Health inequalities and chronic kidney disease in adults

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Better Kidney Care for All
<table>
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<tr>
<th><strong>Title</strong></th>
<th>Health inequalities and chronic kidney disease in adults</th>
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National Kidney Federation  
British Renal Society  
Renal Association  
Department of Health  
Other organisations working to address health inequalities |
| **Description/purpose** | This document aims to summarise the current evidence base on inequalities in kidney disease and its care in adults. This paper reviews the inequalities in:  
• prevalence of chronic kidney disease (CKD)  
• key risk factors for CKD  
• access to renal replacement therapy (RRT)  
• access to renal transplantation in adults. |
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Executive Summary

Health inequalities and chronic kidney disease in adults

Health inequalities matter. They can be the difference between life and death, health and sickness, well-being and misery. Where someone lives, who they are born to, or what work they do should not affect their health or quality of life. Preventable inequalities are, quite simply, unfair.

Tackling inequalities is a key priority for the health service. The first principle of the NHS, as set out in the NHS Constitution, is to provide a universal service, promoting equality through the services it provides. The government’s July 2010 white paper, Equity and Excellence: Liberating the NHS (http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_117353) reasserts its commitment to promoting equality and is consistent with the 2010 Equality Act, which introduces a new public sector duty to consider reducing inequalities.

In kidney care, the delays faced by people from ethnic minority backgrounds in receiving a suitable kidney transplant are widely recognised, with programmes of work underway to address them. However, other issues, such as inequalities in the pace at which chronic kidney disease progresses among different groups, are just being understood and need further attention.

This document summarises the current evidence about inequalities in kidney disease and its care in adults. It is aimed at all those providing, commissioning and managing kidney care, and those working in public health and primary care who are in a position to help understand and address inequalities in the prevention, detection and management of kidney disease.

The publication in December 2010 of the latest Health Survey for England12, of which NHS Kidney Care commissioned the parts relating to kidney disease, confirms the findings of this summary.
**Scope**

The document reviews the evidence about inequalities based on age, gender, ethnicity, and socio-economic status in relation to the following areas of kidney disease and care:

- The rates of chronic kidney disease (CKD) and established renal failure (ERF) - the most severe level of CKD - among different groups
- How common underlying risk factors for CKD (such as obesity, smoking and hypertension) are among different groups
- Any differences between the groups in the proportion of people undertaking renal replacement therapy (RRT)
- Any differences between the groups in the proportion of people who are placed on the waiting list for a kidney transplant and how long they wait for a suitable donor.

Where appropriate, a distinction is made between inequalities, which are variations between different groups, and inequities, which are variations due to factors which may be considered unfair.

**Key findings**

In terms of age, the older people are, the more likely they are to have CKD. The likelihood of needing RRT also increases with age, although the rate of people receiving RRT reduces for women after the age of 80 and for men after 85. Older people are less likely to be put on the waiting list for a kidney transplant and there is significant variation in this figure between different kidney units, suggesting that this is an area where kidney care networks should consider benchmarking themselves against others.

There are a few variations between men and women. Moderate CKD is more common in women yet men are more likely to start RRT. More research is needed to see if there is a gender inequity that is not linked to age.

In terms of ethnicity, South Asian and Black groups have lower rates of moderate CKD. However, CKD progresses faster in these groups, contributing to higher rates of RRT. There are no variations related to ethnicity in how long patients wait to get on the transplant list. However, once on it, people from South Asian and Black groups tend to wait longer for a transplant, reflecting a shortage of suitable donors.

People from more deprived socio-economic groups are more likely to have one or more of the underlying risk factors for developing CKD, which include diabetes, obesity and smoking. RRT rates are also higher in deprived populations. People from deprived groups are less likely to be put on the list for a transplant and, when they are, are likely to have waited longer before being put on it.
Overall, the most notable inequities are socio-economic. People from more deprived populations are more likely to have CKD and are more likely to require RRT. However, they are less likely to be on the waiting list for a transplant. Additionally, as is already widely recognised, people from South Asian and Black ethnic groups who are waiting for a transplant experience significant inequity in receiving a transplant because of the significant shortage of suitable donors.

**Recommendations**

Local commissioners, emerging consortia and local health and wellbeing boards will want to review this document and consider how best to integrate early kidney disease management with vascular care. In particular the CKD QOF toolkit (available on the NHS Kidney Care website at [http://www.kidneycare.nhs.uk/_Resourcestodownload-Toolkits.aspx](http://www.kidneycare.nhs.uk/_Resourcestodownload-Toolkits.aspx)) will be of use to enable commissioners to compare actual and predicted levels of kidney disease incidence in their local area (known as the level of ascertainment).

The findings of this summary highlight areas where further research is required and where more information is needed. Commissioners, networks and clinicians should consider these findings when undertaking health needs assessments or planning future services.

Commissioners, emerging consortia and health and wellbeing boards will want to consider the NICE quality standards for CKD published in March 2011, which support the NHS Outcomes Framework 2011/2012. They should note the drive to tackle health inequalities and consider how data collection can be improved and used more effectively.
Introduction

The aim of this document is to summarise the current evidence base on inequalities in kidney disease and its care in adults. This paper reviews inequalities in:

- prevalence of chronic kidney disease (CKD)
- key risk factors for CKD
- access to renal replacement therapy (RRT)
- access to renal transplantation in adults

Inequality and inequity is investigated in relation to age, gender, ethnicity and socio economic status. Where appropriate we distinguish inequality (variation) from inequity (variation due to social and health care factors which maybe be considered unfair). It is recognised that ethnic minority groups tend to be more socially disadvantaged and are more likely to live in areas classified as deprived. Analyses investigating these factors must take this relationship into account.

Other key factors or groups for consideration in inequalities work such as sexual orientation, religion or belief, gypsies and travellers, prisoners and refugees and asylum seekers have not been addressed as there are no routinely held data that characterise aspects of kidney disease by these factors. Specific studies would be required to look at inequalities in long-term conditions in these groups. Certain conditions are associated with significant disability and an increased risk of kidney disease e.g. spina bifida and spinal cord lesions. These relationships need to be considered when describing inequalities in kidney disease but data are scarce.

The target audiences for the document are commissioners of kidney services, including emerging GP Consortia, primary care, and those working with an interest in vascular risk assessment and management, although it will also be of interest to specialists in kidney care and those involved in other chronic conditions.
Background

Renal replacement therapy (RRT) in the form of either dialysis or transplantation is a life-saving definitive treatment for patients whose chronic kidney disease (CKD) progresses to established renal failure (ERF). Although life-saving, RRT has a significant impact on length[^1] and quality of life[^2]. Further, just 0.02-0.06% of the general population are on RRT, yet these are responsible for 1-2% of spending on health care in developed countries[^3].

Ensuring equity in the provision of renal services for different socio-economic and ethnic groups requires understanding of how these factors influence:

- The frequency of CKD in the general population, and the progression of CKD to ERF
- The frequency of underlying key risk factors for CKD
- Access to RRT
- Access to kidney transplantation, which is a two-stage process of getting onto the waiting list and then receiving a transplant

These are considered in turn.
The prevalence of chronic kidney disease in the population

The introduction of an internationally recognised classification system for CKD\(^4\) (table 1) has led to the realisation that CKD rates vary little between countries: around 10% of the predominantly Europid populations of Iceland, Norway and the US have CKD\(^5,6,7\). Similar rates have been confirmed in England (HSE 2009)\(^12\).

There is no direct evidence on trends in CKD prevalence in the UK. US data\(^9\) from the National Health and Nutrition Examination Survey (NHANES) suggest that the prevalence is increasing. Comparison of the prevalence of CKD in the NHANES 1988–1994 with 1999–2004 showed an increase in population prevalence of CKD stages 1-4, from 10.0 to 13.1%. Moderate severe CKD (stage 3-4) increased from 5.5% to 8.0%. There was also an increase in the prevalence of albuminuria between NHANES 1988-1994 and 1999-2004. Increases in the prevalence of diabetes, hypertension and obesity in the US population largely explained the reported increase in albuminuria and partly explained the higher prevalence of a low estimated glomerular filtration rate (eGFR).

### Table 1: Stages of chronic kidney disease

<table>
<thead>
<tr>
<th>Stage(^a)</th>
<th>GFR (ml/min/1.73 m(^2))</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90</td>
<td>Normal or increased GFR, with other evidence of kidney damage, (most often detection of albumin in the urine ‘albuminuria’)</td>
</tr>
<tr>
<td>2</td>
<td>60–89</td>
<td>Slight decrease in GFR, with other evidence of kidney damage (most often detection of albumin in the urine ‘albuminuria’)</td>
</tr>
<tr>
<td>3A</td>
<td>45–59</td>
<td>Moderate decrease in GFR, with or without other evidence of kidney damage</td>
</tr>
<tr>
<td>3B</td>
<td>30–44</td>
<td>Moderate decrease in GFR, with or without other evidence of kidney damage</td>
</tr>
<tr>
<td>4</td>
<td>15–29</td>
<td>Severe decrease in GFR, with or without other evidence of kidney damage</td>
</tr>
<tr>
<td>5</td>
<td>&lt; 15</td>
<td>Established renal failure</td>
</tr>
</tbody>
</table>

\(^a\) Use the suffix (p) to denote the presence of proteinuria when staging CKD


An international collaboration has pooled and examined cohort studies\(^10\) of the prognostic importance of measures of kidney disease, eGFR and albumin in the urine. The findings have demonstrated an independent and graded effect of declining eGFR and the presence of albuminuria on all cause and cardiovascular mortality.
Most studies of CKD prevalence have been cross-sectional surveys and have therefore used single measures of kidney function despite the definition of CKD ideally requiring chronicity of more than three months. Moreover most prognostic data are also based on single measures of people recruited into follow-up studies. Recent UK primary care routine data have shown that analysis based on single measures may overestimate prevalence rates\(^{11}\). However, routine NHS primary care data are based on selective testing (e.g. those with chronic diseases, people who are ill), with the proportion tested rising with age. Such data also include acute deterioration (and hence prevalence based on single measures of serum creatinine may be misleading) and the true population based prevalence is hard to derive. The Health Survey for England (HSE) 2009\(^{12}\) examined a sample of the general population. It is the first survey of kidney disease in England in a nationally representative general population sample.

Most prevalence studies have used the Modification of Diet in Renal Disease (MDRD) equation which corrects serum creatinine for age sex and ethnicity. The more recent Chronic Kidney Disease Epidemiology Collaboration equation (CKDEpi) formula has been shown to be more accurate. Mean eGFR is higher and the main change compared to MDRD is to re-classify some cases with stage 3a into stages 2 or 1 and hence reduce Stage 3-5 prevalence\(^{13}\).

Stages 1 and 2 CKD require the presence of other markers of kidney damage. In most cross-sectional studies this is based on analysis of single urine samples for albuminuria (usually measured as the urinary albumin/creatinine ratio [ACR]), with the vast majority of positive cases having microalbuminuria (>2.5mg/mmol in men, >3.5mg/mmol in women).

### i) Age

The estimated prevalence of CKD stages 3-5 varies by age and gender. The HSE 2009 data\(^{12}\) estimates that the overall prevalence of CKD stages 3-5 was 6% in people aged 16 and over. This varies with age, the proportion of men and women with CKD stages 3-5 increases from 1% of men and 2% of women in the 16 to 54 years age group to 31% men and 36% women in the 75 years and over age group (table 2).

<table>
<thead>
<tr>
<th>Age groups</th>
<th>16-54</th>
<th>55-64</th>
<th>65-74</th>
<th>75+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>1%</td>
<td>2%</td>
<td>12%</td>
<td>31%</td>
<td>5%</td>
</tr>
<tr>
<td>Women</td>
<td>2%</td>
<td>6%</td>
<td>13%</td>
<td>36%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: Health Survey for England 2009\(^{12}\)
These findings are supported by the New Opportunities for Early Renal Intervention by Computerised Assessment (NEOERICA) study\textsuperscript{14} (table 3). This study provides estimates based on the extrapolation of patients with CKD amongst those tested for kidney function in primary care in the UK. In the 18 to 25 age group the prevalence is less than 1%. This increases to more than 40% in the 85 and over age group\textsuperscript{14}.

HSE 2009\textsuperscript{12} data also show that the presence of albuminuria (largely microalbuminuria) increased with age in both sexes; the overall prevalence was 9%.

Table 3. Prevalence estimates of CKD stages 3 to 5 by gender and age

<table>
<thead>
<tr>
<th>Age groups</th>
<th>18-24</th>
<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65-74</th>
<th>75-84</th>
<th>85+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>0.0%</td>
<td>0.2%</td>
<td>0.7%</td>
<td>3.1%</td>
<td>6.9%</td>
<td>17.7%</td>
<td>33.2%</td>
<td>44.8%</td>
</tr>
<tr>
<td>Women</td>
<td>0.2%</td>
<td>0.8%</td>
<td>2.7%</td>
<td>2.8%</td>
<td>13.1%</td>
<td>27.9%</td>
<td>41.7%</td>
<td>48.6%</td>
</tr>
</tbody>
</table>

Source: NEOERICA\textsuperscript{14}

CKD is more likely to be recognized in older people as they are more likely to have blood tests which include serum creatinine due to their higher rates of morbidity and presentation to health services. Overall the prevalence of CKD stage 1-5 in HSE 2009\textsuperscript{12} was 14% in men and 13% in women and it increased with age in both sexes.
ii) Gender

The HSE 2009 data\(^\text{12}\) (table 2) suggests that the prevalence of CKD stages 3-5 is higher in women overall (7% women, 5% men). This gender difference is found in all age groups. This finding is consistent with the NEOERICA estimates\(^\text{14}\) (above table 3) the prevalence of CKD (stages 3-5) is higher in women compared to men in all age groups except for the 45 to 54 age group.

These findings partly reflect gender differences in the accuracy of the equation for estimating kidney function (MDRD) as the difference is attenuated using the CKDEpi formula. Such gender comparisons ideally need to adjust for age given the longer life expectancy and higher mean age of females\(^\text{15}\). This makes it hard to assess gender inequity in starting RRT, further research is required.

It should be noted that prevalence estimates based on the NEOERICA study may represent an over estimate in CKD prevalence as they are based on routine primary care data and on single measures.

In the HSE 2009\(^\text{12}\) albuminuria was more common in men at 10% compared to 8% in women.

iii) Socio-economic status

Socially deprived people have a higher incidence and prevalence of CKD in developed countries, though the magnitude of the effect varies between countries\(^\text{16,17,18,19}\). In one UK study individuals living in the most socially deprived areas had a 45% increased risk of new diagnosis of CKD compared with those living in the most affluent areas\(^\text{16}\). Similar differences have been observed in Sweden comparing manual and professional workers\(^\text{17}\). HSE 2009 data\(^\text{12}\) supports these findings. In both men and women the prevalence of stage 3-5 CKD was greater in people with lower equivalised household income, compared to higher incomes, although these differences were not found to be significant. Moreover there was a inverse gradient in albuminuria by socio-economic status in men, though there was no gradient in women; this finding warrants further data analysis.

CKD appears to progress more rapidly in socially deprived patients\(^\text{20,21}\). The effects on both incidence and progression are probably mediated through many intermediate factors working at the individual-level (for example, low birth weight, smoking, obesity, diabetes and hypertension, poor compliance with treatment) or area-level (for example, variation in quality of primary care services and poorer access to secondary care)\(^\text{22,23}\).
iv) Ethnicity

Advanced stages of CKD (3b,4 and 5) are more prevalent in South Asian individuals in the UK; compared with people classified as White, the South Asian population had a 2.3-fold higher risk of developing advanced stages of CKD\textsuperscript{24} and a 3-fold higher risk of death attributable to kidney disease\textsuperscript{25}. People from Black ethnic groups in the UK have a risk of mortality attributable to kidney disease that is 5-fold higher than in the White population\textsuperscript{26}.

However there is a paradox in that prevalence of CKD 3-5 is not higher in the Black population in the US\textsuperscript{7} nor is it in both Black and South Asian groups in one primary care based screening study from West London, though here there was some evidence that the prevalence of more advanced CKD and albuminuria were raised, especially in men\textsuperscript{26}. These findings are supported by routine data from primary care in East London\textsuperscript{27}.

Data from the US suggest that much of the increased risk of developing advanced stages of CKD in Black groups relates to more rapid progression of CKD\textsuperscript{28}. There is ongoing research to study progression rates and competing risks (e.g. cardiovascular mortality) by ethnic group in the UK. Within the sub-group of individuals with diabetes, CKD has been shown to progress more rapidly in Black and South Asian populations in the UK\textsuperscript{29}. The explanation for such ethnic disparities, though not well understood, partly reflects co-existing medical conditions such as diabetes and hypertension (in turn maybe due to inappropriate physiological adaptation to rapid transition to western lifestyle from a traditional lifestyle), cultural factors, genetic differences, and socio-economic factors; 40% of the excess risk of CKD in Black groups was explained by such variables in one US study\textsuperscript{30}. There is now some evidence there may be genetic reasons for the ethnic differences in CKD prevalence\textsuperscript{31}. Some of the increased risk of CKD amongst Black groups, at least in the USA, is related to genetic variation. The mechanisms by which this genetic variation interacts with other kidney disease risk factors, such as diabetes and hypertension, remains to be identified.

v) Quality and Outcome Framework CKD prevalence by age and ethnicity

The Quality and Outcomes Framework (QOF) primary care CKD prevalence is a crude prevalence of stages 3-5 CKD in the population aged 18 and over. CKD stage 3-5 prevalence does not increase with deprivation or an increasing proportion of the population from minority ethnic groups, when plotting QOF CKD prevalence against ethnicity and deprivation at PCT level. This is partly due to the confounding by age, as there is a very strong positive relationship between CKD prevalence and age, and both ethnic minority and deprived groups tend to have a younger age distribution, as well as misclassification due to using area level measures and especially when derived from the practice postcode and not the actual catchment population. In order to demonstrate relationships, more complex regression analysis will be needed to control for age and sex to tease out these relationships. The same is true for the management of CKD. Practice level analysis of QOF data would enable inequalities in CKD ascertainment and management to be investigated.
vi) CKD data by age, deprivation and ethnicity, findings from QResearch data

A recently published study used 2002-08 primary care data from England and Wales, to develop and validate an algorithm to estimate the risk of developing moderate to severe CKD (stages 3b to 5) and ERF (see below††). These estimates were adjusted for other independent risk factors for kidney disease including age, deprivation, diabetes, CVD and hypertension. The risk of CKD increased continuously with age and was higher in women compared to men (women 58.5 and men 42.1 per 10,000 person years), though the gender difference was reversed for treated ERF (defined below). The explanation for the reversal is not clear but includes gender misclassification of eGFR, competing risks, faster progression of CKD in men, and possibly differential access to or acceptance onto RRT.

The risks of ethnic minority groups developing CKD and ERF varied. South Asian groups generally had increased risks for both outcomes; for the Black population increased risks were apparent for ERF (though not statistically significant) but for CKD there were lower risks in women and no increase in men. The data also showed increased risks for the Chinese population (although there were relatively small numbers in the study).

People from more deprived populations had higher risks of developing CKD and ERF.

†† Footnote: moderate-severe CKD defined as the first occurrence of any of the following during follow-up:
   a) recorded kidney transplant;
   b) recorded kidney dialysis;
   c) recorded diagnosis of nephropathy;
   d) glomerular filtration rate < 45 mL/min/1.73m² corresponding to stage 3B CKD;
   e) recorded diagnosis of proteinuria;

Established renal failure (ERF) which was defined as the first occurrence of any of the following during follow-up:
   a) recorded kidney transplant;
   b) recorded kidney dialysis;
   c) glomerular filtration rate < 15 mL/min/1.73m² corresponding to stage 5 CKD.
Inequalities in the prevalence of key risk factors for CKD: diabetes, obesity, hypertension and smoking

Diabetes, obesity and hypertension are key risk factors for development and progression of CKD. There is also emerging evidence\textsuperscript{32,34,35} that smoking is linked to incidence and progression of CKD. Inequalities in the prevalence of all of these CKD risk factors also exist.

The Vascular Risk Assessment Programme\textsuperscript{36} (NHS Health Check) is now being implemented in England. The aim is for all adults aged 40-74 to have a vascular risk assessment and stepped intervention according to their level of risk. The programme will collect a minimum dataset from each user. This dataset will provide valuable information on the prevalence of these CKD risk factors, their relationship with socio-economic and demographic variables.

**Diabetes**

A recent UK study indicated that diabetes substantially increased the risk of developing moderate to severe CKD (stages 3b, 4 and 5). In women the risk was about eight times higher and in men over twelve times\textsuperscript{32}. Diabetic nephropathy is a key renal complication of diabetes mellitus. Diabetes is the most common cause of ERF requiring renal replacement therapy in the UK\textsuperscript{58}.

The 2009 Health Survey for England (HSE) data\textsuperscript{12} (table 4) found that the prevalence of doctor diagnosed diabetes (types 1 and 2 combined) increased with age in both men and women. In men the prevalence increased from 0.7% in the 16-34 year age group, to 19.5% in the 75 and over age group. In women the prevalence in 16-34 year olds was 0.6% increasing to 12.7% in the 75 and over age group. The overall prevalence in men was higher than in women (6.5% compared to 4.5% respectively).

<table>
<thead>
<tr>
<th>Age group</th>
<th>16-34</th>
<th>35-54</th>
<th>55-64</th>
<th>65-74</th>
<th>75+</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>0.7%</td>
<td>14.8%</td>
<td>10.5%</td>
<td>15.7%</td>
<td>19.5%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Women</td>
<td>0.6%</td>
<td>3.3%</td>
<td>6.3%</td>
<td>9.2%</td>
<td>12.7%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

Source: HSE 2009\textsuperscript{12}
The Inequalities in Diabetes and Obesity Prevalence in England document examined diabetes and obesity prevalence by ethnicity and deprivation. It states: ‘With the exception of the Irish ethnic group all minority ethnic groups have a higher standardised risk of having doctor diagnosed diabetes compared to the general population. Pakistani women are over five times more likely and Bangladeshi women are over three times more likely to have doctor diagnosed diabetes than women in the general population. Men in these ethnic groups also have a considerably higher risk of having doctor diagnosed diabetes. Indian men and women are over twice as likely to have doctor diagnosed diabetes than people in the general population. Amongst the Black Caribbean ethnic group men are approximately twice and women approximately three times more likely to have diabetes.

‘People living in deprived areas are more likely to have diabetes than those living in more affluent areas. Results from the 2006/07 National Diabetes Audit show that people living in the most deprived 20% of neighbourhoods are 56% more likely to be diagnosed with diabetes than those living in the least deprived 20% of areas. This figure does not take account of the different age structures of more deprived areas compared to the least deprived locations. The age structure of the population in more deprived areas tends to be younger than in the less deprived neighbourhoods. As a result the difference in age adjusted prevalence of diabetes between the most and least deprived areas is likely to be greater.

Inequalities in the management of diabetes have not been explored in full; there is some evidence of poorer diabetes control in the South Asian and Black groups and of inferior blood pressure control in the Black population. The National Diabetes Audit programme provides analysis of inequalities in the proportion of patients receiving each of the nine, National Institute for Clinical Excellence (NICE) recommended, diabetes care processes. Deprivation did not affect the likelihood of all the care processes being completed. However, age had an effect with younger people less frequently receiving the core processes of care. Thus for people with Type 1 diabetes aged 16-39 years all care processes were recorded in 20.3%, but for age 40-84 years it was 34.2%; and for people with Type 2 diabetes it was 35.5% and 51.3% respectively for the same age groups. Ethnicity was also associated with differences in completion of all care processes. Among people with Type 2 diabetes the proportion of people from different ethnic group classifications who completed the care processes were: White 53.6%, Asian 49.6%, Black 46.7% and ‘Other’ 47.4%. These differences were not found in people with Type 1 diabetes.

Obesity

Obesity has been shown to be an important population risk factor for development of CKD, acting partly through other established risk factors such as type 2 diabetes and hypertension. The prevalence of obesity varies with age for both men and women. The findings of the Health Survey for England 2009 (table 5) showed that in men the prevalence increased with age from 6% in the 16-24 age groups to about a third (34%) in 45-54 year olds. In women the prevalence ranged from 17% in 16-24 year olds to a peak of 31% in the 65-74 year olds. In both genders the prevalence reduced to about a quarter (23% males and 26% females) in the over 75 age group. Overall the prevalence of obesity was similar in both women (24%) and men (22%).
Table 5. Prevalence of obesity by age group (HSE 2009)

<table>
<thead>
<tr>
<th>Age group</th>
<th>16-24</th>
<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65-74</th>
<th>75+</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>6%</td>
<td>13%</td>
<td>21%</td>
<td>34%</td>
<td>32%</td>
<td>30%</td>
<td>23%</td>
<td>22%</td>
</tr>
<tr>
<td>Women</td>
<td>17%</td>
<td>16%</td>
<td>24%</td>
<td>27%</td>
<td>29%</td>
<td>31%</td>
<td>26%</td>
<td>24%</td>
</tr>
</tbody>
</table>

Source: HSE 2009

The Inequalities in Diabetes and Obesity Prevalence in England report states ‘The pattern of obesity is not uniform across the ethnic groups. As the prevalence of obesity varies with age and the age structure of the different ethnic groups varies, standardised risk ratios provide a method of comparing the likelihood of being obese after adjustment for age across the different groups. Women from Black Caribbean, Black African and Pakistani ethnic groups are more likely to be obese and have a raised waist circumference than the general population. Bangladeshi women are less likely to be obese but more likely to have a raised waist circumference than women in the general population. No minority ethnic group has a substantially higher risk of male adult obesity compared to the general population. However, Pakistani men are more likely to have a raised waist circumference than men in the general population.’ (Based on a Body Mass Index measurement of above 30, Health Survey for England 2004 data.)

There is a relationship between obesity and social class. Adults in social class V (unskilled manual) have a higher prevalence of obesity than those in social class I (professional). The gap in obesity prevalence between social classes I and V is significant, and has widened since 1997 in both sexes.

Hypertension

The QRisk study found that hypertension severe enough to require treatment increases the risk of developing moderate to severe CKD (stages 3b, 4 and 5). In both women and men this was about two and a half times the risk. Other cohort studies have also demonstrated that hypertension increases the risk of ERF.

Data from the Health Survey for England 2009 (table 6) suggest that the prevalence of hypertension increases with age in both men and women. In men the prevalence increases from 6% in the 16-24 year age group to 73% in the 75 and over age group. In women this range is 1% in 16-24 year olds and 64% in those aged 75 and over. Overall there were more men with hypertension (32%) compared to women (27%).

Table 6. Prevalence of hypertension by age group (HSE 2009)

<table>
<thead>
<tr>
<th>Age group</th>
<th>16-24</th>
<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65-74</th>
<th>75+</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>6%</td>
<td>15%</td>
<td>17%</td>
<td>33%</td>
<td>53%</td>
<td>58%</td>
<td>73%</td>
<td>32%</td>
</tr>
<tr>
<td>Women</td>
<td>1%</td>
<td>5%</td>
<td>12%</td>
<td>25%</td>
<td>41%</td>
<td>60%</td>
<td>64%</td>
<td>27%</td>
</tr>
</tbody>
</table>

Source: HSE 2009
The Association of Public Health Observatories Hypertension Prevalence Model Briefing Document\textsuperscript{45} states that ‘Hypertension is more common among African Caribbeans and South Asians in Britain. The Health Survey for England 2004 report\textsuperscript{42} showed that Black Africans and Caribbeans had the highest standardised risk ratios for hypertension. The majority of UK-based surveys have shown that people of Black African or Black Caribbean origin have higher average blood pressure (BP) levels and rates of hypertension than their White counterparts.’

Less evidence on the relationship between hypertension and deprivation was identified. An Office for National Statistics study\textsuperscript{46} concluded that the ‘data show that for males and females age-standardised prevalence of raised blood pressure decreased with increasing deprivation, irrespective of which index was used. None of the correlation coefficients for these relationships were significant. However, using the Townsend Index, prevalence of raised blood pressure in the least deprived quintile was significantly higher than for all other quintiles’. The finding that there was no clear relationship between hypertension and deprivation was also backed up by some analysis of the Health Improvement Network (THIN) Primary Care dataset by Eastern Region Public Health Observatory\textsuperscript{47}. 
Smoking

The 2010 Q Risk study\textsuperscript{32} suggested that smoking increased the risk of developing moderate to severe CKD (stages 3b, 4 and 5). For light smokers (less than 20 cigarettes a day) the increase in risk for women was 1.3 and for men 1.2 times more likely, and in heavy smokers (20 or more cigarettes a day) in women 1.4 and men 1.3 times more likely. The 2009 Health Survey for England data\textsuperscript{12} (table 7) estimate that the prevalence of self reported smoking decreases with age (above age 35 years) in men and (above age 55 years) in women (with the exception of 35-44 year age group, see table 7). Overall in people aged 16 and over the prevalence of smoking was 24\% of men and 20\% in women.

<table>
<thead>
<tr>
<th>Age group</th>
<th>16-24</th>
<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65-74</th>
<th>75+</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>24%</td>
<td>32%</td>
<td>28%</td>
<td>24%</td>
<td>23%</td>
<td>12%</td>
<td>11%</td>
<td>24%</td>
</tr>
<tr>
<td>Women</td>
<td>25%</td>
<td>26%</td>
<td>20%</td>
<td>26%</td>
<td>17%</td>
<td>13%</td>
<td>8%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Source: HSE 2009\textsuperscript{12}

The prevalence of smoking varies by ethnic group. The 2004 Health Survey for England\textsuperscript{42} estimated that after adjustment for age, Bangladeshi (40\%) and Irish (30\%) men were more, and Indian (20\%) men less, likely to report smoking cigarettes than men in the general population (24\%). Self-reported smoking prevalence was higher among women in the general population (23\%) than most minority ethnic groups, except Irish (26\%) and Black Caribbean women (24\%). The figures for the other ethnic groups were 10\% Black African, 8\% Chinese, 5\% Indian and Pakistani, and 2\% in Bangladeshi women.

In 2009\textsuperscript{12} there were marked differences in smoking prevalence in relation to equivalised household income (equivalised household income takes into account the number of people in the house). Smoking prevalence was lowest in men and women in the highest income households (14\% men, 11\% women) and highest in the lowest income households (40\% men and 34\% women).

More work is needed using QOF data and primary care research databases to look at disparities in the quality of management of these risk factors for CKD especially blood pressure levels in those with hypertension, glycated haemoglobin (HbA1c) in diabetes, and specifically in those with diagnosed CKD blood pressure control and the use of Renin Angiotensin System inhibitor drugs.
Access to renal replacement therapy

The 2009 UK Renal Registry Report\textsuperscript{58} compares the acceptance rate and prevalence of RRT with other countries representing a wide spectrum of economic, cultural and geographic backgrounds. The comparisons relate to five years of data (2003-07) from 19 countries. The median acceptance rate from these countries was 136 per million population (pmp), and the UK ranked the fourth lowest at 109 pmp. For prevalence, the UK ranked fifth lowest (746 pmp). In general the acceptance and prevalence rate in the UK was similar to Australia, New Zealand, Scandinavian and European countries, but much lower than Japan, Taiwan and the USA.

i) Age\textsuperscript{48}

Acceptance rates onto RRT programmes have increased substantially in the UK over the last 20 years, largely due to liberalisation of the referral and acceptance of older people. Rates of start onto RRT now increase with age though they tail off in the older age groups (>80 in females >85 in males) despite their higher rates of established renal failure.

There is limited research on the reasons for this. There may be reduced referral to renal units (from GPs, other physicians etc) or the decisions may be taken by the renal multidisciplinary team (for those who have been referred) with patients/carers to pursue alternatives to dialysis (conservative kidney management)\textsuperscript{49}.

However most older people with more severe CKD are not referred to renal units and, if they are, they are more likely to be referred late i.e. within weeks of needing RRT, suggesting care pathways are more complex and uncertain in older people\textsuperscript{50}.

Mortality in older people is higher once they start RRT but they are more likely to achieve several indicators of quality care than younger people. However a marked functional decline has been observed in people from nursing homes who commence dialysis. A US study\textsuperscript{51} observed that residents who are starting to undergo dialysis had a substantial and sustained decline in functional status in addition to a high mortality rate raising the issue of what is appropriate care for older people with significant co-morbidity and or poor functional status.

Withdrawal from RRT is higher in older people due to poor tolerance of RRT and/or worsening co-morbidity.
ii) Gender

There is a higher rate and number of men commencing RRT compared to women in all age groups. In the UK as a whole 61.4% of the incident cohort were male in 2008. The peak acceptance rate was in the 75-79 age group in men and women. Given the higher prevalence of CKD in women further research is needed to study the relationship of CKD stage 5 and RRT rates by age and gender. There is some evidence of under-referral of women with moderate/severe CKD to nephrologists.

iii) Socio-economic status

Given the higher rates of CKD observed in individuals from socially deprived areas and severe CKD from high ethnic minority areas, it is intuitive that higher rates of RRT should also be observed in areas which reflect these population demographics. In England, this does appear to be the case; census ward-level social deprivation and ethnicity have been found to be associated with higher RRT incidence rates and local authority-level ethnicity data has been shown to be associated with RRT incidence. However, a population-wide study of all patients commencing RRT in Scotland in the late 1990s found no association between area-level social deprivation and incidence of RRT. The number and rate of new patients commencing RRT each year in a defined population is determined not only by the number of patients in the population with CKD, but also by the number dying of other causes before they need RRT and the number not being referred for or accepted onto RRT. There will for example be higher premature mortality, largely from cardiovascular disease, in deprived groups with CKD.

It is important to exclude differential unmet need (e.g. by social disparities in referral to a nephrologist). A key question is whether the socio-economic group RRT rates are commensurate with the pattern of ‘need’ based on prevalence of advanced CKD.

This is more complicated to examine in older people because of the emerging role of alternatives to dialysis as an appropriate option in those who may not benefit from RRT or choose not to start RRT.

Individuals from socially deprived areas commencing RRT in the UK tend to be younger, have more diabetic established renal failure and have more co-morbid illness than their more affluent counterparts. They are also more likely to be referred late to a nephrologist and therefore have less time to be physically and mentally prepared for RRT. However, once differences in socio-demographics and baseline co-morbidity have been taken into account, survival on RRT does not seem to differ between social deprivation groups. A study using UK Renal Registry data of achievement of Renal Association standards on dialysis showed no differences by deprivation group.
iv) Ethnicity

In the UK in 2008, 10.5% of patients commencing RRT reported to the UK Renal Registry were South Asian and 6.8% were from the Black population\(^{58}\) compared with 2.8% classified as Asian and 5.7% classified as Black, in the England general population\(^{59}\) (N.B. general population proportion contains all Asian groups and therefore reflects a higher proportion than the South Asian population only). However, until the UK Renal Registry has full coverage of the UK, and until ethnicity data returns are complete, such observations must be interpreted with caution. A survey of acceptances onto renal units in England in 1991-2 showed age standardised RRT acceptance ratios for South Asian and Black ethnic groups compared to people classified as White of 4.2 and 3.7 respectively\(^{60}\).

There are no data comparing need for RRT (e.g. advanced CKD stages 3b, 4, and 5 rates) and RRT rates by ethnic group.

Both South Asian and Black populations start dialysis at a younger age than people classified as White and more commonly have diabetes as the cause of their ERF\(^{61}\). South Asian and Black groups generally have less co-morbidity at the time of commencing RRT than White groups; except for vascular disease, which is equally prevalent in White and South Asian groups. The proportion of people referred late for RRT was similar for most ethnic groups with elderly South Asian and Black people less likely to be referred late to a nephrologist. There is strong evidence from the US and UK that people from Black ethnic groups have considerably improved survival on RRT with risks reduced by about 50% compared to White groups. The reasons for this survival advantage are not entirely clear\(^{61}\). There is less evidence for the South Asian population but this group also seems to have better survival though not to the extent of the Black population\(^{61}\). A study of the achievement of standards of care on dialysis in the UK found no evidence for systematic inequity between ethnic groups\(^{59}\).

A key component of pre dialysis care is preparation of permanent vascular access, thus avoiding the need for temporary neck lines and minimising the risk of hospital acquired infections. Although vascular access surveys have been undertaken over recent years in the UK\(^{62}\), analyses have not explored the possibility of associations with social deprivation and ethnicity. The relationship between permanent vascular access rates by ethnicity should be explored for evidence of inequalities.
Access to kidney transplantation

Kidney transplantation is associated with lower mortality\textsuperscript{63}, higher quality of life\textsuperscript{64} and lower cost\textsuperscript{65} than haemodialysis or peritoneal dialysis. Access to transplantation in the UK involves a number of steps: a thorough assessment of the individual’s physical fitness for transplantation; registration on the waiting list with their blood group and tissue type by NHS Blood and Transplant, and allocation of a blood group and tissue type compatible organ. Delay at any one of these steps will lengthen the time an individual waits to receive a kidney transplant.

\textbf{i) Age}

There is reduced chance of older people being listed for transplantation, and significant inter-renal unit variation in listing (UK Renal Registry data shows this for \% age <65 listed, we assume this holds for age \>65). Once on the waiting list there should be equity in the chances of receiving a kidney as NHS Blood and Transplant allocation rules have no age factor (except age difference between donor and recipient), though older people who are listed survive for a shorter period.

The net effect is for older people to be more likely to receive dialysis.

\textbf{ii) Gender\textsuperscript{58}}

The gender ratio for both the incidence and prevalence rate for transplants in 2008 was 1.5:1 (male to female). This has remained roughly stable from 2003-2008, and probably largely reflects the higher rates of dialysis treated RRT in males.

\textbf{iii) Socio-economic status}

Individuals from socially deprived areas in England are less likely to receive a pre-emptive renal transplant, in other words to receive a kidney transplant prior to commencing dialysis, than those from affluent areas\textsuperscript{56,66,67}.

Likewise increasing social deprivation was associated in UK Renal Registry data with reduced access to the transplant waiting list; these deprivation effects were more pronounced amongst those 50 years and older. Scottish Renal Registry data have also shown that patients from socially deprived areas take longer to be registered on the national transplant waiting list than those from affluent patients\textsuperscript{68}. Understanding the reasons for these apparent inequities is important if we wish to ensure equitable access to kidney transplants. Once on the waiting list there is no association between social deprivation and the time taken to receive a kidney transplant\textsuperscript{63}. 
iv) Ethnicity

Patients from ethnic minority groups wait longer to receive a kidney transplant: 1419 days for people from Black groups and 1368 days for the South Asian group compared with 719 days for White groups\textsuperscript{69}. However there was no significant ethnic difference in being wait listed after adjustment for patient characteristics and deprivation. Non-White people aged 50 years and older were more likely to be transplant wait listed than people classified as White\textsuperscript{70}.

However, given the problems of matching, ethnic minority groups are less likely to receive a cadaver transplant. When they do receive a transplant, the degree of tissue type matching has also been shown to be inferior\textsuperscript{68}. The explanations for these differences reflect a combination of lower rates of organ donation and rarer blood groups and tissue types among individuals from ethnic minorities. Recent amendments to the organ allocation scheme have taken these factors into account in an attempt to address the issue of equity\textsuperscript{68}.

The Organ Donation Task Force Report states that ‘There are particular concerns related to donation from people of Black and Minority Ethnic (BME) origin. These groups are under-represented amongst actual organ donors, with only 3\% of deceased organ donors coming from BME communities, who in the 2001 census made up 8\% of the population. Currently, 23\% of patients waiting for a kidney transplant are from BME groups – people from Asian or African-Caribbean backgrounds are three to four times more likely to need a kidney transplant than are White people. It is also the case that whilst, overall, families of 40\% of potential donors refuse consent at the critical time, this figure is 75\% for potential donors from a BME background. More work is needed to understand the different reasons for non-donation and to establish how best to encourage engagement with the option of organ donation after death.’

Kidney transplant survival has been shown to be similar in people classified as South Asian and White in the UK\textsuperscript{69,72}, but slightly poorer in Black ethnic groups\textsuperscript{69}. 
Survival on dialysis

Analyses of outcome data from the UK Renal Registry show that as expected survival on dialysis is inversely related to age\textsuperscript{50}. Survival is unrelated to deprivation especially once confounding by co-morbidity is adjusted for\textsuperscript{56}. Despite having higher rates of incident RRT, people from ethnic minority groups have better survival than the White population once dialysis is started, particularly Black groups\textsuperscript{61}. Various mechanisms have been proposed for these findings though the explanation remains unclear.

Conclusion

This paper has reviewed the inequalities in chronic kidney disease prevalence, kidney disease risk factors, access to RRT and transplantation. These inequalities have been investigated in relation to age, gender, ethnicity and socio economic status. In summary the most notable inequities are socio-economic in CKD prevalence, RRT incidence and in access to the transplant waiting list, and in transplantation for ethnic minority groups.

Recommendations

Local commissioners, emerging consortia and local health and wellbeing boards will want to review this document and consider how best to integrate early kidney disease management with vascular care. In particular the CKD QOF toolkit (available on the NHS Kidney Care website at http://www.kidneycare.nhs.uk/_Resourcestodownload-Toolkits.aspx ) will be of use to enable commissioners to compare actual and predicted levels of kidney disease incidence in their local area (known as the level of ascertainment).

The findings of this summary highlight areas where further research is required and where more information is needed. Commissioners, networks and clinicians should consider these findings when undertaking health needs assessments or planning future services.

Commissioners, emerging consortia and health and wellbeing boards will want to consider the NICE quality standards for CKD published in March 2011, which support the NHS Outcomes Framework 2011/2012. They should note the drive to tackle health inequalities and consider how data collection can be improved and used more effectively.
Contributors to this paper

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Further information on kidney disease, including definitions information on risk factors and management is available in the NHS Kidney Care document ‘Kidney disease: Key facts and figures’. This document is available on the NHS Kidney Care website http://www.kidneycare.nhs.uk/

Acknowledgements

Thanks to the following for helpful comments and feedback on the draft report:

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Adrian Sharif South Asian Health Foundation
Mary McGraw British Association for Paediatric Nephrology
Annex 1: Summary of findings

- The prevalence of chronic kidney disease (CKD) increases markedly with age, and is higher in deprived populations. Moderate CKD is more common in women. The prevalence of moderate CKD is not increased in ethnic minority groups (South Asian and Black groups); however the evidence suggests that progression to severe CKD is faster in these groups contributing to their higher renal replacement therapy (RRT) rates.

- There are inequalities in key population risk factors for CKD. The prevalence of hypertension increases continually with age; obesity and diabetes prevalence also increase with age but peak between 55-74 years and decrease in people aged over 75 years. Hypertension, diabetes and smoking are more common in men, overall obesity levels are similar in men and women. More deprived populations have higher levels of diabetes, obesity and smoking; more work is required to establish the relationship between hypertension and deprivation. The prevalence of diabetes, obesity and hypertension are increased in South Asian and Black groups. Smoking prevalence varies by ethnic group but is lower than in the White population and there are gender differences within ethnic groups.

- RRT incidence increases with age although this trend tails off in the older age groups (>80 in females >85 in males) despite their higher rates of established renal failure (ERF). Males have higher RRT rates. Further research is needed to determine to what extent this is true age/gender inequity or appropriate use of conservative kidney management as an alternative to dialysis. RRT rates are higher in deprived populations and in South Asians and Black groups, it is not clear to what extent this is commensurate with need (i.e. level of severe CKD/ERF).

- There is a reduced chance of older people being put on the waiting list for kidney transplantation, and there is significant inter-renal unit variation in such listing. The time taken to register patients from more deprived groups is longer and these patients are less likely to be registered on the kidney transplant list. Understanding the reasons requires further research; however once on the waiting list there is no difference in the time taken to receive a kidney transplant. Access to the waiting list does not appear to be related to ethnicity, but once on the waiting list, people from minority ethnic groups are likely to wait longer to receive a transplant reflecting a specific shortage of suitable organ donors.

In summary the most notable inequities are socio-economic in CKD prevalence, RRT incidence and in access to the transplant waiting list, and in transplantation for ethnic minorities. The findings of this summary highlight areas where further research is required and where there are deficits in the current information collected on kidney disease. Commissioners, renal networks and clinicians should consider these findings when undertaking health needs assessments or planning future services.
### Annex 2: Common renal terms and acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKD</td>
<td>Advanced kidney disease</td>
<td>See CKD below</td>
</tr>
<tr>
<td>AKI</td>
<td>Acute Kidney injury</td>
<td>Occurs when there is a rapid loss of renal function. Formerly known as acute renal failure (ARF)</td>
</tr>
<tr>
<td>APKD</td>
<td>Adult polycystic kidney disease</td>
<td>Inherited kidney disease leading to cyst development and deteriorating kidney function</td>
</tr>
<tr>
<td>APD</td>
<td>Assisted peritoneal dialysis</td>
<td>As PD - machine assisted, often done at night</td>
</tr>
<tr>
<td>ARF</td>
<td>Acute renal failure</td>
<td>See AKI above</td>
</tr>
<tr>
<td>AVF</td>
<td>Arteriovenous fistula</td>
<td>Surgical anastomosis between artery and vein, used for haemodialysis</td>
</tr>
<tr>
<td>CAPD</td>
<td>Continuous ambulatory peritoneal dialysis</td>
<td>As PD - regular exchanges throughout the day</td>
</tr>
<tr>
<td>CKD</td>
<td>Chronic kidney disease</td>
<td>Loss of renal function over a period of months or years. see CKD above</td>
</tr>
<tr>
<td>CRF</td>
<td>Chronic renal failure</td>
<td>Frequent comorbidity with renal disease</td>
</tr>
<tr>
<td>DM</td>
<td>Diabetes Mellitus</td>
<td>Alters the flow into or around a fistula to increase flow to distal arm</td>
</tr>
<tr>
<td>DRIL</td>
<td>Distal revascularisation – interval ligation</td>
<td>See ESRD below</td>
</tr>
<tr>
<td>ERF</td>
<td>Established renal failure</td>
<td>See ESRD below</td>
</tr>
<tr>
<td>ESKD</td>
<td>End stage kidney disease</td>
<td>See ESRD below</td>
</tr>
<tr>
<td>ESRD</td>
<td>End stage renal disease</td>
<td>ESRD refers to kidney function that has deteriorated to a level where renal replacement therapy (RRT) treatment is required to sustain life. ESRD is the main internationally accepted term but is also synonymous with the terms end stage renal failure (ESRF); end stage kidney disease (ESKD) and established renal failure (ERF)</td>
</tr>
<tr>
<td>ESRF</td>
<td>End stage renal failure</td>
<td>See ESRD above</td>
</tr>
<tr>
<td>FSGN</td>
<td>Focal and segmental glomerulonephritis</td>
<td>Glomerular renal disease</td>
</tr>
<tr>
<td>GN</td>
<td>Glomerunephritis</td>
<td>Glomerular renal disease</td>
</tr>
<tr>
<td>HB</td>
<td>Heart beating</td>
<td>Status of deceased kidney donor</td>
</tr>
<tr>
<td>Haemodiafiltration</td>
<td></td>
<td>The combination of haemodialysis and haemofiltration either simultaneously or sequentially</td>
</tr>
<tr>
<td>Haemofiltration</td>
<td></td>
<td>Renal replacement therapy similar to haemodialysis which is used almost exclusively in the intensive care setting. Thus, it is almost always used for acute renal failure. It is a slow continuous therapy in which sessions usually last between 12 to 24 hours and are usually performed daily</td>
</tr>
<tr>
<td>HD</td>
<td>Haemodialysis</td>
<td>Treatment for patients with ESRD. A method for removing waste products, as well as free water from the blood</td>
</tr>
<tr>
<td>HHD</td>
<td>Home haemodialysis</td>
<td>Haemodialysis treatment that happens in people’s own homes. Home haemodialysis patients cease to be classed as such if they need longer than two weeks of hospital dialysis when not an in-patient</td>
</tr>
<tr>
<td>Kidney transplant</td>
<td></td>
<td>The organ transplant of a kidney into a patient with ESRD. Kidney transplantation is typically classified as deceased-donor (cadaveric) or living-donor transplantation depending on the source of the donor organ. Immunosuppressant drugs are used to suppress the immune system from rejecting the donor kidney</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>LR</td>
<td>Living related status of kidney donor</td>
<td></td>
</tr>
<tr>
<td>MCGN</td>
<td>Mesangiocapillary glomerulonephritis</td>
<td></td>
</tr>
<tr>
<td>NHB</td>
<td>Non heart beating status of deceased kidney donor</td>
<td></td>
</tr>
<tr>
<td>PD</td>
<td>Peritoneal dialysis</td>
<td></td>
</tr>
<tr>
<td>PE</td>
<td>Plasma exchange</td>
<td></td>
</tr>
<tr>
<td>PKD</td>
<td>Polycystic kidney disease</td>
<td></td>
</tr>
<tr>
<td>PTFE</td>
<td>(artificial vein graft) Polytetrafluorethylene</td>
<td></td>
</tr>
<tr>
<td>RRT</td>
<td>Renal replacement therapy</td>
<td></td>
</tr>
<tr>
<td>TX</td>
<td>Transplant</td>
<td></td>
</tr>
</tbody>
</table>

**LR Living related**
Status of kidney donor

**MCGN Mesangiocapillary glomerulonephritis**
Nephrology

**Nephropathy**
Degeneration of the kidney (damage or disease)

**NHB Non heart beating**
Status of deceased kidney donor

**PD Peritoneal dialysis**
Treatment for patients with ESRD. A method by which fluids and waste products are exchanged from the blood across the peritoneal membrane lining the inside of the abdomen

**PE Plasma exchange**
Removal of a volume of blood plasma in an extracorporeal circuit

**PKD Polycystic kidney disease**
As APKD

**PTFE (artificial vein graft) Polytetrafluorethylene**
Made from various materials including polytetrafluorethylene (PTFE) and bovine vein

**RRT Renal replacement therapy**
Term used to encompass life-supporting treatments for ESRD. It includes haemodialysis, peritoneal dialysis, haemofiltration, transplantation

**Renal transplant**
See kidney transplant

**Satellite dialysis unit**
Linked to a main renal centre, not autonomous for medical decisions, provide chronic outpatient maintenance haemodialysis but with no acute or in-patient nephrology beds on site

**TX Transplant**
Renal transplant (other organs may also be transplanted in conjunction with the kidney)
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