ABSTRACT BOOKLET

MEDICAL

Thursday 27th October 2016
Friday 28th October 2016

Kingsmills Hotel
Culcabock Road
Inverness
IV2 3LP
A1. AKI alerts in Grampian: An audit of potential volume, location and outcomes
Angharad Marks¹, Corri Black¹, Laura Clark¹, Graham Osler¹, Helen Regan¹ & Simon Sawhney¹ (¹NHS Grampian)

Introduction: The release of AKI alerts beside creatinine results is a potential means of improving the early recognition and care of unwell people. However, to ensure clinicians are adequately prepared, an assessment of the burden and relevance of alerts is necessary. To inform such education and information requirements locally, we audited the volume, location and outcomes of provisional AKI-alerts in Grampian.

Methods: The English AKI alert (based on KDIGO) algorithm for laboratory information management systems (LIMS), was piloted in the region, although no AKI alerts were released to clinicians. All creatinine results and alerts were analysed for a period of 16 weeks (5th March - 25th June 2016). Samples for the very young (<16), old (>100 years) and visitors to the region were excluded. The number of samples, alerts, people and locations involved were summarised. The health board supplied outcomes (date of death, dates of admissions and discharge diagnoses where available) at the 8th July 2016. Seven and 30 day mortality was calculated.

Results: 192536 creatinine results for 92781 adults (45% male, median age 61) out of an estimated population of ~500,000 were available. Out of ~48,000 creatinine results per month, 929-1109 had AKI 1, 249-358 AKI 2 and 224-314 for AKI 3. This pertained to an average 375, 89 and 56 individuals having a maximum alert of AKI 1, 2 and 3 per month. However 15-17% of samples had no reference value to determine if AKI had occurred.

103208 (53.6%) creatinine samples came from general practice, which accounted for 18.3%, 7.1% and 5.3% of AKI 1, 2 and 3 alerts in the region. 57444 (29.8%) creatinine samples came from Aberdeen Royal Infirmary (ARI) in-patients, which accounted for 63.1%, 75.4% and 75.2% of AKI 1, 2 and 3 alerts in the region. The remainder came from other in-patient, out-patient and day-case sources.

For individual in-patients, the first AKI-alert occurred in A&E for 14%, the medical admissions unit for 16%, orthopaedics for 5% the renal ward for 2% and care of the elderly for 6%. Whereas these areas accounted for only 9%, 7%, 3.5%, 2.5% and 4.4% of all creatinine blood tests. In those with an AKI alert there was a 3% immediate, 13% 7 day and 24% 30 day mortality.

Conclusion: The introduction of e-alerts confirms a large and widespread burden of AKI in hospitals. However, this audit illustrates that there is a preponderance of AKI, and poor outcomes with AKI in key in-patient locations. These areas should now perhaps be specifically targeted in patient safety and education initiatives.

Conflict of Interests statement: None of the authors have any conflicting interests.
Funding: nil
A2. Implementation of AKI E-alerts for primary care: Tayside's experience so far.
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Background: Acute Kidney Injury (AKI) is associated with decreased survival, future risk of chronic kidney disease and longer hospital stays. Early detection of AKI may allow early intervention to mitigate the severity and consequences of AKI. In order to improve early identification, implementation of automated electronic alerts (e-alerts) are now mandatory within secondary care in England and Wales, and several health boards in Scotland have now adopted similar alerts. To date there is little experience of e-alerts within primary care. The aim of this study was to establish if e-alerts in primary care led to early monitoring action by primary care staff by examining the time to repeat sampling and the timing of hospital admission after an AKI alert.

Methods: E-alerts for AKI utilising the NHS England algorithm were introduced in April 2015 across both primary and secondary care in NHS Tayside. The NHS Tayside laboratory reporting system was used to identify all e-alerts generated between 30th April 2015 and 1st May 2016. The primary care cohort was identified using the request location. Data on age, sex, stage of AKI according to KDIGO criteria, repeat biochemistry testing following the generation of the e-alert and timing of this, hospital admission and need for acute renal replacement therapy (RRT) were collated.

Results: During the study period, 9781 AKI e-alerts were generated. Of these, 1460 (14.9%) alerts were generated in primary care. Of these, 1167 (80%) were stage 1 AKI, 181 (12%) stage 2 and 112 (8%) stage 3 AKI. Following generation of an e-alert in the community, blood sampling was repeated in all stages of AKI (79% in AKI stage 1, 90% in AKI stage 2 and 89% in AKI stage 3). Median duration to repeat blood testing was 5 days for AKI stage 1 (IQR 2-10), 2 days for Stage 2 (IQR 1-5) and 1 day (IQR 0-2) for Stage 3. 215 (19%) of patients with Stage 1 AKI were admitted to hospital with none requiring acute RRT, 76 (42%) with Stage 2 AKI were admitted with 2 (1%) requiring RRT and 76 (68%) of Stage 3 were admitted with 9 (8%) requiring RRT.

Conclusions: Our study demonstrates that within primary care, GPs are responding to AKI e-alerts through repeat testing. Further work is needed to assess how this compares with practice prior to implementation of e-alerts. The authors declare no conflict of interest.
A3. How accurately is renal telephone advice recorded by doctors?
Vivienne Li, Fongcheng Hong, Colin C Geddes
Glasgow Renal and Transplant Unit, Queen Elizabeth University Hospital, Glasgow

Background
A substantial proportion of nephrology work involves giving telephone advice about patients with in-patient nephrology problems to non-nephrologist clinical teams. The aim of this study was to determine how accurately this information is recorded in the in-patient medical record.

Method
From the West of Scotland electronic renal patient record (SERPR) we identified in-patients in our healthboard who had received nephrology telephone advice between 01/01/2016 and 31/01/2016. We assessed the correlation between the first advice recorded by the on-call nephrologist in SERPR and the corresponding entry by the referring clinician in the electronically scanned in-patient handwritten record, using pre-defined advice categories (investigations, medications, fluid management, follow-up arrangement and other).

Results
During the period of study 108 patients were referred for telephone advice from 16 specialities in 8 hospitals: 52 had AKI previously not under nephrology follow-up, 27 were patients already on renal replacement therapy (15 on hospital haemodialysis, 2 on peritoneal dialysis, 10 with a functioning transplant), 12 were known low clearance patients and 14 were under renal out-patient care before this inpatient admission. 3 other patients were not previously known to nephrology but referred for reasons other than AKI. Overall the handwritten record by the referring clinician was felt to be an accurate reflection of the recording in SERPR in 205/326 (62.9%) entries. In 26/326 (8%) recordings there was no record of the corresponding advice category in the handwritten record. In 5 different patients, there were major inaccuracies that could have adversely affected patient care. In 39/326 (11.9%) documentations, there were some inaccuracies that were felt not to have an adverse effect on patient care. The accuracy of recording of investigations, medications, fluid management, follow-up arrangement and other advice specifically was 62.7%, 64.4%, 64.1%, 51.7% and 69.1 % respectively.

Conclusions
Our data highlights that telephone advice is a potential risk for patient care in that there are sometimes important differences between the record of advice given and advice received. In some cases, there are major inaccuracies or lack of documentation for other patients. This observation is likely to apply to telephone referrals in all specialities.
Foot for thought: a missed opportunity for diabetic haemodialysis patients
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Monklands Hospital, NHS Lanarkshire

Background: Foot ulceration is common in haemodialysis (HD) patients regardless of diabetes status, but is much more common in diabetic HD patients and is associated with increased risk of lower limb amputation and mortality1. Regular (monthly) foot screening has been shown to reduce the rate of major amputation by up to 17%2. In recent guidelines published by the Joint British Diabetes Societies3, it is recommended that all patients with diabetes on HD should have foot screening 3-monthly, and that all should be treated as high risk with heel protection on dialysis. We aimed to assess concordance with these recommendations in HD patients with diabetes at Monklands Hospital, NHS Lanarkshire.

Methods: We identified all prevalent haemodialysis patients with a documented diagnosis of diabetes at Monklands Hospital by electronic search of the renal patient database in May 2016. The audit was conducted over 2 weeks in June 2016 (9/6/16–22/6/16). Data were extracted from electronic records (renal electronic patient record, SCI-Diabetes and Clinical Portal) for baseline demographics and data relating to foot screening. Dialysis unit reviews were conducted on all patients to assess use of foot protection measures.

Results: There were 59 haemodialysis patients with documented diagnosis of diabetes (n=44 (74.6%) type 2 diabetes). Mean age was 62.4 (SD 12.7) years and 62.7% (n=37) were male. Median deprivation category (DepCat) score was 4 (IQR 4-5); 89.8% (n=53) were of DepCat 4, 5 or 6. Median duration of diabetes was 20 years (IQR 12.5-26.5). Median time since commencement of haemodialysis was 24 months (IQR 12-42). Diabetic nephropathy was primary renal disease in 81.4% (n=48) cases, and other micro- and macrovascular complications were common. 55.9% (n=33) had documented foot screening in the preceding year. Median duration since last foot screen was 11.5 months (IQR 3.6-22.6). Although 84.4% (n=39) had documented moderate, high risk or active foot disease on last screen, 3 patients (5.1%) wore any form of foot protection during dialysis, despite spending an average of 12.9 hours per week in a dialysis chair or bed.

Conclusion: Foot screening is simple, quick and cheap, but is not routinely performed in high risk haemodialysis patients in Monklands Hospital. We have taken steps locally to rectify this. Given the frequency of hospital visits and the documented benefits of regular foot screening in this group, consideration should be given to implementing routine foot screening in the HD unit on a wider scale.

References:
A5. Detecting changes in Cardiac Structure, Function and Fibrosis in Incident Haemodialysis patients over a 6-month period: Results of the CUDDLE Study

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\textsuperscript{1}BHF Cardiovascular Research Centre, University of Glasgow \textsuperscript{2}Renal Unit, QEUH Glasgow

Introduction and Aims:

Patients on haemodialysis are at high risk of sudden cardiac death. This risk appears to be exaggerated early after dialysis initiation. We sought to characterise markers of cardiac function, fibrosis and hypertrophy in patients who had recently started haemodialysis at baseline and again after six months of haemodialysis.

Methods:

Twenty-eight patients, who had commenced on haemodialysis within the last year, were prospectively recruited from dialysis centres across NHS Greater Glasgow & Clyde. Cardiac magnetic resonance imaging was performed on a non-dialysis day (Siemens 3T). The imaging protocol included a T1 mapping sequence to characterise cardiac fibrosis (Siemens Healthcare) and assessment of left ventricular dimensions and function. Global longitudinal strain, which evaluates cardiac stiffness and function, was also measured. Images were blindly analysed offline using dedicated analysis software (LV Volumes: Siemens Syngo MR software, Strain: Diogenes CMR FT software). Pre-dialysis serum N-Terminal-B Natriuretic Peptide (NT-ProBNP) and galectin-3 (a biomarker of cardiac fibrosis) were measured on the day prior to study imaging.

Results:

Six months of haemodialysis was associated with a significant reduction in left ventricular mass index (LVMI) (baseline LVMI 78.3 ± 18.2gm$^{-2}$, follow up LVMI 67.9 ± 19.0 gm$^{-2}$ p= <0.001). Change in LVMI was correlated with age (R= 0.514 p= 0.014) and baseline NT-ProBNP (R=0.492, p=0.02). There was no significant change in septal T1 time after 6 months of haemodialysis (Septal T1 time baseline 1276.7 ± 27 ms, follow up 1271.8 ± 37ms p=0.600). Differences in septal T1 times correlated with difference in LVMI (R= 0.545 p= 0.009) and serum galectin-3 (R= 0.432 p= 0.0045). Global longitudinal strain also improved after 6 months of haemodialysis (global longitudinal strain at baseline -17.6 ± 5.2%, follow up -21.5 ± 6.3 p=<0.001). There was no difference in ejection fraction (EF) indexed end diastolic volumes (EDVI) or end systolic volumes (ESVI) after 6 months of haemodialysis (EF p=0.115, EDVI p=0.554, ESVI p=0.784).

Conclusions:

In this study, 6-months of haemodialysis was associated with significant improvements in markers of LV hypertrophy and global longitudinal strain but no significant change in T1 mapping markers of cardiac fibrosis. The changes demonstrated may be linked to commencement of control of uraemia and/or blood pressure several months after dialysis initiation, however more work is required to explore this further.

Funding:

This study was funded by a Kidney Research UK Innovation Grant IN02/2013

No author has any conflict of interest to declare.
A6. Using MRI T2* to Assess Potential Iron Overload in the Hearts and Livers of Haemodialysis Patients

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Background

Haemodialysis (HD) patients normally receive regular iron transfusions. Iron overload in this patient group is a potential concern. Tissue iron quantification by biopsy is rarely clinically justified. The gold standard non-invasive test for assessing iron overload in the heart and liver is MRI derived non-contrast T2* time (milliseconds). A low T2* time on MRI is representative of iron overload. To date, T2* MRI has not been used to investigate iron overload in HD patients. We hypothesised that heart and liver T2* times would be different between HD patients and age- and sex-matched volunteers. We also hypothesised that T2* relaxation times (ms) would be affected by the total cumulative iron dose that HD patients had received prior to their MRI scan.

Methods

28 incident HD patients and 28 age and sex matched healthy volunteers were enrolled. All participants underwent a cardiac MRI scan at 3.0T (Magnetom Verio Siemens Healthcare) with T2* sequences of the heart and liver. Scans were blindly analysed offline using dedicated Medis analysis software (QMaps). Patient demographic and clinical data were collected from electronic renal records. Minitab version 17 was used for statistical analysis.

Results

T2* times were higher in the HD group compared to healthy volunteers (Table 1).

In the HD group, septal T2* negatively correlated with duration of haemodialysis ($R^2 = -0.46$, $p=0.005$) and with cumulative iron dose ($R^2 = -0.514$, $p=0.009$) prior to imaging. Liver T2* also negatively correlated with duration of haemodialysis ($R^2 = -0.607$, $p=0.002$) and with cumulative iron dose ($R^2 = -0.457$, $p=0.028$). On multivariate regression analysis septal T2* was an independent associate of cumulative iron dose ($p=0.035$) but not for duration of haemodialysis ($p=0.147$).

<table>
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<tr>
<th></th>
<th>HD patients</th>
<th>Healthy Volunteers</th>
<th>p-value</th>
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<td>T2*, septum (ms)</td>
<td>28.9 (27.1, 33.1)</td>
<td>22.3 (20.7, 27.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>T2*, liver (ms)</td>
<td>27.0 (23.0, 29.0)</td>
<td>18.0 (16.0, 21.5)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Table 1: Septal and Liver T2* times in HD and Healthy Volunteers

Conclusion

We have demonstrated that, at 3.0T, T2* times in the myocardial septum and liver are higher in incident HD patients compared with healthy volunteers. Furthermore, we observed that a greater cumulative iron dose is associated with lower T2* time in the myocardial septum. Further research is required to explore the reasons for these differences in the T2* time and to determine if higher cumulative iron doses will lead to a longitudinal decrease in T2* time.

Funding/Conflicts of Interest

This study was funded by Kidney Research (UK) (Research Innovation Grant IN02/2013). The University of Glasgow holds a research agreement with Siemens Healthcare. No author has any conflict of interest to declare.
A7. Comorbidity as a driver of outcome differences in men and women with less advanced CKD?

Theodosios Balaskas & Angharad Marks, University of Aberdeen

**Introduction:** Chronic kidney disease (CKD) is common (1 in 10 adults), but for the majority it is not advanced. However, some with CKD will have worsening kidney function over time, eventually requiring renal replacement therapy (RRT). More women than men seem to have less advanced CKD (stage 3), but more men seem to start RRT. We aimed to demonstrate whether this gender imbalance in outcomes among people with stage 3 CKD is associated with an imbalance in comorbidity load.

**Methods:** This analysis used the GLOMMS-II cohort (including ~20,000 people with CKD, of which ~18,000 had stage 3 CKD, and a random sample of ~20,000 with normal kidney function). Routine hospital episode and biochemistry data were available, as was RRT, myocardial infarction and death events during 6.5 years follow-up. The prevalence at baseline of 5 comorbidities (ischaemic heart disease, congestive cardiac failure, peripheral vascular disease, stroke and diabetes) amongst men and women with stage 3 CKD was described and compared to those with normal kidney function. Outcomes (RRT initiation, death and myocardial infarction events) were described and compared by gender and presence of comorbidities. Incidence rates of both RRT initiation and mortality in the presence and absence of the comorbidities were calculated and compared by gender, and rate ratios calculated (also adjusted for age and stratified by proteinuria status).

**Results:** The majority with stage 3 CKD were women (65%). The prevalence of the comorbidities was higher amongst men than women whether with stage 3 CKD or normal kidney function although lower if overall normal (e.g. IHD 19.9% and 12.5% or 7.5% and 2.9% respectively). More men than women had proteinuria (3.5% and 1.4% macroalbuminuria respectively). A higher proportion of men with stage 3 CKD initiated RRT (0.8%), died without initiating RRT (41.3%) and had myocardial infarction events (8.5%) compared to women (0.2%, 36.9% and 6.9% respectively). For both men and women with stage 3 CKD, diabetes (vs no diabetes) increased RRT initiation rate (rate ratios for men and women were 4.0 (2.1-7.7) and 6.4 (2.8-14.5) respectively). However, the rate of RRT intiation was lower in those with the other comorbidities than those without them. For those with a given comorbidity there was no statistically significant difference in outcomes between men and women, except for those with diabetes (2.3% of diabetic men initiated RRT, 56.5% died and 41.2% survived (without initiating RRT) vs 1.0%, 50.9% and 48.1% of diabetic women (p=0.016)). The mortality rate was higher amongst men than women with stage 3 CKD (88 vs 75 per 1000 patient years). Having a comorbidity increased the mortality rate in both men and women (i.e. mortality rate ratios for diabetes 1.7 (1.5-1.9) and 1.6 (1.4-1.9) respectively).

**Conclusions:** We confirm that diabetes is a key contributor to RRT initiation in both men and women with stage 3 CKD. The higher prevalence of diabetes amongst men partially explains why a greater proportion of men initiate RRT. A higher mortality in those with all comorbidities and higher prevalence of comorbidities in men partially explains the higher mortality in men than women.

**Funding:** Medical Research Scotland Vacation Scholarship. No conflicts of interest.
A8. Utility of Native Renal Biopsy

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**Background and Aims:** Native renal biopsy has several key roles in nephrology: providing diagnoses, guiding treatment and helping with prognosis. Defining pathological diagnosis may permit further investigative strategies, impact families in the case of genetic diseases or have implications for transplantation. We aimed to establish the utility of renal biopsy and how it impacted patient management within 2 nephrology centres.

**Methods:** Over a 3 month period, patients undergoing native renal biopsy were identified, and the requesting consultant was asked to predict the diagnosis. Once the full biopsy report was available and the patient reviewed in clinic, a follow up survey was sent to the requesting consultant. They were asked whether the diagnosis was expected (Q1), whether it informed prognosis (Q2), allowed new treatment to be started (Q3) or other treatment stopped (Q4). They were also asked if it was helpful in any other way (Q5 – Glasgow only) and whether, in hindsight, they would perform the biopsy again (Q6).

**Results:** Across the two centres, there were 114 biopsies performed in the 3 month period (69 in Glasgow, 45 in Edinburgh). Cases were excluded if there was no pre-biopsy diagnosis, insufficient tissue for diagnosis, repeat/protocol biopsies or no follow up survey completed. In total, 66 patients were included (39 in Glasgow, 27 in Edinburgh).

Q1. The diagnosis was expected in 64% and partially correct or “not unexpected” in a further 12%. Q2. It informed prognosis in 90% of cases. Q3. New treatment was initiated in 47% of cases, most commonly corticosteroids or cytotoxic therapies. Q4. Treatment was stopped or ruled out for 52%. Q5. Biopsy was felt to have been useful in some other way for 46%, most commonly for reassurance or explanation to patients. Q6. 100% of consultants said they would perform the biopsy again. Findings were similar across the 2 centres.

**Conclusion:** Clinical and pathological diagnoses differed in over a third of patients, and undergoing biopsy allowed targeted therapies to be started or stopped. It was seen to be most useful for establishing prognosis and giving patients explanations and reassurance about their disease. In all cases, consultants considered the biopsy to be of sufficient value to perform the biopsy again, given the same clinical situation. We now aim to triangulate these data with a survey of patient experience of this procedure.

**Funding:** None

**Conflict of Interest:** None
A9. The utility of anti-Müllerian hormone in renal failure

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\textsuperscript{b} Cardiovascular Research Centre, University of Glasgow
\textsuperscript{c} Reproductive & Maternal Medicine, University of Glasgow

Background & Aims:
Anti-Müllerian hormone (AMH) is a glycoprotein with a molecular weight of 140kD released from the granulosa cells of antral follicles with measurable serum levels, which have shown to be proportional to the number of developing follicles in the ovaries. So far, there is not an established test to measure ovarian function in females with renal failure. We aimed to measure serum AMH levels in women with renal failure and compare with reference values from healthy females.

Methods:
Females of childbearing age (18-40 years) with renal failure were recruited from the renal outpatient clinics in Glasgow between August 1, 2015 and March 31, 2016. Females with estimated glomerular filtration rate of <60mL/min/1.73m\textsuperscript{2} or a kidney transplant or on dialysis were included in the study. Apart from AMH, other biochemical parameters associated with follicular growth were measured including follicle-stimulating hormone (FSH), luteinising hormone (LH), prolactin, oestradiol, and progesterone. AMH levels from healthy females were retrieved and used as reference values.

Results:
Among 71 females included in analysis, 26 had chronic kidney disease (CKD) stage 3 or less, 25 had a renal transplant and 26 were on dialysis. The mean age was 32.9 (SD 5.4) years, half of them had regular menstrual periods, and approximately a third of them were on hormonal contraception. AMH levels were significantly higher in females on dialysis compared with the other groups (median 2.9ng/mL; range 1.1–5.2 for women on dialysis vs. 1.6ng/mL; range 0.7–2.2 for women with CKD vs. 1.5ng/mL; range 1.0–4.2 for women with kidney transplants, \( P=0.05 \)). Compared with healthy controls, median AMH levels were significantly lower in kidney disease women in all age groups (4.3ng/mL; range 2.6-5.7 vs. 3.3ng/mL; range 1.7-4.2 for healthy vs. kidney disease women between 20-29yr, \( P=0.034 \) and 3.0ng/mL; range 1.4-4.2 vs. 2.0ng/mL; range 0.7-2.8 for healthy vs. kidney disease women between 30-39yr, \( P<0.001 \)).

Conclusions:
AMH levels are significantly lower in females of childbearing age with renal failure compared with healthy females at all age groups. Higher AMH levels in females on dialysis may be explained by impaired glomerular filtration or clearance by dialysis. Further research is required to assess if a normal for age AMH level may be a predictor of good ovarian health in females with kidney disease pursuing pregnancy.
A 59 year old man with fluctuating conscious levels due to high serum ammonia was transferred to the renal dialysis unit at the Queen Elizabeth University Hospital Glasgow. He was known to have a background of pancreatitis, Type 2 Diabetes Mellitus, moderately proteinuric stage 3 chronic kidney disease and Parkinson’s disease (PD). He had a family history that involved consanguineous parentage and he was noted to have two brothers who also had a diagnosis of PD. He was reported by his family to have been fully independent before developing a fluctuant yet steadily progressive decline in global neurological function with associated nausea, irritability and latterly recurrent episodes of comatose state over a three month period. An EEG showed encephalopathy and biochemical testing showed a profound hyperammonaemia (445; normal range 20 – 50 umol/L). He was transferred to the renal unit for acute haemodialysis to correct his hyperammonaemia. After each session of HD his ammonia level increased rapidly and his neurological symptoms recurred before a steady reduction in the post dialysis ammonia level was achieved. The clinical course of his serum ammonia levels is shown in Figure 1.

Hyperammonaemia is usually secondary to underlying abdominal pathology, small bowel bacterial overgrowth, chronic urinary tract infections due to urea splitting organisms or inborn errors of metabolism. This patient underwent a series of investigations aimed at excluding these potential causes including abdominal ultrasound scanning and oesophageal gastric duodenoscopy, both of which were unremarkable. The patient was noted not to be on any medications that have been associated with hyperammonaemia. Amino acid analysis however suggested a diagnosis of late onset citrullinaemia type II (CTLN2). A high protein, high calorie diet with supplementary arginine and carbohydrate restriction was successful in keeping his ammonia levels low after HD and ultimately led to a successful withdrawal of dialysis treatment. Hyperammonaemia is an unusual indication for acute HD and is usually a secondary phenomenon. In adults, an underlying inborn error of metabolism should still be considered as part of the differential diagnosis.
No funding was required for the above work. There is no conflict of interest among named authors. Patient consent was obtained for the above work.
A11. A retrospective study of PD catheter removals: the “pull technique” is simple, safe and frees space in operating theatres.


Renal Unit, Aberdeen Royal Infirmary; Ternopil State Medical University, Ukraine; Vascular Surgery, Aberdeen Royal Infirmary.

AIM: In our institution PD catheters are removed either surgically in an operating theatre under general anaesthetic, or by the “pull technique” in the clinic using inhalational analgesia (Entonox). The method of catheter removal is determined by indication, clinical assessment and surgical preference. This study aimed to assess the number of catheters removed by each technique, the indications for catheter removal and the complications of catheter removal by the “pull technique”.

METHODS: We retrospectively identified all PD catheters removed in Aberdeen Royal Infirmary from 1st January 2010 to 1st August 2016. We used the Clinical Vision Renal electronic patient record, TRAKCare Patient Management System, case note review and patient consultation to identify the technique of catheter removal, reason for catheter removal, patient demographics and complications.

RESULTS: 104 PD catheter removals were identified in 102 patients. 25 patients had either died, moved to another region or had their catheter removed at the time of a transplant. 32 catheters were removed “surgically” and 47 catheters were “pulled”. The indications for catheter removal for those who had them pulled were post transplant (19); inadequate dialysis (16); peritonitis/exit site infection (8); and other (4). Two patients who had catheters “pulled” had a complication. One patient required cuff removal by laparotomy under general anaesthetic for unresolved infection; and one patient had to re-attend later the same day due to an ongoing fluid leak but did not require admission.

CONCLUSION: This is the largest series reporting outcomes after removing PD catheters by the “Pull Technique”. It is a simple, safe and efficient method for removal of PD catheters in selected patients. It reduces the number of general anaesthetics required and frees up operating time for other procedures.


Funding: none.
Conflicts of interest: none.
Ali SR, Young D, Shaheen I, Ramage I, Maxwell H, Hughes DA, Athavale D, Shaikh MG, Royal Hospital for Children, Glasgow, UK

Background:
Post renal transplantation, tubulopathies may occur as an effect of transplantation itself or secondary to the use of immunosuppressive regimes\(^1,2\). This often requires administration of large doses of sodium bicarbonate and sodium chloride, often resulting in poor compliance.

Adult studies have shown the advantages of fludrocortisone in the treatment of severe tubulopathies post renal transplant\(^3\). There is limited data in children. We report our experience from a Scottish tertiary paediatric centre.

Objective:
- To evaluate the efficacy of fludrocortisone as a treatment for tubulopathy post renal transplantation in children.
- To review the reduction in sodium supplementation in patients commenced on fludrocortisone.

Method:
- Retrospective review using data collected from a Scottish renal database from December 2014 to January 2016.
- Data on patient demographics, medication, renal function and feeds obtained.

Results:
47 post-transplant patients were reviewed in the service between December 2014 and January 2016. 23 patients were identified as being on sodium supplements, of which 9 patients were commenced on fludrocortisone. The median patient age was 8.3(4.9–16.4) years. Patients received fludrocortisone 22(1–80) months after transplant and were followed up for 9(2–20) months.

Following treatment with fludrocortisone, all patients stopped sodium bicarbonate and all patients had a reduction or no increase in the total daily dose of sodium chloride. Serum potassium levels were significantly lower on treatment, 5.2 vs 4.5 mmol/l, \(p=0.04\). There was no significant increase in systolic blood pressure, 107 vs 106 mmHg, \(p=0.81\). Renal function was unchanged, eGFR 77.8 vs 81.7 ml/min/1.73m\(^2\), \(p=0.45\). No side-effects of treatment secondary to the use of fludrocortisone were reported in this cohort.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Diagnosis</th>
<th>Fludrocortisone (mcg)</th>
<th>NaHCO(_3) (g)</th>
<th>NaCl (g)</th>
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<td></td>
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<td>Initial dose</td>
<td>Max dose</td>
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<td>75</td>
<td>3.0</td>
</tr>
<tr>
<td>5</td>
<td>Congenital renal hypoplasia</td>
<td>50</td>
<td>150</td>
<td>5.0</td>
</tr>
<tr>
<td>6</td>
<td>Congenital nephrotic syndrome</td>
<td>50</td>
<td>100</td>
<td>1.5</td>
</tr>
<tr>
<td>7</td>
<td>Congenital renal hypoplasia</td>
<td>50</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Congenital renal hypoplasia</td>
<td>100</td>
<td>200</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Chronic kidney disease stage 4</td>
<td>100</td>
<td>100</td>
<td>-</td>
</tr>
</tbody>
</table>

* Patients 1–6 were taking sodium supplements prior to commencing fludrocortisone.
* Patients 7–9 were commenced directly onto fludrocortisone.
* All patients were taking tacrolimus.
Conclusion:

- Fludrocortisone is an effective treatment for tubulopathies in children post renal transplantation.
- Fludrocortisone reduced the requirement for sodium bicarbonate and sodium chloride supplementation without a significant effect on renal function or blood pressure.
- The hypokalaemic properties of Fludrocortisone are an added benefit as some patients in this cohort were on potassium restricted diets.
- This study adds to the limited evidence in the literature regarding the benefit of Fludrocortisone.

Conflicts of interest – None.
A13. Tactical decision games: an innovative and sustainable method of teaching non-technical skills in acute medicine and nephrology

Iain Drummond\textsuperscript{1, 2}, Marc MacCrossan\textsuperscript{3}, Steven Klym\textsuperscript{4}, Janet Skinner\textsuperscript{2}, Morwenna Wood\textsuperscript{4, 5}

1. Renal Unit, Royal Infirmary of Edinburgh
2. Centre for Medical Education, University of Edinburgh
3. Anaesthetics, Aberdeen Royal Infirmary
4. Medical Education Department, Victoria Hospital Kirkcaldy
5. Renal Unit, Victoria Hospital Kirkcaldy

Background: Clinical decision-making, task prioritisation, situation awareness, teamwork and communication are key non-technical skills (NTS) required by junior doctors in acute specialties. Tactical decision games (TDGs) are low-fidelity classroom based activities designed to develop proficiency in NTS. TDGs have been used extensively in safety-critical industries, such as aviation, military, police and fire and rescue. We aimed to explore whether TDGs could be used to develop medical students’ NTS.

Methods: We initially ran sessions with groups of final year medical students using existing generic (non-medical) TDGs. Thereafter, we developed two acute medical TDGs with support from national experts in NTS and simulation-based education. The acute medical TDGs were piloted and iteratively developed in sessions with final year medical students until a “final product” was developed. We used our experience of developing acute medical TDGs to develop a nephrology TDG, which we then piloted and iteratively developed with groups of Year 4 medical students.

Results: We found non-medical TDGs to be a feasible and acceptable method of introducing NTS to final year medical students. Students were able to relate acute medical and nephrology TDGs to their clinical experiences. Acute medical and nephrology TDGs required students to consider prioritisation in the clinical environment, capabilities and responsibilities of team members and to develop a real-time workable solution. We have trained a team of facilitators and have incorporated both acute medical and nephrology TDGs into the core undergraduate curriculum.

Conclusion: TDGs are an innovative and sustainable method of teaching NTS in acute medical and nephrology contexts. Medical TDGs encompass realistic scenarios that require students to make clinical decisions and prioritise tasks in a time-pressured environment.

Funding: This work was supported by grants from the Clinical Skills Managed Educational Network (CSMEN) and the University of Edinburgh Principal’s Teaching Award Scheme (PTAS).

Conflicts of Interest: None
A14. Predicting early deaths in patients starting Renal Replacement Therapy for established renal failure in the West of Scotland. Validation of a clinical prediction tool.

Michael Sullivan, Jamie Traynor, Ian Handel, Emily McQuarrie, Bruce McKinnon, Peter Thomson

**Background.** Patients with established renal failure must be assessed to determine if dialysis is in their best interests or whether conservative care is more appropriate. Clinical prediction tools exist to assist physicians in this decision-making process and one example was developed in 2015 by Floege et al. Our population-based retrospective study sought to determine if this tool could accurately predict mortality in a real-life West of Scotland population.

**Method.** Information was gathered on patients initiating dialysis within Greater Glasgow and Clyde and Forth Valley between 2011 and 2013. Data were collected from 640 patients and used to calculate one and two-year predicted mortality rates which were then compared with the observed deaths. Patients were divided into quintiles of risk for statistical analysis from which Kaplan Meier plots and hazard ratio calculations were made. Information was gathered on a group of 143 patients who were provided with conservative care in the same time period and they were compared to the dialysis population. The use of these risk scores was also applied to predicting three-month survival and compared to the predictive power of patient age.

**Results.** Analysis of the risk quintiles suggests that the Floege model does have some predictive power with patients in higher risk quintiles having higher rates of death at one year. One-year mortality was 2.4% in the lowest and 34% highest risk quintiles respectively (Figure 1). The hazard ratio for quintiles four and five was 6.33 compared to quintiles one to three (95% confidence interval 3.87–10.37, P<0.0001). However, the strength of the correlation between predicted one-year mortality and observed one-year survival was poor with r-squared value of 9% (Figure 2). Similar results were found when using the Floege model to predict 3-month and 2-year survival.

In particular, predictions overestimated the rates of mortality with the two-year mortality prediction over 99.4% in quintile five with just 49.2% of patients dying. Patient age alone could predict one-year mortality in a similar fashion to the tool with a hazard ratio of 4.26 (2.7–6.75, p<0.0001) when comparing quintile five with the rest of the population.

**Conclusion.** Floege’s tool can highlight which patients are at high risk of dying at one and two years but patient age is just as good a predictor. The tool overestimates risk and is least accurate in the high risk groups. These are the patients for whom conservative care is a viable option and so the tool is not useful in our population.

K Porch, C Geddes, B Mackinnon, JP Traynor, P Thomson, JG Fox. Glasgow Renal and Transplant Unit, UK

BACKGROUND: Autosomal dominant polycystic kidney disease (ADPKD) is the most common hereditary renal disease worldwide. Until recently, treatment was limited to blood pressure and symptom control. The TEMPO 3:4 trial reported a beneficial effect of tolvaptan (V2 receptor antagonist) in slowing growth of polycystic kidneys and preserving renal function. Following this, tolvaptan was approved by the European Medicines Agency (EMA) in May 2015 for adults with ADPKD, eGFR >30 ml/min and ‘rapidly progressing disease’ (not defined further). In the USA, the FDA did not approve tolvaptan for this indication but requested further evidence. Recently published Renal Association guidelines set out a structured approach to establish which patients may be eligible for treatment and include criteria for rapid disease progression by eGFR decline or increasing kidney size. The aim of this study was to establish the number of patients with ADPKD attending Glasgow Renal and Transplant Unit who may be eligible for treatment and the implications for our service.

METHODS: All adults with ADPKD attending Glasgow Renal and Transplant Unit (which serves a population of 1.5 million) were identified using the West of Scotland Electronic Patient record (SERPR). Patients already receiving RRT were excluded from further analysis. Values for eGFR using the CKD-EPI equation (most recent, 1 year and 5 years ago) were collected. Rapid disease progression was defined as decline in eGFR ≥5ml/min in 1 year or ≥12.5ml/min over 5 years. Patients without evidence of rapid disease progression by eGFR were further evaluated by family history and imaging criteria. Numbers qualifying for treatment or requiring further imaging according to UK Renal Association guidelines were calculated.

RESULTS: 854 patients with ADPKD and attending Glasgow Renal and Transplant Unit were identified. Point prevalence of ADPKD was 430 per million population. 209 patients receiving RRT were excluded and 645 patients were included in the study. 353 met EMA age and renal function criteria and 185 also met criteria for rapid disease progression by declining eGFR. 168 did not have rapid disease progression by eGFR decline. 73 had no recent measurement of kidney length and require ultrasound (US). 12 had mean kidney length >16.5cm on US, and require MRI to establish kidney volume. 64 had mean kidney length <16.5cm, requiring follow-up US every 2-3 years.

CONCLUSIONS: The introduction of Tolvaptan therapy for ADPKD will have significant implications for renal services. Many patients will require imaging by US and/or baseline and follow-up MRI. Treated patients require monthly blood tests for the first 18 months of therapy and 3 monthly thereafter. This study has enabled our unit to estimate the likely requirements for implementation of this service including staffing, prescription, dispensing, imaging and follow up. Our data, derived from a population of defined size, will help renal units assess the implications for their services.
A16. Clinical Experience of the first 40 people on Tolvaptan for Autosomal Dominant Polycystic Kidney Disease
Madeleine A Vernon, Sadaf Arshad, Alistair Lawrie, Cory Dunnigan and Neil Turner. Renal Unit, Royal Infirmary of Edinburgh

Background: Tolvaptan has recently been licensed for use in the clinical setting to slow the progression of Autosomal Dominant Polycystic Kidney Disease (ADPKD). Further information is available at bit.ly/pkedren. We have set up a dedicated clinic for the initiation and implementation of this medication.

Methods: We reviewed all patients who have been seen in the dedicated ADPKD clinic and patients recruited to the TEMPO (Tolvaptan Efficacy and Safety in Management of ADPKD and its outcomes) and REPRISE (Efficacy and Safety of Tolvaptan in Subjects with Chronic Kidney Disease Between Late Stage 2 to Early Stage 4 due to ADPKD) clinical trials locally and documented various parameters.

Results: To date, the clinic has run monthly for 6 months. A total of 28 patients have commenced therapy with Tolvaptan with a further 4 that have been counselled and have delayed commencement. 3 have subsequently discontinued the medication, with one of these on a temporary basis. Of the 3 patients not commencing therapy, 2 were due to patient choice and 1 is under review.
All patients report polyuria and thirst, which is often dramatic. No other major side effects have been reported and LFTs are unchanged in all patients.
Of the 26 patients taking Tolvaptan, 17 are on maximum dose (90mg in morning and 30mg in afternoon, 90/30mg) and 5 are new starts currently on the low dose of 45mg/15mg in the afternoon. 3 patients are on the intermediate dose (60mg/30mg) and one is on a hybrid dose (60mg/15mg). There were 12 patients enrolled in the REPRISE and TEMPO study locally. 58% tolerated maximum dose. There were no unexpected side effects reported.

Conclusion: Tolvaptan is being tolerated in the majority of patients with no significant side effects reported.

Funding/Conflicts of interest: Madeleine Vernon and Neil Turner have both received consulting fees from Otsuka Pharmaceuticals.
A17. Developing a new imaging service for renal failure patients with ferumoxytol-enhanced magnetic resonance angiography

Sokratis Stoumpos\textsuperscript{a,b}, Martin Hennessy\textsuperscript{c}, Giles Roditi\textsuperscript{c}, Aleksandra Radjenovic\textsuperscript{b}, David B Kingsmore\textsuperscript{a}, Patrick B Mark\textsuperscript{a,b}

\textsuperscript{a} Renal & Transplant Unit, Queen Elizabeth University Hospital
\textsuperscript{b} Cardiovascular Research Centre, University of Glasgow
\textsuperscript{c} Radiology Department, Queen Elizabeth University Hospital

Background & Aims:
The usually employed methods for cardiovascular imaging using magnetic resonance imaging (MRI) or computed tomography carry potential risks for kidney disease patients. Ferumoxytol is an ultrasmall superparamagnetic iron oxide which has excellent potential as MRI contrast agent in assessing the heart, central and peripheral vessels. We aimed to determine the imaging quality and diagnostic accuracy of ferumoxytol-enhanced magnetic resonance angiography (FeMRA) use in patients with late-stage kidney disease or on dialysis.

Methods:
Patients with late-stage kidney disease or on dialysis requiring cardiovascular imaging were included in this case series. All patients underwent FeMRA on a 3T Prisma MRI system between December 1, 2015 and August 1, 2016. All the scans were performed for clinical indications where alternative imaging techniques were deemed potentially harmful or were inconclusive. We performed first-pass, steady state and steady state high-resolution magnetic resonance angiography using incremental doses of up to 4mg/kg body weight of ferumoxytol (diluted by four-fold) as intravenous contrast agent for vascular enhancement in patients with glomerular filtration rate of <30mL/min per 1.73m\textsuperscript{2}. The signal-to-noise ratio and contrast-to-noise ratio before contrast administration, after each incremental dose, and after the full dose was delivered were determined.

Results:
Thirty-five patients have had FeMRA for various indications including pre-operative kidney transplant candidacy assessment, haemodialysis vascular access creation or surveillance, peripheral vascular disease, and renal artery stenosis due for potential intervention. Satisfactory arterial and venous enhancement were obtained and the scans aimed clinical decision making in the majority of cases. All patients completed their studies without adverse events. Ferumoxytol doses exceeding 3mg/kg body weight did not improve diagnostic accuracy.

Conclusion:
Our preliminary experience supports the feasibility of vascular imaging with FeMRA in patients with late-stage kidney disease or on dialysis. The optimal (minimum) dose of ferumoxytol required to achieve adequate vascular enhancement was 3mg/kg body weight.
A18. A Retrospective Analysis of HLA Sensitisation in Patients Requiring Renal Allograft Nephrectomy
Sophie McIntyre, Ailish Nimmo, Lorna Henderson, Richard Battle, RIE

Background
The development of HLA antibodies towards a failing renal allograft can impact upon chance of future transplantation. We assessed the formation of HLA antibodies in patients who underwent transplant nephrectomy at our centre over a 10 year period.

Methods
We conducted a retrospective study evaluating patients with a failed transplant who underwent graft nephrectomy from 2005-2015. Samples were tested for DSA at 5 time points: pre-nephrectomy, post-nephrectomy, pre-immunosuppression (IS) weaning, post-IS weaning and post-IS cessation. Calculated reaction frequency (cRF) was determined for each time point. cRF data was entered into the ODT chances of transplant (CoT) calculator with all other demographics reflecting an average patient at our centre.

Results
24 patients (14 male, mean age 45 years) had sufficient data for analysis. Mean time from immunosuppression weaning to nephrectomy was 376 days, and from nephrectomy to immunosuppression cessation 166 days. One patient had no sample post-immunosuppression cessation. One patient remained on immunosuppression throughout. 7 patients had immunosuppression stopped within 14 days of nephrectomy. Table 1 shows cRF and chance of transplant at specified time points.

<table>
<thead>
<tr>
<th></th>
<th>Mean cRF</th>
<th>Chance of Transplant at 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nephrectomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Nephrectomy</td>
<td>58%</td>
<td>46%</td>
</tr>
<tr>
<td>Post-Nephrectomy</td>
<td>69%</td>
<td>46%</td>
</tr>
<tr>
<td>Immunosuppression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-IS Wean</td>
<td>31%</td>
<td>54%</td>
</tr>
<tr>
<td>Post-IS Wean</td>
<td>69%</td>
<td>46%</td>
</tr>
<tr>
<td>Post-IS Stop</td>
<td>89%</td>
<td>42%</td>
</tr>
</tbody>
</table>

Table 1. Mean cRF and CoT at 5 years at specified time points.

Discussion
This analysis investigated changes to sensitisation and chance of future transplant after nephrectomy and immunosuppression withdrawal. An increase in cRF following nephrectomy and stepwise increase in cRF as immunosuppression was withdrawn was observed. Immunosuppression changes occur in close time proximity to transplant nephrectomy which confounds this assessment however it is clear the risks and benefits of stopping immunosuppression need to be carefully considered on an individual basis to maximise chance of future transplant.
A19. The utility of renal biopsy in transplant recipients – a survey of current practice

Pugh D, Hunter RW, Petrie MC, Henderson L
Department of Renal Medicine, Royal Infirmary of Edinburgh, United Kingdom

Introduction: Renal biopsy is an essential tool when assessing transplant dysfunction however there remains a lack of consensus regarding the exact indications for its use. This leads to variability between centres and clinicians which may impact upon patient outcomes. We performed a retrospective analysis of renal transplant biopsy utilisation locally as a first step towards assessing this variability, with the ultimate aim of improving patient care.

Methods: All patients who underwent renal transplant biopsy during 2015 at the Royal Infirmary of Edinburgh were identified using electronic records obtained from the radiology department. Data were gathered from electronic patient records (Vital Data and TRAK). Patient demographics, indications for biopsy, creatinine trends, biopsy adequacy, complication rates, histological diagnoses, post-biopsy treatment plan and rate of graft failure at 6 months post-biopsy were recorded. Data were analysed to observe trends and discrepancies in practice.

Results: 146 biopsies were carried out in 105 patients. The indications for biopsy were as follows; deterioration in GFR (68), delayed graft function (34), protocol/surveillance biopsy (15), assessment of response to treatment (14), best creatinine higher than expected (7), proteinuria (4), BK viraemia (4).

Mean number of glomeruli captured was 16.4 (range 0-48), with 14 of 146 (9.6%) biopsies considered unsatisfactory. The likelihood of having an adequate biopsy performed within 2 days of request was 78.8%. There were no reported major complications of biopsy.

Histological diagnoses are characterised in the table below which classifies biopsies as early (0-90 days post-transplant), mid (90-360 days post-transplant) or late (>360 days post-transplant).

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>Early %</th>
<th>Mid %</th>
<th>Late %</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-cell mediated rejection</td>
<td>12</td>
<td>16</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Antibody mediated rejection or mixed rejection</td>
<td>6</td>
<td>4</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>Acute tubular necrosis (ATN)</td>
<td>45</td>
<td>4</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Interstitial fibrosis + tubular atrophy (IFTA)</td>
<td>15</td>
<td>32</td>
<td>71</td>
<td>37</td>
</tr>
<tr>
<td>BK virus-associated nephropathy</td>
<td>1</td>
<td>12</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Calcineurin inhibitor toxicity</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>De novo glomerulonephritis</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Recurrent primary renal pathology</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>4</td>
</tr>
</tbody>
</table>

Figures represent % of biopsies displaying the diagnosis at each time point.

Conclusions: This analysis has highlighted several points of interest including a low rate of protocol/surveillance biopsy (15 of 146) despite no reported major biopsy complications. Our analysis raises the question of whether the right patients are selected for biopsy at the right time and we suggest there is scope to improve practice.

(The authors have no conflicts of interest. No funding was provided for this study)
A20. Long-term survival and the association of primary renal disease with all-cause mortality in patients with childhood-onset end-stage renal disease
D. Galiyeva¹, C. Jackson¹, N. Halbesma¹, D. Hughes², S. Burns², W. Metcalfe³, S. Wild¹
¹ Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, Edinburgh, Scotland
² Royal Hospital for Children, Glasgow, Scotland
³ Scottish Renal Registry

**Background** End-stage renal disease (ESRD) in children is a rare but serious health problem, which occurs in about 5 to 10 children per million each year, globally. Data on long-term survival rates among children with ESRD are sparse.

**Aim** We aimed to describe the long-term survival and the association of primary renal disease (PRD) among patients initiating renal-replacement therapy (RRT) in childhood in Scotland.

**Methods** We included all patients <18 years from the Scottish Renal Registry (SRR) who started RRT between 1961 and 2013. Patients were followed from the start of RRT until 31 December 2015 or date of death. Survival was determined using the Kaplan–Meier estimate. Cox regression analysis was used to determine unadjusted and adjusted hazard ratios (HRs) and 95% confidence intervals (CIs) for the association of PRD with all-cause mortality. PRD were divided into three categories: congenital anomalies of kidney and urinary tract (CAKUT), glomerulonephritis and “other” (cystic kidney disease, hereditary nephropathy, ischemic renal failure, vasculitis and metabolic disorders). The association of PRD with all-cause mortality was adjusted for age, gender and decade of start of RRT.

**Results** Baseline characteristics of the study population are presented in Table 1. The largest group of PRD was CAKUT. Cystic kidney disease was the largest PRD in the “other” category of PRD. In total 479 patients were followed for a median of 18.3 years (interquartile range 8.7-27.0), giving 8,165 patient-years (p/y) of follow-up. During the study period 126 patients died. The major cause of death was cardiovascular mortality (Table 2). The overall mortality rate was 15.43 per 1000 p/y (95% CI 9.12-21.74). The longer-term survival rate among children requiring RRT was 86% (95% CI 82.9-89.1) at 10 years and 76% (95% CI 72.2-79.8) at 20 years. Cox regression analysis showed that patients in the PRD category “other” had a significantly higher risk of death than those with CAKUT or glomerulonephritis. Crude and adjusted HRs for glomerulonephritis versus CAKUT were 0.98 (0.59-1.63) and 1.06 (0.64-1.78), respectively, while crude and adjusted HRs for “other” versus CAKUT were 1.54 (1.04-2.31) and 1.56 (1.04-2.36), respectively.
A20. Table 1. Baseline characteristics of the total cohort

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Patients, N=479 (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age at start of RRT (years)</td>
<td>11.9 (Standard Deviation 5.01)</td>
</tr>
<tr>
<td>Male</td>
<td>265 (55.3%)</td>
</tr>
<tr>
<td>Therapy modality at start of RRT</td>
<td></td>
</tr>
<tr>
<td>HD</td>
<td>220 (45.9%)</td>
</tr>
<tr>
<td>PD</td>
<td>207 (43.2%)</td>
</tr>
<tr>
<td>Transplantation</td>
<td>50 (10.4)</td>
</tr>
<tr>
<td>Unknown/missing</td>
<td>2 (0.5%)</td>
</tr>
<tr>
<td>Primary renal disease</td>
<td></td>
</tr>
<tr>
<td>CAKUT</td>
<td>231 (48.2%)</td>
</tr>
<tr>
<td>Glomerulonephritis</td>
<td>80 (16.7%)</td>
</tr>
<tr>
<td>Other</td>
<td>140 (29.2%)</td>
</tr>
<tr>
<td>Unknown/missing</td>
<td>28 (5.9%)</td>
</tr>
</tbody>
</table>

Table 2. Distribution of causes of death

<table>
<thead>
<tr>
<th>Causes of death</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>46 (36.5)</td>
</tr>
<tr>
<td>Infection</td>
<td>14 (11.1)</td>
</tr>
<tr>
<td>Malignancies</td>
<td>7 (5.6)</td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>3 (2.4)</td>
</tr>
<tr>
<td>Other</td>
<td>25 (19.8)</td>
</tr>
<tr>
<td>Unknown</td>
<td>31 (24.6)</td>
</tr>
<tr>
<td>Total</td>
<td>126 (100)</td>
</tr>
</tbody>
</table>

Conclusions

Ten and twenty year survival in patients initiating RRT in childhood were 86% (82.9-89.1) and 76% (72.2-79.8), respectively. PRD other than glomerulonephritis or CAKUT is associated with a higher risk of all-cause mortality.
**A21. A randomized single-blind cross-over trial of recovery time in high-flux haemodialysis and haemodiafiltration.**

James R Smith\textsuperscript{a}, Norica Zimmer\textsuperscript{a}, Elizabeth Bell\textsuperscript{a}, Bernard G Francq\textsuperscript{b}, Alex McConnachie\textsuperscript{b}, Robert Mactier\textsuperscript{a}.

\textsuperscript{a}Glasgow Renal and Transplant Unit, Queen Elizabeth University Hospital, Glasgow, UK. 
\textsuperscript{b}Robertson Centre for Biostatistics, University of Glasgow, UK.

**Background**

The choice between haemodiafiltration (HDF) or high-flux haemodialysis (HD) to treat end-stage kidney disease remains a matter of debate. The duration of recovery time after treatment has been associated with mortality, affects quality of life, and may therefore be important in informing patient choice. We aimed to establish whether recovery time is influenced by treatment with HDF or HD.

**Methods**

We randomly assigned 100 patients with end-stage kidney disease in two satellite dialysis units in Glasgow to receive either 8-weeks of HD followed by 8-weeks of online post-dilution HDF or vice versa. Patients were blinded to treatment allocation and measures were taken to prevent inadvertent unblinding. The primary outcome was length of post-treatment recovery time. Secondary outcomes included change in health related quality of life scores, adverse events during treatments, haematological and biochemical parameters.

**Results**

There was no overall difference in recovery time between treatments - HD, median 30 minutes (interquartile range [IQR] 0, 210) vs. HDF, median 47.5 minutes (IQR 0, 240), \( p=0.9 \). Health related quality of life scores were equivalent. There were significant increases in rates of intra-dialytic tendency to clotting (OR 2.67, 95% CI 1.42, 4.99, \( p=0.002 \)) and symptomatic hypotension (OR 1.51, 95% CI 1.16, 1.98, \( p=0.002 \)) during HDF treatment. Blood parameters were largely similar between treatments (Table 1). However, serum albumin was significantly lower with HDF (32 g/L vs. 33 g/L, \( p<0.001 \)).

**Conclusions**

Patients blinded to whether they were receiving HD or HDF in a randomized controlled cross-over study reported similar post-treatment recovery times and health related quality of life scores, however adverse events occurred more frequently during HDF.

None of the co-authors have conflicts of interest to declare. Financial support for this study was provided by the Glasgow Renal and Transplant Unit Research Fund.

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**Table 1 - Midweek pre-treatment blood test results – HD vs. HDF**

<table>
<thead>
<tr>
<th>Variable</th>
<th>HD</th>
<th>HDF</th>
<th>Cross-over ( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/dL)</td>
<td>11.5 ± 1.3</td>
<td>11.3 ± 1.3</td>
<td>0.1</td>
</tr>
<tr>
<td>WCC (x10(^3)/μL)</td>
<td>7.3 ± 2.6</td>
<td>7.4 ± 2.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Platelets (x10(^3)/μL)</td>
<td>225 ± 73</td>
<td>226 ± 79</td>
<td>0.7</td>
</tr>
<tr>
<td>CRP (mg/L)</td>
<td>14 ± 17</td>
<td>12 ± 10</td>
<td>0.9</td>
</tr>
<tr>
<td>Calcium (mmol/L)</td>
<td>2.4 ± 0.1</td>
<td>2.4 ± 0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Phosphate (mmol/L)</td>
<td>1.6 ± 1.2</td>
<td>1.6 ± 1.2</td>
<td>0.7</td>
</tr>
<tr>
<td>PTH (pg/mL)</td>
<td>701 ± 483</td>
<td>666 ± 474</td>
<td>0.2</td>
</tr>
<tr>
<td>Albumin (g/L)</td>
<td>33 ± 3</td>
<td>32 ± 3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sodium (mmol/L)</td>
<td>137 ± 2</td>
<td>137 ± 3</td>
<td>0.9</td>
</tr>
<tr>
<td>Potassium (mmol/L)</td>
<td>4.8 ± 0.6</td>
<td>4.8 ± 0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Chloride (mmol/L)</td>
<td>100 ± 2</td>
<td>101 ± 3</td>
<td>0.02</td>
</tr>
<tr>
<td>Bicarbonate (mmol/L)</td>
<td>20 ± 2</td>
<td>20 ± 2</td>
<td>0.3</td>
</tr>
<tr>
<td>Kt/V</td>
<td>1.6 ± 0.4</td>
<td>1.7 ± 0.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Note: all data displayed as mean ± standard deviation.

\*data log transformed prior to statistical tests
A22. The Cerebrovascular and Neurocognitive effects of Haemodialysis
Mark Findlay, Deborah McGlynn, Jesse Dawson & Patrick Mark.

Background
Stroke and cognitive impairment are common in the haemodialysis (HD) population. It is possible that HD induced alterations in the cerebral circulation contribute. We assessed cognitive function in HD patients to describe the frequency of occult cognitive impairment, and performed assessments both on & off dialysis to explore if changes in cerebral blood flow during HD affect cognitive function.

Methods
Design: Prospective cohort study in patients receiving HD for established renal failure (ERF). Those with known cerebrovascular or cognitive impairment were excluded. A neurocognitive battery was performed during a routine dialysis session and was then repeated on a non-dialysis day (with a 4 week gap to reduce learning effect). The cognitive tests included the Montreal Cognitive Assessment (using an accepted cut-off to define cognitive impairment) and additional tests of language, memory, processing speed and executive function. Mean flow velocity (MFV) was measured in the middle cerebral artery during dialysis using Transcranial Doppler ultrasound. We compared cognitive function and MFV on and off dialysis and assessed the relationship between any changes using Spearman’s rank correlation.

Results
97 participants were enrolled (median age 59 [IQR 51,67] years, 40% female, median duration of ERF 1.76 years [IQR 0.6, 3.98]. 88 participants attended both visits. Cognitive impairment was present in 44 participants (50%). Those with CI were more likely to have a history of hypertension (95.5 v 81.8%) and a higher recorded mean systolic blood pressure (148.3 vs 132.4mmHg) than those without (p<0.05). MFV declined during dialysis (mean; 49.8 cm/s to 43.21cm/s, p<0.001). Changes in MFV were correlated with UF volume and presence of diabetes but not change in blood pressure. Participants scored lower on tests of processing speed and executive function during dialysis when compared to their non-dialysis day scores. Decline in test scores for language and executive function significantly correlated with the dialysis-related fall in MFV, p<0.05.

Conclusion
Cognitive impairment was common in this study and cognitive function was demonstrably worse during dialysis. Cerebral blood flow is reduced during HD and relates to UF volume and the decline in cognitive function seen. Ongoing study is examining whether the changes in MFV and cognitive function are related to long term decline in cognitive function.

Conflicts of interest: none
Funding: Kidney Research UK & Darlinda’s Charity for Renal Research
A23. Risk of Acute Kidney Injury in patients treated with Metformin: an observational cohort study

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Background: Whether metformin precipitates lactic acidosis in patients with chronic kidney disease (CKD) remains under debate. We examined whether metformin use was associated with an increased risk of acute kidney injury (AKI) as a proxy for lactic acidosis and whether survival among those with AKI varied by metformin exposure.

Methods: All individuals with type 2 diabetes and available prescribing data between 2004-2013 in Tayside, Scotland were included. The electronic health record for diabetes which includes issued prescriptions was linked to laboratory biochemistry, hospital admission, death register and Scottish Renal Registry data. AKI events were defined using the KDIGO criteria with a rise in serum creatinine of at least 26μmol/l or a rise of greater than 150% from baseline for all hospital admissions. Cox Regression Analyses were used to examine whether person-time periods in which current metformin exposure occurred were associated with an increased rate of first AKI compared to unexposed periods. Cox regression was also used to compare 28 day survival rates following first AKI events in those exposed to metformin versus those not exposed.

Results: 25,148 patients were included with a total person-time of 126,904 person years. 4,944 people had at least one episode of AKI during the study period. There were 32.4 cases of first AKI/1000pyrs in current metformin exposed person-time periods compared to 44.9 cases/1000pyrs in unexposed periods. After adjustment for age, gender, diabetes duration, calendar time, number of diabetes drugs and baseline renal function, current metformin use was not associated with AKI incidence, HR 0.93 (95% CI 0.85-1.00, p=0.06). Among those with incident AKI, being on metformin at admission was associated with a higher rate of survival at 28 days (HR 0.81, 95% CI 0.70-0.95, p=0.007) even after adjustment for age, sex, pre-admission eGFR, HbA1c and diabetes duration.

Conclusion: We found no evidence that metformin increases incidence of AKI or worsens 28 day survival following incident AKI but was associated with survival benefit after AKI.

The authors declare no conflict of interest
A24. To dialyse or not to dialyse?
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**Background and aims:** Patients with chronic kidney disease are increasingly older and co-morbid and the survival advantage of those opting for renal replacement therapy (RRT) in these circumstances remains unclear. Quality as well as duration of life should be considered. We aimed to review the pathways that our more frail patients take after RRT education including dialysis modality planned and received (if any), life expectancy, vascular access creation and usage, emergency admissions to hospital and end of life care.

**Methods:** The Strathclyde Electronic Renal Patient Record (SERPR) database was searched to identify patients in whom conservative care (CC) and RRT had been discussed by our RRT education nurse specialist from January 2012 - January 2014. The fact that both options were discussed was thought to represent a holistic assessment that the patient may not benefit from RRT and CC should be considered. Data was retrieved from SERPR and Clinical Portal entries and letters then analysed in Microsoft Excel.

**Results:** 98 patients had CC and RRT discussed. Patients who chose RRT had better functional status than those who chose CC although the comorbidity scoring was similar. At the time of analysis (July 2016), 77 patients had died (79%). Of these, 43 had initially intended to have RRT but only 30 actually received it – the remainder changed to CC or died of another cause before RRT was indicated. Average survival from estimated Glomerular Filtration Rate (eGFR) <15 was 21 months for those who received RRT and 16 months for those who did not. 34% of these patients who started RRT died within 1 year.

39 arteriovenous fistulae were created in 33 patients and only 17 (43%) of these were used – either patients did not dialyse or there were fistula complications. 30 tunnelled central venous catheters were inserted into 20 patients and 4 peritoneal dialysis catheters were inserted into 4 patients all of which were used. In the last 6 months of life, patients who received long term dialysis spent an average of 58 days in hospital due to emergency admissions, compared to 23 days for those who opted for conservative care. Elective admissions were not included. Those opting for CC were more likely to have evidence of end-of-life planning (63% vs. 42%), and more likely to die at home, in a nursing home, or hospice (34%) compared to RRT patients (21%). Stated cause-of-death was similar across the groups, with end-stage renal disease/withdrawal of dialysis, cardiovascular disease and sepsis the most common.

**Conclusions:** The patients examined in this cohort had a survival advantage of 5 months if they received long term RRT, but they had more vascular access procedures, more inpatient days and were more likely to die without end of life planning. This is based on a small sample population in a single unit where we have used a surrogate marker for frailty and proxy measures for quality of life. However, these findings allow us to better explain to patients the benefits and drawbacks of RRT and CC to help them make more informed choices.

**Funding:** None

**Conflict of Interest:** None