>
<td>115</td>
<td>82</td>
<td>55</td>
<td>219</td>
<td>91</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Krcldy</td>
<td>16</td>
<td>117</td>
<td>94</td>
<td>63</td>
<td>256</td>
<td>71</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangor</td>
<td>13</td>
<td>115</td>
<td>92</td>
<td>69</td>
<td>186</td>
<td>85</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Cardiff</td>
<td>72</td>
<td>116</td>
<td>82</td>
<td>46</td>
<td>118</td>
<td>64</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Clywd</td>
<td>13</td>
<td>108</td>
<td>85</td>
<td>62</td>
<td>417</td>
<td>91</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Swansea</td>
<td>55</td>
<td>112</td>
<td>84</td>
<td>60</td>
<td>318</td>
<td>90</td>
<td>65</td>
<td>62, 4,125, 36</td>
</tr>
<tr>
<td>Wrexm</td>
<td>33</td>
<td>112</td>
<td>82</td>
<td>58</td>
<td>303</td>
<td>88</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>England</td>
<td>2,566</td>
<td>112</td>
<td>81</td>
<td>57</td>
<td>301</td>
<td>89</td>
<td>63</td>
<td>69, 4,000, 28</td>
</tr>
<tr>
<td>N Ireland</td>
<td>69</td>
<td>111</td>
<td>84</td>
<td>62</td>
<td>361</td>
<td>96</td>
<td>65</td>
<td>77, 4,000, 22</td>
</tr>
<tr>
<td>Scotland</td>
<td>179</td>
<td>115</td>
<td>84</td>
<td>51</td>
<td>237</td>
<td>86</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td>186</td>
<td>113</td>
<td>83</td>
<td>55</td>
<td>217</td>
<td>80</td>
<td>64</td>
<td>62, 4,125, 36</td>
</tr>
<tr>
<td>UK</td>
<td>3,000</td>
<td>112</td>
<td>81</td>
<td>57</td>
<td>295</td>
<td>88</td>
<td>64</td>
<td>69b, 4,000b, 28b</td>
</tr>
</tbody>
</table>

Blank cells denote centres excluded from analyses due to poor data completeness or low patient numbers or because the data item was not available.

aData from Q1 only.

bESA summary results are for E, W & NI (not UK).

ESA data only shown for those centres where the percentage on ESA was 40% or more.

---

*Anaemia Management in UK dialysis patients*

*Nephron 2017;000(suppl0):165–188*
received by the UKRR. As stated in the methods section, centres returning unexpectedly low ESA returns were assumed to have had problems with data entry and/or data transfer. Centres were excluded from further ESA analyses if they reported ESA use in less than 60% of HD patients or less than 40% of PD patients.

Summary statistics for haemoglobin, serum ferritin and ESA are shown in table 7.4 for HD and 7.5 for PD.

**Haemoglobin in prevalent haemodialysis patients**

The median Hb of patients on HD in the UK in 2015 was 110 g/L (IQR 101–119) and is shown in table 7.4. For HD patients 79% had a Hb $\geq 100 \text{ g/L}$. Figure 7.7 shows the median Hb in HD patients by renal centre. Figure 7.8 shows the proportion of patients by centre with Hb within the Renal Association guideline range (100–120 g/L) and figure 7.9 shows the distribution of Hb within, above and below this range.

Funnel plots for the percentage of patients with Hb $\geq 100 \text{ g/L}$ (figure 7.10) and between 100–120 (figure 7.11) are shown with 95% and 99.9% confidence limits. Table 7.4 can be used to identify centres in these funnel plots.

**Haemoglobin in prevalent peritoneal dialysis patients**

The median Hb of patients on PD in the UK in 2015 was 112 g/L (IQR 103–120, table 7.5). For PD patients 81% had a Hb $\geq 100 \text{ g/L}$. Figure 7.12 shows the median Hb in PD patients by centre. Figure 7.13 shows the proportion of patients by centre with Hb within the Renal Association guideline range (100–120 g/L) and
figure 7.14 shows the distribution of Hb within, above and below this range.

Figures 7.15 and 7.16 are funnel plots showing the percentage of PD patients by centre in 2015 with Hb ≥ 100 g/L and Hb ≥ 100 g/L and ≤ 120 g/L respectively.

Relationship between Hb in incident and prevalent dialysis patients

The relationship between the percentage of incident and prevalent patients with Hb ≥ 100 g/L is shown in figure 7.17. As expected, all centres had a higher percentage of prevalent patients achieving a Hb ≥ 100 g/L than of incident patients.

Changes in achievement of Hb ≥ 100 g/L by year of start in both incident and prevalent patients is shown in figure 7.18. This shows a continuing fall in the proportion of patients achieving a Hb ≥ 100 g/L over the last decade.

Ferritin in prevalent haemodialysis patients

The median and IQR for serum ferritin for patients treated with HD are shown in figure 7.19. The percentages with serum ferritin ≥ 100 µg/L, > 200 µg/L to
Fig. 7.12. Median haemoglobin in patients treated with PD by centre in 2015

Fig. 7.13. Percentage of PD patients with Hb $\geq 100$ g/L and $\leq 120$ g/L by centre in 2015

Fig. 7.14. Distribution of haemoglobin in patients treated with PD by centre in 2015
Fig. 7.15. Funnel plot of percentage of PD patients with Hb $\geq 100$ g/L by centre in 2015

Fig. 7.16. Funnel plot of percentage of PD patients with Hb $\geq 100$ g/L and $\leq 120$ g/L by centre in 2015

Fig. 7.17. Percentage of incident and prevalent dialysis patients with Hb $\geq 100$ g/L by centre in 2015

Fig. 7.18. Percentage of incident and prevalent dialysis patients (1998–2015) with Hb $\geq 100$ g/L.
≤500 μg/L, and ≥800 μg/L are shown in figures 7.20, 7.21 and 7.22 respectively. The median serum ferritin in HD patients was 415 μg/L with 94% of HD patients achieving a serum ferritin ≥100 μg/L.

Ferritin in prevalent peritoneal dialysis patients
The median and IQR for serum ferritin for patients treated with PD are shown in figure 7.23. The percentages with serum ferritin ≥100 μg/L, >100 μg/L to ≤500 μg/L, and ≥800 μg/L are shown in figures 7.24, 7.25 and 7.26 respectively. The median serum ferritin in PD patients was 295 μg/L with 88% of PD patients achieving a serum ferritin ≥100 μg/L.

Erythropoiesis stimulating agents in prevalent haemodialysis patients
The median dose of ESA for prevalent HD patients in England, Wales and Northern Ireland was 7,500 IU/week with wide variation between centres from 4,833 IU/week (York) to 13,267 IU/week (Newcastle) (table 7.4). There was very little correlation between median ESA dose and either median Hb (figure 7.27) or compliance with Hb 100–120 g/L (figure 7.28). For these analyses only patients with both Hb and ESA data were included.

Erythropoiesis stimulating agents in prevalent peritoneal dialysis patients
The median dose of ESA for prevalent PD patients in England, Wales and Northern Ireland was 4,000 IU/week (table 7.5).

ESA prescription and association with achieved haemoglobin
Figures 7.9 and 7.14 show the distribution of Hb concordance with the RA guideline (100–120 g/L). Not all patients with Hb >120 g/L are receiving ESA. The
Fig. 7.21. Percentage of HD patients with ferritin \(\geq 200\) and \(\leq 500\) μg/L by centre in 2015

Fig. 7.22. Percentage of HD patients with ferritin \(\geq 800\) μg/L by centre in 2015

Fig. 7.23. Median ferritin in patients treated with PD by centre in 2015
**Fig. 7.24.** Percentage of PD patients with ferritin $\geq 100 \mu g/L$ by centre in 2015

**Fig. 7.25.** Percentage of PD patients with ferritin $>100$ and $\leq 500 \mu g/L$ by centre in 2015

**Fig. 7.26.** Percentage of PD patients with ferritin $\geq 800 \mu g/L$ by centre in 2015
consensus was that these patients should not be included in the group of patients not meeting this target. There are two reasons: first, the high Hb remains largely outside the control of the clinician; secondly, the trials suggesting it may be detrimental to achieve a high Hb in renal patients were based upon patients treated with ESAs [6–8]. Figures 7.29 and 7.30 therefore show the percentages of HD and PD patients in each centre whose Hb lies below, within or above the RA guideline range. For those patients with Hb $\geq 120$ g/L it also differentiates between those receiving, or not, ESAs. In centres with useable ESA data, 20.0% of HD patients had a Hb $\geq 120$ g/L and 4.9% had a Hb $\geq 120$ g/L and were not receiving ESAs. For PD patients 21.3% had a Hb $\geq 120$ g/L and 11.8% had a Hb $\geq 120$ g/L and were not receiving ESAs.

**ESA prescription: age and modality associations**

The proportion of patients on ESA was higher for HD (88%) than for PD (69%). This difference was maintained across all age groups (figure 7.31). The proportion of patients with Hb $\geq 100$ g/L without requiring an ESA is shown (by age group and modality) in figure 7.32.

**ESAs and time on renal replacement therapy**

The percentage of patients on ESA by time on RRT and dialysis modality is shown in figure 7.33. This is a

---

**Fig. 7.27.** Median Hb versus median ESA dose in HD patients on ESA, by centre in 2015

**Fig. 7.28.** Compliance with Hb 100–120 g/L versus median ESA dose in HD patients on ESA, by centre in 2015

**Fig. 7.29.** Distribution of haemoglobin in patients treated with HD and the proportion of patients with Hb $>120$ g/L receiving ESA by centre in 2015
cross-sectional analysis of patients at the end of 2015. Patients who had previously changed RRT modality were included in the analysis. The proportion of PD patients receiving ESA rises with duration of RRT from 65% after 3–12 months to 84% after 10 or more years.

**Resistance to ESA therapy**

The Renal Association guidelines define resistance to ESA therapy as ‘failure to reach the target Hb level despite sc epoetin dose >300 IU/kg/week (450 IU/kg/week iv epoetin) or darbepoetin dose >1.5 mcg/kg/week’ [4]. Figure 7.34 shows the frequency distribution of weekly ESA dose adjusted for weight by treatment modality. Centres included in this analysis were restricted to those with good completeness for weight (>75%) and ESA data. Thirty three centres were included for HD data and 20 centres for PD. The prevalence of PD patients receiving over 300 IU/kg/week was 1.6% with 6.1% of HD patients receiving more than 300 IU/kg/week and 1.1% more than 450 IU/kg/week.

**Success with guideline compliance**

The percentage of prevalent dialysis patients achieving a Hb ≥100 g/L by year (1998–2015) is shown in

---

*Fig. 7.30.* Distribution of haemoglobin in patients treated with PD and the proportion of patients with Hb >120 g/L receiving ESA by centre in 2015

*Fig. 7.31.* Percentage of dialysis patients on ESA, by age group and treatment modality in 2015

*Fig. 7.32.* Percentage of whole cohort (2015) who were not on ESA and had Hb ≥100 g/L, by age group and treatment modality
Figure 7.35. This has shown a gradual fall in achievement of this guideline over the last decade.

Table 7.6 shows that the percentage of all patients treated with an ESA and having Hb >120 g/L ranged between 6–27% for HD and between 0–27% for PD.

Table 7.7 shows the percentage completeness for ESA type, dose, route and frequency for centres reporting ESA data. Even for this group of centres which is already restricted to those with useable ESA data, completeness of frequency and administration route average below 50%. Roughly half of the centres have very good completeness for these items and the other half did not submit at all.

Discussion

Anaemia is one of the major comorbidities associated with chronic kidney disease. This is largely caused by a reduction (absolute or relative) in erythropoietin production, though there are a number of other contributory factors including (absolute or relative) iron deficiency; inflammatory processes related to underlying kidney disease or other comorbidities; inflammatory processes related to dialysis; blood loss (CKD-associated platelet dysfunction, frequent phlebotomy, dialysis-associated
Table 7.6. Percentage of patients with Hb >120 g/L and on ESA and percentage of patients with serum ferritin <100 μg/L and on ESA, by modality

<table>
<thead>
<tr>
<th>Centre</th>
<th>HD % with Hb &gt;120 g/L and on ESA</th>
<th>HD % with ferr &lt;100μg/L and on ESA</th>
<th>PD % with Hb &gt;120 g/L and on ESA</th>
<th>PD % with ferr &lt;100μg/L and on ESA</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Heart</td>
<td>10</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>B QEIH</td>
<td>9</td>
<td>2</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Basldn</td>
<td>14</td>
<td>7</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Bradfd</td>
<td>20</td>
<td>4</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Brighton</td>
<td>20</td>
<td>1</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Bristol</td>
<td>18</td>
<td>4</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Carls</td>
<td>11</td>
<td>0</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Chelms</td>
<td>21</td>
<td>2</td>
<td>27</td>
<td>35</td>
</tr>
<tr>
<td>Covnt</td>
<td>8</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Donc</td>
<td>9</td>
<td>2</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Dorset</td>
<td>17</td>
<td>0</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Exeter</td>
<td>18</td>
<td>6</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Glouc</td>
<td>9</td>
<td>4</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Hull</td>
<td>13</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Ipswi</td>
<td>8</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kent</td>
<td>16</td>
<td>9</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>L Kings</td>
<td>9</td>
<td>6</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Leeds</td>
<td>10</td>
<td>4</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Leic</td>
<td>24</td>
<td>6</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Middlbr</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Newc</td>
<td>13</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norwch</td>
<td>27</td>
<td>6</td>
<td>36</td>
<td>14</td>
</tr>
<tr>
<td>Nottm</td>
<td>12</td>
<td>1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Oxford</td>
<td>12</td>
<td>10</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Prestn</td>
<td>17</td>
<td>3</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Redng</td>
<td>27</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheff</td>
<td>19</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sthend</td>
<td>6</td>
<td>5</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Sund</td>
<td>19</td>
<td>0</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Wirral</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wolve</td>
<td>26</td>
<td>4</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>York</td>
<td>10</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>N Ireland</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antrim</td>
<td>9</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Belfast</td>
<td>21</td>
<td>6</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Newry</td>
<td>13</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ulster</td>
<td>25</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West NI</td>
<td>20</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangor</td>
<td>17</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swanse</td>
<td>7</td>
<td>12</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>England</td>
<td>15</td>
<td>4</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>N Ireland</td>
<td>18</td>
<td>5</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Wales</td>
<td>9</td>
<td>11</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>E, W &amp; NI</td>
<td>15</td>
<td>4</td>
<td>9</td>
<td>5</td>
</tr>
</tbody>
</table>

Blank cells: centres excluded from analyses due to poor data completeness, small numbers with data or incomplete ESA data
Table 7.7. Percentage completeness for type, dose, route and frequency of administration of ESA

<table>
<thead>
<tr>
<th>Centre</th>
<th>N on ESA</th>
<th>% with drug type</th>
<th>% with dose</th>
<th>% with frequency</th>
<th>N on ESA</th>
<th>% with drug type</th>
<th>% with dose</th>
<th>% with frequency</th>
<th>% with administration route</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>England</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Heart</td>
<td>311</td>
<td>100</td>
<td>99</td>
<td>0</td>
<td>22</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B QEH</td>
<td>822</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>77</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Basldn</td>
<td>141</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>24</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Bradfd</td>
<td>203</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>98</td>
<td>12</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Brightn</td>
<td>333</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bristol</td>
<td>454</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>35</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Carlis</td>
<td>51</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Chelms</td>
<td>128</td>
<td>100</td>
<td>100</td>
<td>99</td>
<td>100</td>
<td>15</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Covnt</td>
<td>279</td>
<td>100</td>
<td>98</td>
<td>0</td>
<td>0</td>
<td>46</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Donc</td>
<td>145</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>12</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Dorset</td>
<td>251</td>
<td>100</td>
<td>100</td>
<td>97</td>
<td>100</td>
<td>28</td>
<td>100</td>
<td>100</td>
<td>86</td>
</tr>
<tr>
<td>Exeter</td>
<td>380</td>
<td>100</td>
<td>99</td>
<td>0</td>
<td>0</td>
<td>54</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Glouc</td>
<td>195</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>17</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hull</td>
<td>204</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>31</td>
<td>100</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Ipswi</td>
<td>86</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kent</td>
<td>372</td>
<td>100</td>
<td>100</td>
<td>99</td>
<td>100</td>
<td>25</td>
<td>100</td>
<td>100</td>
<td>96</td>
</tr>
<tr>
<td>L Kings</td>
<td>480</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>62</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Leeds</td>
<td>434</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>41</td>
<td>100</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>Leic</td>
<td>817</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>80</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Middlbr</td>
<td>231</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newc</td>
<td>191</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norwch</td>
<td>284</td>
<td>100</td>
<td>100</td>
<td>98</td>
<td>100</td>
<td>22</td>
<td>100</td>
<td>100</td>
<td>82</td>
</tr>
<tr>
<td>Nottm</td>
<td>304</td>
<td>100</td>
<td>100</td>
<td>97</td>
<td>100</td>
<td>47</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Oxford</td>
<td>367</td>
<td>100</td>
<td>99</td>
<td>0</td>
<td>0</td>
<td>68</td>
<td>100</td>
<td>91</td>
<td>0</td>
</tr>
<tr>
<td>Prestn</td>
<td>486</td>
<td>100</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>33</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Redng</td>
<td>246</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheff</td>
<td>457</td>
<td>100</td>
<td>91</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Sthend</td>
<td>103</td>
<td>100</td>
<td>97</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>100</td>
<td>55</td>
<td>0</td>
</tr>
<tr>
<td>Sund</td>
<td>186</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Wirral</td>
<td>146</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>15</td>
<td>100</td>
<td>100</td>
<td>93</td>
</tr>
<tr>
<td>Wolve</td>
<td>243</td>
<td>100</td>
<td>100</td>
<td>98</td>
<td>100</td>
<td>42</td>
<td>100</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>York</td>
<td>132</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>98</td>
<td>16</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>N Ireland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antrim</td>
<td>107</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>13</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Belfast</td>
<td>155</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>16</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Newry</td>
<td>74</td>
<td>100</td>
<td>100</td>
<td>99</td>
<td>100</td>
<td>10</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Ulster</td>
<td>88</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West NI</td>
<td>105</td>
<td>100</td>
<td>100</td>
<td>99</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangor</td>
<td>63</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swansea</td>
<td>318</td>
<td>100</td>
<td>96</td>
<td>96</td>
<td>98</td>
<td>34</td>
<td>91</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>England</td>
<td>9,462</td>
<td>100</td>
<td>93</td>
<td>40</td>
<td>31</td>
<td>894</td>
<td>100</td>
<td>93</td>
<td>44</td>
</tr>
<tr>
<td>N Ireland</td>
<td>529</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>53</td>
<td>100</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>Wales</td>
<td>381</td>
<td>100</td>
<td>80</td>
<td>80</td>
<td>82</td>
<td>34</td>
<td>91</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>E, W &amp; NI</td>
<td>10,372</td>
<td>100</td>
<td>93</td>
<td>44</td>
<td>37</td>
<td>981</td>
<td>100</td>
<td>93</td>
<td>48</td>
</tr>
</tbody>
</table>

Blank cells: centres with useable data for HD patients but not for PD patients
blood loss); hyperparathyroidism and dialysis inadequacy.

Since the introduction of ESAs in the 1980s the management of renal anaemia has changed markedly, from the general acceptance of severe anaemia punctuated by intermittent blood transfusions, to the maintenance of acceptable Hb concentrations for patients with CKD. The understanding of what constitutes an acceptable Hb range has evolved with the published literature and is illustrated by the historic analyses in figures 7.18 and 7.35. These figures show a steady increase in Hb until the middle of the last decade followed by a steady fall during the last ten years. This change in trend followed the publication of the CHOIR and CREATE studies in 2006 which unexpectedly showed adverse outcomes from the physiological correction of haemoglobin with ESAs [6–7]. These findings were supported by the TREAT study in 2009 [8].

Haemoglobin outcomes were similar for both HD and PD patients with proportions of prevalent patients compliant with Hb 100–120 g/L of 59% and 57% respectively. Prevalent HD patients had a higher median serum ferritin (415 μg/L vs 295 μg/L), a higher proportion of patients requiring ESAs (88% vs 69%) and a higher median ESA dose in those receiving ESAs (7,500 IU/week vs 4,000 IU/week) compared with prevalent PD patients.

As expected, a greater proportion of prevalent patients than incident patients attained a Hb ≥ 100 g/L (80% vs 47%). Only 34% of late presenters achieved a Hb ≥ 100 g/L suggesting that part of this difference is because there was less opportunity for anaemia to be treated with iron or ESAs. The fact that even in the early presenting incident group of patients only 51% achieved Hb ≥ 100 g/L suggests that opportunity is only part of the explanation for incident patients. Alternative explanations include the fact that a number of patients commence dialysis at the time of an acute illness when acute anaemia is common.

The proportion of patients achieving a serum ferritin of ≥ 100 μg/L was 94% of HD patients and 88% of PD patients.

The NICE guideline on managing anaemia was published mid-way through the data collection period [5] and there are some fundamental differences between these and the previous Renal Association guideline, especially with respect to measurements of iron status. Specifically, the new NICE guidance recommends that percentage hypochromic red blood cells or reticulocyte haemoglobin are preferable markers of iron deficiency than serum ferritin or transferrin saturation. Renal centres will need to consider the incorporation of these changes into local guidelines as well as the need to ensure electronic collection of these data items. Assuming these recommendations are incorporated into the revised RA anaemia guidance, these additional iron indices will then need to be added to the UKRR dataset.

The analysis of ESA usage was limited by incomplete data returns. From the available data, 88% of HD patients and 69% of PD patients were receiving ESAs. The attainment of Hb targets correlated poorly with median ferritin and ESA usage.

There continued to be variation in concordance with anaemia guidelines between UK renal centres.

Conflicts of interest: the authors declare no conflicts of interest

References


5 National Institute for Health and Care Excellence (NICE). Chronic kidney disease: managing anaemia. 2015 nice.org.uk/guidance/ng8


188 Nephron 2017;000(suppl0):165–188 Ford/Gilg/Williams