Scottish Renal Association and Royal College of Physicians of Edinburgh Joint Renal Meeting

A symposium held on 5–6 November 2010 at the Royal College of Physicians of Edinburgh

ASSESSING PATIENT OUTCOMES IN HYPERTENSION: THE PREDICTIVE ABILITY OF PROTEINURIA AND ESTIMATED GLOMERULAR FILTRATION RATE

[1]S Methven, [2]B Mackinnon, [3]B Sloan, [4]A Alharf, [4]L Murray, [4]M Walters, [4]GT McInnes, [4]A Jardine
[1]Renal Unit, Crosshouse Hospital, Kilmarnock; [2]Glasgow, Clyde & Forth Valley Renal Service; [3]Department of Public Health, University of Glasgow; [4]Department of Medicine, University of Glasgow

Introduction: In patients with hypertension, reduced renal function is associated with a greater likelihood of all-cause and cardiovascular mortality. Albuminuria also predicts cardiovascular risk in this group, even at levels below the traditional threshold for microalbuminuria. However, few studies have considered the combination of these risk markers in a hypertensive population.

Methods: We studied 9,981 attendees at a hospital hypertension clinic who had a baseline measurement of kidney function. Those <18 years (n=39), those with an estimated glomerular filtration rate (eGFR) of <15ml/min/1.73m^2 (n=45) and those who were not screened for proteinuria (n=1,420) were excluded. A Cox proportional hazards model was constructed. Outcomes were cardiovascular and all-cause mortality. Covariates included in the model were eGFR (4-variable Modification of Diet in Renal Disease [MDRD] formula), dipstick measurement of proteinuria, age, gender, blood pressure, vascular disease at baseline, smoking and diabetes.

Results: Of 8,477 patients, 23% had a baseline eGFR of <60ml/min/1.73m^2, 1842 (22%) had proteinuria, but only 6% had both. The mean age of the cohort was 50 (±13) years, mean blood pressure was 169/100 (±29/15) mmHg, 52% were male and 7% had diabetes. During the follow-up period, 49% of those with an eGFR <60ml/min/1.73m^2 died. In this group 76% died of cardiovascular disease. The adjusted hazard ratios for all-cause mortality and cardiovascular death are shown below, divided according to the international staging system of chronic kidney disease.

Conclusion: The combination of proteinuria and reduced eGFR are powerful predictors of cardiovascular and all-cause mortality in patients with hypertension, and both are essential for risk stratification in this population.

TABLE 1 Adjusted hazard ratios for all-cause mortality and cardiovascular death divided according to the international staging system of chronic kidney disease

Adjsuted hazard ratios		All-cause mortality	Cardiovascular mortality
CKD 1/2 (eGFR ≥60ml/min/ 1.73m^2)	**p+**	**1.19** (1.05–1.35) p=0.007	**1.22** (1.05–1.41) p=0.010
CKD 3A (eGFR 45-59ml/ min/ 1.73m^2)	**p-**	**1.10** (0.99–1.22) p=0.089	**1.13** (1.00–1.28) p=0.049
	p+	**1.40** (1.15–1.71) p=0.001	**1.52** (1.22–1.90) p<0.001
CKD 3B (eGFR 30-44ml/ min/ 1.73m^2)	**p-**	**1.54** (1.31–1.82) p<0.001	**1.67** (1.39–2.02) p<0.001
	p+	**1.80** (1.45–2.23) p<0.001	**1.95** (1.53–2.49) p<0.001
CKD 4 (eGFR 15-29ml/ min/ 1.73m^2)	**p-**	**2.45** (1.69–3.54) p<0.001	**2.51** (1.64–3.84) p<0.001
	p+	**4.65** (3.49–6.20) p<0.001	**4.89** (3.55–6.75) p<0.001

CKD: chronic kidney disease, eGFR: estimated glomerular filtration rate, p+: proteinuria, p-: no proteinuria. Reference group: eGFR≥60ml/min/1.73m^2, p-

OUTCOME IN A COHORT WITH CHRONIC KIDNEY DISEASE, AT SIX YEARS

A Marks, C Black, N Fluck, A MacLeod on behalf of the GLOMMS-I (Grampian Laboratory Outcomes, Morbidity and Mortality Study–I) group of the AARRC
Aberdeen Applied Renal Research Collaboration (AARRC), University of Aberdeen & NHS Grampian, Aberdeen, UK

Introduction: After instigation of the KDOQI definition, chronic kidney disease (CKD) has been found to be common. However only some individuals progress to start renal replacement therapy (RRT). There is a high reported cardiovascular mortality. We report the outcome at six years for a cohort of CKD patients from Grampian.

Methods: All those in Grampian with a creatinine above 150µmol/l for males and 130µmol/l for women measured between 1 January 2003 and 30 June 2003 were identified, and notes and investigation results examined for evidence of chronicity. Case notes were reviewed for co-morbidity at baseline. The date of starting RRT or death was gathered up to 30 June 2009 (minimum six years follow-up). The rate of starting RRT and death was calculated. Survival based on important co-morbidity and age at baseline was examined.

Results: There were 3,426 individuals (1,912 females and 1,514 males), median age in 2003 was 78.5 years (range 16–103 years). Median eGFR was 33.2ml/min/1.73m^2. There was a high level of co-morbidity: 40% had ischaemic heart disease, 17% had congestive cardiac failure and 23% had type 2 diabetes. Only 1.6% had no co-morbidity at baseline.

By follow-up at 30 June 2009, 2,101 (61%) had died. There was an important association between the presence of baseline co-morbidity and mortality. Those with a given co-morbidity have higher mortality than those without. Age had a significant effect on outcome. Death rate increased from 16 deaths per 1,000 patient years follow-up in those 25–35 years of age to 605 deaths per 1,000 patient years follow-up in those 95–105 years.

At follow-up 171 (5%) had started RRT (77 had subsequently died).

Further, 1,235 (36%) had neither died nor started dialysis at follow-up. For these people currently not on RRT, data on the progression of their renal disease are currently in preparation.

Conclusions: In this cohort, who have been followed for at least six years, a significant number 1,235 (36%) did not progress to starting RRT, nor die. The propensity for these outcomes is unsurprisingly affected by baseline co-morbidity and age. More knowledge of outcomes other than mortality and need for starting RRT is essential for appropriate patient education and service planning.

PREVALENCE OF CHRONIC KIDNEY DISEASE IN AYRSHIRE & ARRAN: THE IMPACT OF EGFR FORMULAE

[1]F Gifford, [1]S Methven, [1]EM Spalding, [2]DE Boag, [1]MS MacGregor

[1]Renal Unit and [2]Department of Biochemistry, Crosshouse Hospital, Kilmarnock, UK

Introduction: Estimated glomerular filtration rate (eGFR) reporting by UK laboratories became widespread in 2006. However the eGFR formula currently in use may over estimate the prevalence of chronic kidney disease (CKD) and this could potentially influence epidemiological studies and public health strategies. The aim of this study was to compare the prevalence of CKD according to different formulae based estimates of GFR in an unselected adult population.

Methods: Results from all serum creatinine samples processed in the Ayrshire and Arran board area (A&A) in one year, April 2009–March 2010, were analysed (n=368,149). Results from patients <18 years and those receiving renal replacement therapy were excluded. The lowest creatinine value for each individual was used for the analysis (n=123,344). An eGFR (traceable to the isotope dilution mass spectrometry value) was calculated for each subject using the MDRD-4 and CKD-EPI formulae, and the resultant CKD stage compared. Sub-group analysis was performed, by age and sex.

TABLE 1 The prevalence of CKD divided according to the international staging system

CKD Stage			eGFR ≥60	3A	3B	4	5
Overall		MDRD	86.6%	9.4%	3.3%	0.7%	0.1%
		CKD-EPI	87.9% (+1.3%)	8.0% (–1.4%)	2.3% (–0.1%)	0.8% (–0.1%)	0.1% (NC)
Sex	Male	MDRD	90.2%	6.9%	2.3%	0.5%	0.1%
		CKD-EPI	90.2% (NC)	6.6% (–0.3%)	2.4% (+0.1%)	0.6% (+0.1%)	0.1% (NC)
	Female	MDRD	83.7%	11.3%	4.0%	0.8%	0.1%
		CKD-EPI	86.1% (+2.4%)	9.0% (–2.3%)	3.8% (–0.2%)	0.9% (+0.1%)	0.1% (NC)
Age	< 60 Yrs	MDRD	95.9%	3.1%	0.7%	0.2%	0.06%
		CKD-EPI	97.7% (+1.8%)	1.6% (–1.5%)	0.5% (–0.2%)	0.2% (NC)	0.05% (–0.01%)
	≥ 60 Yrs	MDRD	77.7%	15.3%	5.7%	1.1%	0.2%
		CKD-EPI	78.7% (+1.0%)	14.0% (–1.3%)	5.8% (+0.1%)	1.4% (+0.3%)	0.2% (NC)

CKD: chronic kidney disease, eGFR: estimated glomerular filtration rate, +: increased prevalence, –: decreased prevalence, NC: no change

Results: 42.9% (123,344) of the adult population of A&A had their serum creatinine measured within the 12 month period; 44.1% were male and 51.4% ≥60 years old. Overall CKD prevalence (eGFR <60ml/min/1.73m^2) fell by 1.4% using the CKD-EPI formula to calculate eGFR, compared with MDRD-4; 12.0% (n=14,912) vs 13.4% (n=16,586) respectively.

The prevalence of CKD is illustrated in the table above, divided according to the international staging system.

A total of 2,213 (1.8%) patients identified as having CKD stage 3A by the MDRD-4 formula had an eGFR >60ml/min/1.73m^2 when reassessed using the CKD-EPI formula. Of these 82% were women with a mean age of 58.9 years (standard deviation [SD] 11.4). In contrast, 542 (0.4%) patients with an eGFR >60ml/min/1.73m^2 according to MDRD-4 became stage 3A with CKD-EPI. Of this group, 70% were male with a mean age of 86 years (SD 5.6).

Conclusion: The CKD-EPI formula, thought to be more accurate at higher GFR, reduced the overall prevalence of CKD by 1.4%. Specifically the number of middle-aged and elderly females identified as having CKD was reduced. This reduction was offset by a smaller increase in prevalence of CKD in elderly males.

HAS AN INCREASE IN GENTAMICIN PRESCRIBING RESULTED IN A CORRESPONDING INCREASE IN GENTAMICIN-ASSOCIATED ACUTE KIDNEY INJURY REQUIRING RENAL REPLACEMENT THERAPY?

[1]A Helps, [1]C Deighan, [2]Y Gourlay, [2]RA Seaton
[1]Glasgow, Clyde & Forth Valley Renal Service; [2]Brownlee Unit, Gartnavel General Hospital, Glasgow, UK

Acute kidney injury (AKI) affects up to 20% of hospitalised patients and is associated with a significant increase in mortality. In Scotland 286 patients per million receive renal replacement therapy (RRT) for AKI. An important iatrogenic cause of AKI is gentamicin. The reported incidence varies widely due to variations in study design, toxicity definitions, patient population and concomitant risk factors, although a reasonable estimate would be 10–20%.

In July–August 2008, following a rise in *Clostridium difficile* infection within NHS Greater Glasgow and Clyde (GGC), infection management guidelines (IMG) were revised to restrict cephalosporins, co-amoxiclav and quinolones and to promote short-term use of gentamicin in severe infection. As a consequence, gentamicin use doubled from 20 to 40 defined daily doses/1,000 bed days between 2007 and 2008.

To investigate whether this increase in gentamicin usage has resulted in any increase in AKI, we performed a retrospective audit of all patients requiring RRT for acute kidney injury within GGC. Both renal units and all intensive therapy units in GGC were included. A total of 191 patients were identified between 8 January 2007 and 28 February 2008, and 184 patients between 1 August 2008 and 28 February 2009. All of these patients received RRT for AKI. Those with documented Stage 5 chronic kidney disease (CKD) or already requiring RRT were excluded. Three patients with functioning renal transplants were included in the analysis. The study periods were separated by six months to allow a 'run in' period for the revised IMG and to minimise seasonal bias. Electronic and paper case notes were interrogated for pre-existing co-morbidities, contributing causes of AKI, date of first and last gentamicin dose, length of RRT, mortality and extent of renal recovery.

There was no statistically significant difference in patient age, length of hospital stay and mortality in the two populations, using the Mann-Whitney U Test. In the period beginning 2007, 75% of patients, compared with 70% in 2008, had sepsis contributing to the cause of their AKI; 43% patients in both populations received gentamicin. There was no significant difference between the timing of gentamicin in relation to commencing RRT or mortality between the two time periods. Of all patients who received gentamicin, 42% (61/145) received their first dose of gentamicin between one and ten days prior to RRT, with 17% (25/145) receiving their first dose of gentamicin on the same day as starting RRT. There was a trend towards more patients being given gentamicin to treat sepsis in the period starting 2008, although this did not meet statistical significance (58.1% compared with 52.4% in 2007).

In this audit we have not identified any increase in gentamicin induced AKI that required RRT. Gentamicin use in this population was very high, reflecting the data which demonstrate sepsis to be the most common precipitant of AKI. The concern that the increased gentamicin use will result in a significant increase in AKI requiring RRT appears to be unfounded at present. Further audit into AKI not requiring dialysis is required, as lesser degrees of AKI are also associated with significant morbidity and mortality. This is especially relevant as gentamicin toxicity classically manifests as non-oliguric AKI which may not be referred to renal services.

CATHETER-RELATED BACTERAEMIA: METHODS OF SURVEILLANCE AND QUALITY CONTROL ANALYSIS

PC Thomson, CC Geddes, CJ Deighan
Glasgow, Clyde & Forth Valley Renal Service

Introduction: Catheter-related bacteraemia incurs considerable morbidity, hospitalisation and mortality, notwithstanding cost. This has been recognised nationally by the development of a Health improvement, Efficiency, Access and Treatment (HEAT) target, specifically aimed at reducing the burden of staphylococcal bacteraemia. In addition, the UK Renal Association has recommended that units routinely record and monitor all cases of catheter-related bacteraemia as a measure of best practice. Few groups, however, have suggested specific methods of achieving this nor demonstrated how such methods may affect subsequent clinical practice.

Methods: A retrospective analysis of all incident and prevalent patients using a tunnelled central venous catheter (TCVC) in the Glasgow Renal Units and their satellites was performed for the period starting 1 January 2008 and ending 31 December 2009. Catheter-related bacteraemia (CRB) events were sought through analysis of all positive blood culture results allied to the documentation of a raised systemic inflammatory response and the absence of clinical or radiological signs of a non-catheter related source of infection. Monthly CRB rates were determined and quality control analysis was conducted with mean (standard deviation ±3) plots and cumulative sum analysis.

Results: A total of 796 TCVC episodes occurred during the two-year period. When examining monthly data, mean TCVC prevalence was 191/588 (32.5%) with a maximum TCVC prevalence of 218/588 (37.7%) occurring in March 2009.

Mean CRB rate was determined as 1.86 per 1,000 catheter days. The monthly CRB rate for Glasgow Royal Infirmary and its satellite units varied within three standard deviations of the mean at 1.81 (upper limit 3.96) per 1,000 catheter days. The monthly CRB rate for the Glasgow Western Infirmary and its satellite units varied within three standard deviations of the mean at 1.88 (upper limit 4.99). Trends toward a lower CRB rate in the first two weeks following insertion in those who received antibiotic prophylaxis did not reach significance (0.08 vs 0.19 per 1,000 catheter days, p=0.066).

Cumulative sum analysis of the monthly rates demonstrated a subtle yet consistent reduction in monthly CRB rates concurrent with the institution of a deep-cleaning programme within the Western Infirmary dialysis units. No overt change was demonstrated in monthly CRB rates in the Glasgow Royal Infirmary dialysis units where no such programme was instituted. No change in CRB rates was noted in either site when a change was made to the chlorhexidine preparations used to clean TCVC exit sites.

Conclusion: By determining monthly TCVC prevalence and monthly CRB rates and by assessing their variability through quality control analysis, we were able to characterise both the absolute and relative burden of CRB events in our haemodialysis population. Through these methods the effect of changes to clinical practice could be assessed. We aim to automate these processes within the Strathclyde Electronic Renal Patient Record and extend their use to different haemodialysis and peritoneal access types.

RHABDOMYOLYSIS AND ACUTE KIDNEY INJURY: REPORT OF 92 CASES IN A DISTRICT GENERAL HOSPITAL

[1]S Gould, [1]K Donaldson, [1]S Robertson, [1]A Almond, [1]R Flynn, [2]C Isles
[1]Renal Unit, Dumfries & Galloway Royal Infirmary, Dumfries; [2]Medicines Monitoring Unit, University of Dundee, Ninewells Hospital, Dundee

Introduction: Rhabdomyolysis occurs in a variety of settings and frequently but does not invariably lead to acute kidney injury. The purpose of our study was to determine the causes of rhabdomyolysis in a contemporary patient population and to examine the relation between creatine kinase (CK) and serum creatinine.

Methods: We chose CK >10,000 iu/l as our threshold for rhabdomyolysis and used our biochemistry lab browser to identify all patients with CK >10,000 iu/l during the past ten years.

Results: We found 92 patients, 61% of whom were male, with an average age of 57 years, range 4–99 years. Of these, 53 (58%) of cases were due to muscle trauma, exertion or ischaemia and 39 (42%) due to non-traumatic causes, namely temperature extremes, metabolic abnormalities, autoimmune disease, infections, drugs and toxins and acute pancreatitis. Statins were being taken by 27% of patients and were thought to be the cause of rhabdomyolysis in 20%. The distribution of renal failure by Risk Injury Failure Loss End-Stage kidney disease (RIFLE) criteria and tertile of CK is shown in the table below, in which normal renal function means serum creatinine less than 1.5x baseline and the tertile cut points for CK were 16,500 and 31,000.

CK tertile	Normal n (%)	R n (%)	I n (%)	F n (%)	L n (%)	E n (%)
Low	18 (60)	3 (10)	4 (13)	5 (17)	0 (0)	0 (0)
Medium	18 (58)	4 (13)	3 (10)	5 (16)	1 (3)	0 (0)
High	13 (42)	0 (0)	5 (16)	12 (39)	0 (0)	1 (3)
Total	49 (53)	7 (8)	12 (13)	22 (24)	1 (1)	1 (1)

© 2010 RCPE

An analysis of CK in tertiles using back-transformed mean data showed no association between CK and creatinine (p=0.08). The Pearson correlation co-efficient between log peak CK and log creatinine was 0.334, suggesting that only 11% of the variation in creatinine was accounted for by variations in CK.

Conclusion: Muscle trauma, exertion and hypoxia remain the most common causes of rhabdomyolysis in a contemporary population. There was no strong association between CK and serum creatinine in patients whose CK was >10,000 iu/l. A significant proportion of patients with rhabdomyolysis do not develop renal failure by RIFLE criteria, suggesting that muscle damage alone is not always sufficient to cause acute kidney injury.

POTENTIAL ACUTE KIDNEY INJURY ASSOCIATED WITH USE OF 'LEGAL HIGHS' IN LOTHIAN

F Duthie, N Dhaun, C Bellamy, P Gibson, J Neary
Department of Renal Medicine, Royal Infirmary of Edinburgh, UK

There has been recent media interest surrounding a reported increase in the number of patients presenting to hospital following ingestion of drugs commonly termed 'legal highs'. The Chief Medical Officer for Scotland issued a letter on 13 August 2010 asking for medical professionals to be aware of these drugs and their potential for harm. Here we describe the cases of four patients admitted to the Renal Unit at the Royal Infirmary of Edinburgh with acute kidney injury (AKI) between August and September 2010. All had unusual features to their AKI with the potential involvement of 'legal highs'.

A 28-year-old male presented with a seizure, agitation and behavioural disturbance following reported ingestion of the cathinone-derived stimulant flephedrone. He had an elevated creatine kinase, dark urine and haematuria. His serum creatinine peaked at 189 µmol/l. He was diagnosed with AKI consistent with rhabdomyolysis. This resolved with rehydration.

A 20-year-old male presented with severe bilateral loin pain. This developed three days after ingestion of a similar stimulant, mephedrone. He had proteinuria with associated AKI, with a creatinine of 289µmol/l. Renal biopsy showed only mild acute tubular injury. His symptoms and renal function resolved over several days following treatment with intravenous fluid and analgesia.

A further two cases of males aged 25 and 31 are also described. Both presented with abdominal pain. They were noted to have microscopic haematuria, proteinuria and AKI with relative hypertension. In these cases the serum creatinine rose to 275 and 269 µmol/l, respectively. Both patients had renal biopsies, neither of which provided adequate explanation for the AKI. Both patients had been intoxicated with alcohol several days prior to admission. In each case, the renal impairment was self-limiting, resolving over several days, and remained unexplained.

The effects of the ingestion of 'legal highs' are not well known, but recent clinical experience has reported similar effects to amphetamines. The majority of the patients who present to hospital are male. Behavioural disturbance and sympathomimetic effects usually predominate, and seizures have been reported. Nephrologists should be aware of the increasing problem of 'legal highs' as a potential cause for AKI.

RITUXIMAB AS PRIMARY THERAPY IN ANTI-GLOMERULAR BASEMENT MEMBRANE ANTIBODY DISEASE – CASE SERIES.

Y Shah
Arrowe Park Hospital, Wirral and Royal Liverpool Hospital, UK

Plasma exchange in combination with prednisolone and cyclophosphamide is the conventional treatment of anti-glomerular basement membrane antibody (anti-GBM) disease. However, the use of these immunosuppressants is not without risks of toxicity. Because of concerns for these risks, we used rituximab as primary therapy in three patients with anti-GBM disease. Our follow-up data (33–49 months) suggests rituximab is a safe and effective therapy for anti-GBM antibody disease.

Case 1: A 54-year-old man presented with serum creatinine 1,874 µmol/l and anuria. His anti-GBM antibodies were >680 U/ml. He was dialysis dependent from the outset and treated with IV methyl prednisolone (PMP) 1 g x 4, IV cyclophosphamide 500 mg and plasma exchange. He developed overt pulmonary haemorrhage by day five, along with thrombocytopenia and leucopenia. Because of fears of on going infection he was changed from cyclophosphamide to rituximab (375 mg/m^2 x 4 weekly doses). He received 50 sessions of plasma exchange to reduce his antibody levels. He remained dialysis dependent. He is now on the transplant list and no complications of rituximab have been noted, since its use 49 months ago.

Case 2: A 64-year-old man presented with serum creatinine 536 µmol/l. His serum was positive for anti-GBM antibodies (49 U/ml) and perinuclear anti-neutrophil cytoplasmic antibody (p-ANCA) (myeloperoxidase [MPO] = 369 U/ml). His renal biopsy showed 75% crescents. He was initially dialysis dependant. He received high-dose steroids and oral cyclophosphamide (50 mg/day), converting to rituximab (375 mg/m^2 x 4 weekly IV doses) seven days later because of thrombocytopenia. One week after the fourth dose of rituximab he became dialysis independent and his anti-GBM antibodies normalised six weeks later. His maintenance prednisolone

© 2010 RCPE

was stopped after 16 months. Thirty-seven months after presentation, his serum creatinine is 260 µmol/l and negative anti-GBM antibodies and p-ANCA (MPO).

Case 3: A 17-year-old man presented with serum creatinine 272 µmol/l and anti-GBM level of 131 units. On kidney biopsy 80% of glomeruli showed crescents. Cyclophosphamide therapy was declined because of concerns regarding fertility. He received PMP 1 g IV for four days along with two doses of rituximab 375 mg/m^2, one week apart and 17 plasma exchanges. GBM antibodies were normalised 20 days after rituximab was commenced. Maintainance treatment included oral prednisolone 30 mg daily, slowly tapered and stopped in one year. His serum creatinine after 33 months is 100 µmol/l and creatinine clearance of 60 ml/min.

Conclusion: Due to the rarity of this disease, it is difficult to perform randomised control studies. Our experience suggests rituximab is effective in anti-GBM disease and its use may avoid side effects associated with cyclophosphamide and limit steroid use and toxicity.

BLEEDING RISK IN PATIENTS UNDERGOING THERAPEUTIC PLASMA EXCHANGE FOLLOWING NATIVE RENAL BIOPSY

[1]AH Taylor, [1]E McQuarrie, [1]C Geddes, [2]KW Douglas, [3]B Mackinnon

[1]Glasgow, Clyde & Forth Valley Renal Service; [2]Department of Clinical Apheresis, Scottish National Blood Transfusion Service, Beatson Oncology Centre, Glasgow, UK; [3] Glasgow, Clyde & Forth Valley Renal Service, UK

Introduction and aims: Therapeutic plasma exchange (TPE) is a procedure used in immunological, neurological and haematological diseases that aims to remove large molecular weight substances from the plasma. In renal disease the removal of pathogenic autoantibodies, circulating immune complexes or immunoglobulins can reduce further renal damage and help reverse the pathological process. There is some concern, however, that platelet removal during TPE could result in an increased bleeding risk after native renal biopsy. We aimed to assess the risk of bleeding complication in those patients who received TPE following native renal biopsy.

Methods: Since 2000, details of all patients who have undergone native renal biopsy in Glasgow Royal Infirmary (GRI) and the Western Infirmary Glasgow (WIG) have been prospectively recorded. Patients receiving TPE were identified from information held on the electronic patient record (SERPR). To ensure that our study cohort was complete, a list of all patients who had undergone TPE in either renal unit was obtained from the Apheresis Unit in the Beatson Oncology Centre. Demographic details, pre- and post-biopsy haemoglobin and the development of a major bleeding complication (those requiring blood transfusion, surgical or radiological intervention) were documented. The risk of bleeding complications among patients undergoing emergency renal biopsy who then received TPE was compared with those not requiring TPE.

Results: Between 1 January 2000 and 30 December 2009 1,618 (108 per million people [pmp]/year) patients underwent native renal biopsy. Fifty-nine of these patients (4 pmp/year) required TPE treatment around the time of their biopsy. The average time at which TPE was commenced after biopsy was 3.20 days (standard deviation 5.94 days). Mean change in haemoglobin was –0.19g/dl (standard deviation 0.97g/dl), two (3.4%) patients had a major bleeding complication. This was not significantly different from those undergoing emergency renal biopsy but not then requiring TPE (–0.31g/dl and 14 [2.3%] patients respectively).

Conclusions: In this series of native renal biopsies, from two centres over a decade, treatment with TPE after biopsy was not associated with an increase in the risk of bleeding.

BENEFITS AND HARMS OF IMMUNOSUPPRESSIVE STRATEGIES FOR TREATMENT OF BIOPSY-PROVEN PROLIFERATIVE LUPUS NEPHRITIS

[1]P Masson, [2]LK Henderson, [2]AC Webster, [2]JC Craig

[1]Department of Renal Medicine, Royal Infirmary of Edinburgh, UK; [2]Cochrane Renal Group, Centre for Kidney Research, Sydney, Australia

Background: Lupus nephritis (LN) accounts for 1% of all patients commencing dialysis in the UK. Cyclophosphamide combined with steroids preserves renal function but with significant side effects. Newer immunosuppressive agents suggest reduced toxicity with equivalent rates of remission.

Methods: We searched MEDLINE, EMBASE, CENTRAL and conference proceedings to March 2010 for randomised controlled trials (RCTs) of immunosuppression for proliferative LN. Treatment effects were synthesised using random effects models and results expressed as relative risk (RR) with 95% confidence interval (CI).

Results: Twenty new RCTs (1,543 patients) of six comparators; cyclophosphamide (16 studies), azathioprine (six studies), mycophenolate mofetil (MMF) (11 studies), rituximab (two studies), tacrolimus (four studies) and cyclosporine (two studies) brought the total to 45 RCTs (2,458 patients). For induction therapy, MMF was as effective as cyclophosphamide in achieving stable renal function (five studies 1.05; CI 0.94–1.18) and complete remission of proteinuria (six studies, RR 1.07; CI 0.86–1.34). There was no difference in mortality or major infection, but a significant reduction in ovarian failure (four studies, RR 0.14; CI 0.04–0.51), alopecia (four studies, RR 0.28; CI 0.09–0.85) and lymphopenia (four studies, RR 0.36; CI 0.18–0.73). Three trials involving 371 patients compared MMF with azathioprine

for maintenance therapy. The risk of renal relapse was significantly higher with azathioprine (three studies, RR 1.90; CI 1.28–2.83), but there was no difference in maintaining stable renal function (three studies, RR 2.09; CI 0.89–4.94). Wide variation among other RCT interventions (including rituximab) and comparators precluded further cross comparisons and meta-analysis.

Conclusions: Considerable heterogeneity among interventions and comparators make firm conclusions challenging. On the basis of current evidence, MMF is as effective as cyclophosphamide in inducing remission in LN with a lower risk of certain adverse effects such as ovarian failure and lymphopenia. MMF is more effective than azathioprine in preventing relapse for maintenance therapy but is not superior in maintaining stable renal function with no significant difference in side effects. A strategic and collaborative approach to future trial design would enhance ability to compare treatment options.

INTEGRATING PALLIATIVE CARE WITHIN A LOW CLEARANCE CLINIC IS ASSOCIATED WITH IMPROVED OUTCOMES

[1]L Russon, [1]A Mooney, [2]J Ackroyd
[1]Leeds Teaching Hospitals NHS Trust, UK; [2]Calderdale and Huddersfield NHS Foundation Trust, Yorkshire, UK

Background: The *National Service Framework for Renal Services – Part Two: Chronic kidney disease, acute renal failure and end of life care* (2005) included a quality requirement for end-of-life care and recommended a jointly agreed palliative care plan with renal networks establishing links with palliative care services. This was reinforced by the end-of-life care strategy (2008), and a framework for implementation has also been produced which sets out how to achieve these goals. Since 2006, palliative care services in Leeds have been integrated within the renal services (patients receive identical care to patients choosing renal replacement therapy [e.g. anaemia management, dietetic support, etc.] within the same renal clinic, but medical review is by a palliative care consultant instead of a nephrologist). We now review the first three years' experience of this service.

Method: During this three-year period approximately 150 patients have been reviewed in the service with 77 deaths. Details of the end-of-life care and death of 74 of these patients were recorded to assess the role of palliative care for this group of patients.

Results: The numbers of conservative patients rose from 0% to 13% of the clinic (52 of approximately 400 patients). Mean age at death was 82 years (range 66.4–93); 73% lived for less than one year from date of referral (range two weeks to 35 months).

Seventy-seven deaths occurred among this cohort of patients (September 2006–September 2009) of which 57% were in preferred place of care (PPC) (home/nursing home/hospice) vs 25% among dialysis patients, and 45% among all deaths nationally. Death took place at home for 30% (average GFR 10.5, range 4.0–21.0); in a hospice for 13.8%; in a nursing home for 12.5%, and in an acute hospital setting for 43% (average GFR 10.8, range 4.6 –22.5).

Of the 20 hospital deaths, only six (30%) were recorded as being due to renal failure (1a or 1b on death certificate).

Seven patients (4.6% of referrals) changed their mind and were dialysed, one due to a change of religious beliefs, two due to family pressure and four when they became acutely fluid overloaded. Fluid overload has been the most difficult symptom to control.

Patient satisfaction with the integrated service is very high (100% on patient questionnaire). Overall, 82/126 (65%) receive input from social services (43% advice/support/signposting; 26% care package; 18% housing/benefits advice; only 8% fast-track support; all are offered bereavement counselling).

Conclusion: There is a significant role for palliative care in the management of chronic kidney disease. Integrating palliative care within the renal service has led to high patient satisfaction and referral rates, and improved outcomes for patients. The recent framework has recommended the development of regional leads. The first satellite clinic started in Calderdale in 2008 and funding has been approved to continue to roll out this model of care regionally.

DELIVERY OF END-OF-LIFE CARE FOR RENAL PATIENTS

K Henriksen, E Miller-Hodges
Royal Infirmary of Edinburgh, Edinburgh, UK

Introduction: Acceptance rates of patients onto dialysis have risen steeply in those aged over 65 in the past ten years. This is associated with increased co-morbidity and increased risk of death on dialysis. Consequently, the importance of end-of-life care for those with advanced kidney disease is highlighted in the *National Service Framework for Renal Services*. This audit aimed to review the history, management and outcomes of patients who died, or were identified as dying, in the Royal Infirmary of Edinburgh (RIE) renal unit.

Method: A retrospective case notes analysis was undertaken of all patients who died under the care of the RIE renal team, or were discharged to die elsewhere, over a nine-month period. Notes were examined for the accurate identification of patients potentially in the last

year of life, appropriate anticipatory care planning and the delivery of end-of-life care for patients identified as dying.

Results: During the audit period, 50 patients either died in the unit or were discharged for end-of-life care elsewhere, although incomplete records meant only 23 patients notes were analysed. Mean patient age was 72 (44–92) years. Performance status was not formally recorded but on retrospective analysis was two or above for the majority of patients. Multiple co-morbidities and frequent hospital admissions in the year preceding death were identified in almost all patients. No patient had a clear end-of-life care plan or an advance directive prior to admission, which was judged to have been appropriate in 83% of cases. Of the 23 deaths, 11 (48%) were expected and 12 (52%) 'unexpected' (i.e. patients were still receiving life-prolonging treatment). Of the 23 patients, 19 (83%) had active Do Not Attempt Cardio-Pulmonary Resuscitation (DNA CPR) orders. For those patients in whom death was expected, appropriate clinical goals were met. End-of-life symptoms were identified in the 'unexpected deaths' and in these symptomatic management was suboptimal.

Discussion: This audit demonstrates that approximately 15 patients known to the Edinburgh Renal Unit die per month, supporting the requirement to review current procedures for end-of-life care planning. Poor prognostic indicators were evident for those that died. However, this information was not being collated or responded to in a systematic manner. Clinical decision-making and formal advanced care planning could be better informed if admission documentation were to facilitate recording of this data. Current end-of-life care on the unit for those identified as dying is appropriate, in line with the goals identified in the Liverpool Care Pathway. In circumstances where CPR would be a medically unsuccessful intervention but ongoing active management continues, pre-emptive prescribing for end-of-life symptoms should be considered alongside active interventions in order to reduce the risk of a potentially distressing death.

INCIDENCE AND MANAGEMENT OF ACUTE KIDNEY INJURY IN SURGICAL PATIENTS AT A DISTRICT GENERAL HOSPITAL

AB Pearson AB, J O'Donnell
Borders General Hospital, Melrose, UK

Introduction: Acute kidney injury (AKI) is a serious issue for hospital inpatients, but the extent and management of the problem in this district general hospital has never been evaluated. Serum creatinine measurements and monitoring of urine output remain central to the Acute Kidney Injury Network and Risk Injury Failure Loss End-Stage Kidney Disease definitions of AKI, and are easily measurable in the ward setting.

Methods: This retrospective observational study looked at the creatinine results for one month in all surgical patients. Lab results were reviewed to identify inpatients demonstrating a rise in serum creatinine >26µmol/l or >150% from baseline over 48 hours. Only patients with a baseline eGFR >45ml/min and no evidence of impairment on admission were included. The quality of their management was considered in four areas: 1) the time to recognition of an impairment; 2) the management plan provided and its implementation; 3) the outcome in terms of renal function; 4) the presence of medical complications attributable to AKI.

Results: Out of 359 surgical patients, 21 cases were reviewed. The median rise from baseline creatinine was 167%. Overall care was judged as good, satisfactory or unsatisfactory in 67%, 19% and 14% of cases respectively. Three patients (14%) were not recognised as developing AKI. The average age of those developing AKI was significantly older than other patients (75.7 years vs 63.9 years, $p<0.001$). Post-operative hypovolaemia or sepsis contributed to precipitating AKI in 95% of cases. Ten (48%) of patients did not have accurate fluid balance, and this was related to use of catheters. Of the 15 patients on nephrotoxic medications, 11 (73%) did not have these reviewed. Three (14%) of patients had a urinalysis result recorded. One patient suffered a medical complication related to their AKI. Three patients died, with AKI not attributable in any case. Of the remainder, three patients (17%) were discharged without follow-up before function had returned to baseline.

Conclusions: The incidence of AKI observed (5.8%) was comparable to rates elsewhere. Overall, the majority of impairments were mild and 87% of patients received care judged to be 'good' or 'satisfactory'. Areas of concern remain in that: 1) some patients were not recognised as developing an impairment; 2) accuracy of fluid balance measurements was inadequate in half of cases; 3) many cases showed no evidence that nephrotoxic and harmful medications were reviewed; 4) the use of urinalysis is low; 5) appropriate monitoring of known cases was not always instigated. These issues indicate a role for concise guidelines available on the ward to advise junior staff on the recognition and important considerations when managing patients with an AKI.

© 2010 RCPE

PRE-DIALYSIS EDUCATION: HOW ARE WE DOING AND WHAT'S MISSING – LESSONS FROM NEW ZEALAND

[1]RL Powell-Jackson, [2]AM Churchhouse, [3]T Maddren, [3]N Peita, [3]WW Saweirs
[1]Department of General Surgery, Cheltenham General Hospital, Cheltenham, Gloucestershire, UK; [2]Department of General Surgery, Royal Infirmary of Edinburgh, Edinburgh, UK; [3]Renal Unit, Whangarei Hospital, Northland District Health Board, New Zealand

Introduction: There are few studies that examine both the impact and effectiveness of pre-dialysis education from the patient perspective. Fewer still look at ethnic variations in perceptions of dialysis. This study performed in Northland, New Zealand (NZ), aimed to both assess patient perspectives on dialysis and pre-dialysis education among NZ European and NZ Maori populations, and compare findings between these two ethnic groups.

Methods: Two anonymous, self-administered patient questionnaires aimed at assessing the views of patients on their preparation and education received before starting dialysis were distributed to patients at the two dialysis units in Northland; one questionnaire for those already receiving dialysis, and one for those yet to start dialysis who had received pre-dialysis education. Results were categorised and statistical analysis performed using the chi squared test.

Results: Both NZ European and Maori dialysis patients felt statistically less prepared for dialysis when asked about their feelings retrospectively compared with the feelings of pre-dialysis patients before starting dialysis ($p=0.046$). Maori patients on dialysis felt statistically less prepared for dialysis than NZ European patients on dialysis ($p=0.046$). However, Maori pre-dialysis patients did not feel statistically less prepared for dialysis than NZ European patients ($p=0.117$).

Discussion: While pre-dialysis patients feel that they are generally prepared for dialysis, patients who have experienced dialysis feel in retrospect that they were less well prepared. This implies that there is something that pre-dialysis education does not provide. This observation is particularly apparent in Maori, rather than NZ European, patients.

RETROSPECTIVE AUDIT: RATE OF HOSPITAL ADMISSIONS OF HAEMODIALYSIS PATIENTS AT A DISTRICT GENERAL HOSPITAL IN SCOTLAND

[1]J Chew, [2]N Velasco
[1]Ayr Hospital, UK; [2]Crosshouse Hospital, Kilmarnock, UK

Objective: We suspected an increasing frequency of vascular access-related hospitalisations in view of the high incidence of dialysis catheter use for long-term haemodialysis (HD) at our institution. A retrospective audit was conducted to identify the rate and causes of hospital admissions of HD patients in an attempt to recognise the needs of these patients so that admission numbers may be possibly reduced.

Methods: All patients over 18 years attending regular HD that were admitted to Crosshouse Hospital between 1 January and 30 June 2008 were included in the study. These patients were followed up for a period of 12 months from their first admission and were monitored for recurrent admissions, change in dialysis mode, transplantation and death.

Findings: In 2008, there were 139 patients registered under the John Lynch Renal Unit and regularly attending HD. A total of 46 patients were hospitalised during the six-month study period and accounted for 59 hospital admissions. The leading causes of hospital admission were vascular access-related problems (catheter infection, blocked catheters, problematic arteriovenous fistulas/grafts) (45.7%), general infections (22%) and acute cardiovascular events (15.3%). The rate of hospital admission per patient year at risk was calculated to be 0.85. The average length of admission per patient year was found to be 10.7 days. This was heavily influenced by long hospital stay caused by social rather than medical reasons. The rate of infection per patient year at risk was calculated to be 0.47. During the 12-month follow-up period, 14 out of 46 patients (70%) were deceased within a year. The most common cause of death was acute myocardial infarction followed by withdrawal from dialysis and sepsis. Two out of 46 patients (4%) received functioning permanent access creation, 29 out of 46 patients (63%) had recurrent admissions and one patient (2%) underwent subsequent kidney transplantation. Surprisingly, the proportion of readmissions had no correlation with recurrence of vascular access problems.

Conclusions: When comparing our findings with published data available for similar patient population elsewhere (United States Renal Data System), our rate of hospital admission of HD patients is not excessively high.

All hospital admissions were justifiable and were not preventable as these patients are associated with multiple co-morbidities requiring frequent medical attention. Nevertheless, efforts to reduce hospitalisation for this population group are desirable to improve patients' quality of care and to decrease unnecessary National Health Service expenditure.

© 2010 RCPE

FACTORS AFFECTING MORTALITY IN HAEMODIALYSIS PATIENTS

[1]M Griffiths, [1]M Pringle, [1]N Stephenson, [2]B Conway
[1]University of Edinburgh Medical School; [2]Royal Infirmary of Edinburgh, UK

Introduction: Haemodialysis patients have an increased mortality rate compared with the general population. We sought to investigate factors that predict mortality in a retrospective inception cohort of haemodialysis patients.

Methods: Data from 408 consecutive patients starting dialysis from 2003–2006 inclusive in the Lothian and Borders area were retrieved from our PROTON database and followed up until September 2010. For each patient, age, socioeconomic status, mode of vascular access, cause of renal disease, weight and body mass index (BMI) at the time of commencing dialysis were obtained. In addition, blood pressure, urea reduction ratio, albumin, C-reactive protein (CRP), parathyroid hormone (PTH), calcium, phosphate, potassium and haemoglobin were recorded for each patient three months after they started dialysis. Kaplan-Meier survival analysis, univariate analyses and a multivariate regression analysis were employed to determine which factors significantly affected mortality.

Results: Of the total 408 patients, 253 died (62%) with a median survival of 3.43 years. On univariate analysis, age, cause of disease, mode of vascular access, body weight, BMI, diastolic blood pressure, phosphate, calcium, albumin, CRP and haemoglobin were shown to significantly impact on mortality. On multivariate analysis age and CRP positively correlated with risk of death, while body weight, albumin and haemoglobin negatively correlated with mortality. Only age, CRP and haemoglobin independently influenced cardiovascular mortality. Interestingly haemoglobin values over 120 g/l were associated with improved survival, largely due to a reduction in cardiovascular events.

Conclusion: In our haemodialysis cohort, increasing age and CRP levels were associated with increased mortality, while increased weight, albumin and haemoglobin levels conferred a reduced risk of death.

WHAT ASPECTS OF HAEMODIALYSIS TREATMENT MOST CONCERN PATIENTS?

[1]KP Murphy, [2]CE Whitworth
[1]University of Edinburgh Medical School; [2]Department of Renal Medicine, Royal Infirmary of Edinburgh, Edinburgh, UK

Background: Haemodialysis is a repetitive and intensive treatment for those with a variety of renal conditions. Patients' lifestyles have to be altered drastically in order to fit in this time-consuming process. This project investigated how patients rate their treatment experience.

Methods: A questionnaire was designed to ask patients to grade their opinions and experiences using a scale-answer mechanism. Questions were designed to cover the patient's clinical experiences, physiological symptoms, psychosocial adaptations and self-perceived personality changes.

Results: A total of 113 patients were questioned. The most negative responses were psychosocial concerns, namely dependency on dialysis, a hesitancy to travel on holiday, an inability to enjoy the same activities and hobbies as before and a decrease in social life. The length of time on dialysis bothered many. Staff performance was rated best among the survey questions.

Conclusions: Patients on haemodialysis are most concerned by the lifestyle changes necessary to undertake treatment. Actions to limit the time taken up by dialysis, such as improving travel arrangements and reducing waiting times could allow for a lesser impact of treatment on normal lifestyle. Improved information services on travel options may also benefit patient freedom. Patients preferred smaller units with higher nurse to patient ratios.

AGEING – A KEY MODULATOR OF RENAL INFLAMMATION AND SCARRING

D Ferenbach, R Hughes, M Vernon, S Clay, DC Kluth, J Hughes
Queen's Medical Research Institute, University of Edinburgh, UK

Introduction: Ageing has important biological effects and affects inflammatory and immune responses. For example, older individuals are at increased risk of developing acute renal failure and recover less well than young individuals. This project explored the effect of ageing in two diverse murine models of kidney inflammation and scarring – acute kidney injury (AKI) induced by clamping the renal vessels (20 minutes) and unilateral ureteric obstruction (UUO) induced by surgical ligation of the left ureter. Female mice aged either two months (young) or 12 months (aged) were used in these experiments. Both aged and young mice exhibited normal baseline renal function and no significant proteinuria.

AKI model: Serum creatinine and the acute tubular necrosis (ATN) score was determined 24 hours following the induction of AKI. Aged mice exhibited significantly worse acute renal failure (creatinine 38±6 vs 120±35 μmol/l; young vs aged; $p<0.01$) and ATN (55±0.4 vs 75±1.2 % ATN; young vs aged; $p<0.001$). Interestingly, the medulla of aged mice exhibited defective induction of hemeoxygenase-1 (HO-1), a key anti-inflammatory enzyme that plays a critical role in tissue protection. HO-1 expression was reduced five-fold in the medulla of aged mice compared with young mice.

Furthermore, pretreatment of aged mice with the potent HO-1 inducer hemearginate (HA) strongly induced HO-1 and significantly improved renal function (creatinine 128.5±31.5 vs 49.6±6.3 vs 68.0±10.0 µmol/l; aged+PBS vs aged+HA vs young+PBS; $p<0.05$) and reduced tissue injury (58.4±12.9 vs 21.0±6.5 % ATN; aged+PBS vs aged+HA; $p<0.05$).

UUO model: The left kidneys of young or aged female mice were surgically obstructed and removed after three or seven days. Kidney tissue sections were immunostained for HO-1, F4/80 (macrophage marker), smooth muscle actin (SMA – a myofibroblast marker) and collagen I (scar tissue). Immunostaining was quantified by computer image analysis and expressed as per cent of surface area. Unlike AKI, minimal HO-1 upregulation was evident in UUO. Aged mice exhibited increased F4/80 expression at day three but no difference at day seven. Interestingly, aged mice exhibited significantly less SMA expression at days three and seven (day seven SMA: 13.1±0.8 vs 5.8±1.2 % of surface area; young vs aged; $p<0.05$). Collagen I expression was also significantly reduced in aged mice at days three and seven (day seven collagen I: 19.95±0.81 vs 15.31±1.5 % of surface area; young vs aged; $p<0.05$).

Conclusion: Aged female mice exhibit worse renal failure and increased tissue damage following AKI, compared with young mice. In contrast, aged female mice exhibit reduced levels of scarring in UUO. These differences may reflect the failure of HO-1 upregulation in older mice following AKI and the effect of cell senescence on macrophages or intrinsic kidney cells in the fibrosis that follows UUO. Upregulation of HO-1 protects aged mice from AKI and represents a potential therapeutic target for the vulnerable aged kidney.

Funding source: Kidney Research UK and Medical Research Scotland (Ferenbach) and the Nuffield Foundation (Hughes).

HAEMOLYTIC URAEMIC SYNDROME IN SCOTLAND – 1987–2009

[1]MC Convery, [2]BD Oates, [1]IJ Ramage
[1]Renal Unit, Royal Hospital for Sick Children, Yorkhill, Glasgow; [2]Paediatrics, Crosshouse Hospital, Kilmarnock, UK

Objectives: To describe the clinical features, treatment and outcome of haemolytic uraemic syndrome (HUS) in Scotland over the past 23 years.

Methods: A retrospective case note review of children presenting with a clinical diagnosis of HUS to a national paediatric nephrology centre between 1987 and 2009.

Results: Three hundred and seven children were identified (145 [47%] males), with a median age of 3.2 years (range 0.2–14.9). A diarrhoeal prodrome was present in 298/307 (97%) with *E.coli* 0157 identified in 180/250 (72%). At presentation, associated clinical features were anuria 118/273 (43%), hypertension 105/304 (35%), hyperkalaemia 71/307 (23%), hypovolaemia 40/258 (16%) and clinical fluid overload 59/260 (23%). Dialysis was required in 237/306 (77%). Peritoneal dialysis was undertaken in 197/303 (65%) and haemodialysis in 76/301 (25%) with 38/301 (13%) receiving both. Two patients did not recover renal function; of those that did the average dialysis duration was 12 days for haemodialysis and ten days for peritoneal dialysis. Median hospital stay was 14 days (2–137). A median of two transfusions (1–12) were undertaken in 295/303 patients. Seizures occurred in 9% of children, with a significant association with hyponatraemia $p=0.007$ (2-sample t-test), and 11/306 (4%) required a laparotomy and 4/306 (1.3%) developed diabetes. There were five deaths (1.6%). Follow-up ethylene diamine triacetic acid (EDTA) glomerular filtration rate (GFR) data were available in 131/307, mean 111.2 ml/min/1.73m^2 with 16/131 (12%) having a GFR < 80. Blood pressure was documented as normal in 250/302 (83%) and proteinuria resolved in 200/302 (66%).

Conclusions: We report data from a large cohort of patients treated in a single centre and found death or endstage renal disease in 2.3%, with 12% having evidence of an impaired GFR.

FACTORS ASSOCIATED WITH OUTCOME IN LITHIUM INDUCED NEPHROPATHY

[1]M Kolhatkar, [1]C Deighan, [1]C Stirling, [1]L Hamilton, [2]A McConnachie
[1]Glasgow, Clyde & Forth Valley Renal Service; [2]Robertson Centre for Biostatistics, University of Glasgow, UK

Introduction: Lithium, used in the treatment of bipolar disease, is nephrotoxic, causing nephrogenic diabetes insipidus (NDI) and chronic interstitial nephropathy. In patients with chronic kidney disease (CKD) secondary to lithium, the rate of progression of CKD is variable, available guidance on cessation of lithium is lacking and the parameters influencing renal outcomes remain to be established.

Methods: Patients attending the renal outpatient clinics at Glasgow Royal Infirmary with a diagnosis of chronic lithium nephrotoxicity or NDI secondary to lithium were identified from the electronic patient record (EPR). In addition we included all patients with CKD who were on or had previously been treated with lithium. Patients registered on the EPR due to an episode of acute lithium toxicity were excluded.

Data were collected from the patient's first outpatient clinic appointment to February 2009 for blood pressure (BP)

(systolic and diastolic), albumin creatinine ratio (ACR), protein creatinine ratio (PCR), creatinine and estimated glomerular filtration rate (eGFR). Dates of commencement of renal replacement therapy (RRT), discharge from clinic and death were obtained. A retrospective cohort was constructed, from all patients with baseline data of BP, ACR, PCR and eGFR. The association between baseline factors, including age and use of lithium, on the time the composite outcome of death/RRT/halving of eGFR was analysed.

Results: Sixty-two patients (29 male, 33 female) were identified between 1 September 1990 and 30 November 2008 with a mean age at diagnosis of 59 years. Fifty-two were taking lithium at baseline, of whom 41 subsequently stopped lithium.

A retrospective cohort was constructed of 46 patients with complete baseline measurements of systolic BP, diastolic BP, ACR and PCR and eGFR. The mean age of this cohort was 60 years; mean eGFR was 33.2 ml/min (range 5.6–65). Median time of follow up was five years (seven months–18 years). The rate of progression of eGFR was found to be 0.8 ml/min/year. Comparison of mean slopes for the patients on and off lithium was not possible due to the marked heterogeneity of the data. Within the retrospective cohort, eight patients died, three patients progressed to RRT, and eGFR halved in six patients.

In total, ten patients (22%) reached the composite endpoint of death, RRT or halving of eGFR. On univariate analyses, time to this composite endpoint was associated with ACR≥30 ($p=0.016$), PCR≥50 ($p<0.001$), age ($p=0.076$), systolic BP ($p=0.029$), eGFR ($p=0.002$) and creatinine ($p=0.003$). Use of lithium at baseline was not associated with the composite endpoint. On multivariate survival analysis, age (hazard ratio per year; 1.08, $p=0.050$) and PCR≥50 (hazard ratio; 13.5, $p<0.001$) were independent predictors of outcome.

Conclusions: Lithium use at baseline did not predict outcome in this study. Several parameters were associated with outcome, but many of these confounded with each other. Those most strongly associated with outcome were ACR and PCR, in keeping with other population studies of CKD.

DOES LITHIUM-INDUCED CHRONIC RENAL FAILURE IN PSYCHIATRIC PATIENTS REALLY EXIST? EFFECTS OF AGE, HYPERTENSION AND OTHER CO-MORBIDITIES MAY PREDOMINATE

Y Shah, K Abdulnabi, J Alexander, M Bone, P McClelland, A Crowe

Arrowe Park Hospital, Wirral, and Royal Liverpool Hospital, UK

Introduction: Lithium salts (Li) have been used in psychiatry for some 50 years. The earliest renal side effect was nephrogenic diabetes insipidus (NDI). More recently a role in chronic progressive renal failure (CRF) has been recognised. Because Li has been such a safe and effective agent, a common strategy was to reduce the dosage and monitor kidney function. More recently there has been a tendency to withdraw Li entirely. We have found that other co-morbidities may have a more prominent role.

Patients: From 1,990, 37 patients (20 female; 17 male) aged 37–83 (median 60) years were referred with renal impairment, potentially from Li therapy. Li exposure ranged from 1–40 (median 12) years. On referral, all but one (in end stage CRF) had mild–moderate CRF, protein/creatinine ratio (pCr) 86–288 (median 150) µmol/l. Proteinuria was low (0–0.5, median 0.2 g/24h) apart from one nephrotic diabetic.

Co-morbidities at presentation:

a) Age: half were elderly (>60 years);
b) Hypertension: 23 patients (62%) plus two others on follow-up;
c) NDI: 13 (35%)
d) Cardiovascular: 13 (35%);
e) Prostatic obstruction: six (16%);
f) Liver (alcohol): four (11%);
g) Diabetes mellitus: three (plus one on follow-up);
h) Non-Li drugs: four (analgesics, angiotensin converting enzyme inhibitors, olanzepine);
i) Nephrocalcinosis: one.

Results:

a) The duration of Li therapy had no effect on renal function on presentation;
b) The effects of withdrawing Li were inconclusive: some patients got better, some worse;
c) Two patients, both hypertensive were stable for two–three years, then lost to follow-up for five–seven years, returning with poor blood pressure control, more proteinuria and worse renal function (<40% of previous value). One had stopped Li, the other was still on Li therapy;
d) Mortality occurred in the older patients with more co-morbidities (especially cardiovascular).

Discussion: Water deprivation, as in Li-induced NDI, can depress renal function, but this should be reversible.

However, Li-treated psychiatric patients have usually been on this therapy for many years, often starting in middle age.

Age, hypertension, prostatic hypertrophy, diabetes, reno-vascular disease and cardiac disease can all affect renal function adversely in the longer term. These factors were prevalent in our population of Li-treated patients with CRF. Perhaps these points have been under-reported in earlier series, and the role of Li in the causation of chronic kidney disease may have been overemphasised.

Summary: The role of Li in the origins of CRF in psychiatric patients has been examined. A high prevalence of other significant co-morbidities, such as hypertension, age, cardiovascular disease and diabetes mellitus, has been identified. Perhaps these have a greater effect on the long term than Li itself. Nevertheless, Li-treated patients should all be closely monitored regarding blood pressure and renal function.

HOME, HOSPITAL AND PERITONEAL DIALYSIS EFFICACY USING STANDARDISED KT/V

ND Gunatillake, R Mactier, M Black, M Thomson, S McManus
Glasgow, Clyde & Forth Valley Renal Service, UK

Background: There is no universally accepted method of quantifying dialysis dose across different haemodialysis schedules. European Best Practice Guidelines cite equilibrated Kt/V as the preferred method of quantifying dialysis dose. However, multicentre data from Europe shows that this is not in widespread use[1]. The majority of units use urea reduction ratio (URR). The method of URR cannot be applied to home haemodialysis patients with differing dialysis regimens. Standardised Kt/V is a validated measure of dialysis efficacy over seven days.[2]

Aim: To evaluate the efficacy of home haemodialysis by retrospectively auditing the standardised Kt/V in home, hospital and peritoneal dialysis patients. To compare standardised Kt/V between high and low frequency home haemodialysis.

Results: There were 31 home haemodialysis (home HD), 26 peritoneal dialysis (PD) and 70 hospital haemodialysis (hospital HD) patients studied. The mean standard Kt/V for home HD was 2.7 (95% CI ±0.21), Hospital HD 2.4 (CI ±0.03) and PD 1.5 (CI ±0.14). Figure 1 shows the mean standard Kt/V for each modality. Within the home HD group, 26% performed daily dialysis (mean Kt/V=3.40), 62% perform dialysis three times per week (mean Kt/V=2.30).

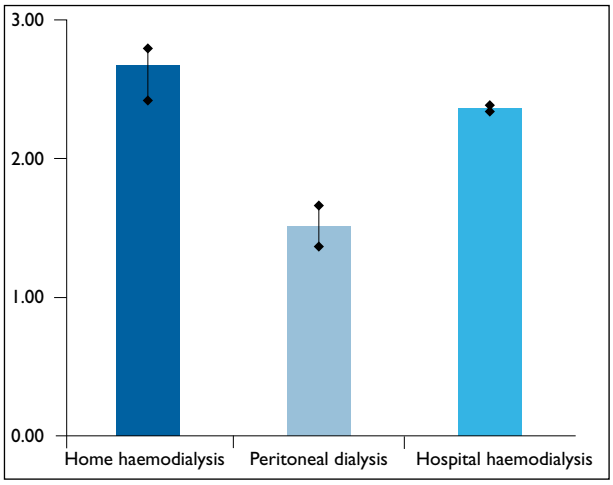

FIGURE 1 Mean standard Kt/V for home haemodialysis, peritoneal dialysis and hospital haemodialysis

Implications: Home haemodialysis at Glasgow Royal Infirmary is as efficacious as hospital-based therapies. The generation of Kt/V values should be routinely incorporated into patient management to ensure adequacy of home haemodialysis.

References

1 Couchoud C, Jager J, Tomson C et al. Assessment of urea removal in haemodialysis and the impact of the European Best Practice Guidelines. *Nephrol Dial Transplant* 2009; 24:1267–1274.
2 Gotch F. The basic, quantifiable parameter of dialysis prescription is Kt/V urea; treatment time is determined by the ultrafiltration requirement; all three parameters are of equal importance. *Blood Purif* 2007; 25:18–26.

A COMPARISON OF OPEN AND LAPAROSCOPIC PERITONEAL DIALYSIS CATHETER INSERTION.

[1]J Downie, [2]M Ashton, [2]ME Flett, [1]IJ Ramage
[1]Renal Unit and [2]Department of Surgery, Yorkhill Hospital, Glasgow, UK

Peritoneal dialysis (PD) is the predominant method of renal replacement therapy in children, with catheter insertion increasingly undertaken laparoscopically. A retrospective case note study was undertaken, comparing the survival and complications of both laparoscopic and openly inserted PD catheters.

Patients were identified using procedure coding in two databases: HISS and PROTON between 1 January 2008 and 31 December 2009. Case notes were assessed to determine technique of insertion, specialty of operating surgeon, demographics and rates of complication.

Thirty-seven children were included, encompassing the insertion of 44 PD catheters. Twenty (45.5%) were inserted for acute renal failure (ARF) and 24 (54.5%) for chronic renal failure (CRF). Forty-three of 44 (97.7%) PD catheters were inserted by a consultant, of these 23 (53.5%) were inserted by a urologist. The remainder were inserted by a general paediatric surgeon (20) or trainee (1).

Twenty-nine (66%) catheters were inserted laparoscopically, 19 (65.5%) by urologists as compared with ten (34.5%) by general surgeons, while 15 (34%) underwent open insertion, 4 (26.7%) by urologists as compared with 11 (73.3%) by general surgeons.

PD catheter survival for ARF was 14.7 days and for CRF was 142 days, although 12 catheters, originally inserted for CRF, remained in situ at the time of data collection.

A total of 44 episodes of complications were recorded in 26 (59%) catheters (Figure 1). Of these 44 complications, 33 (75%) were seen in catheters that had been inserted laparoscopically and 11 (25%) were seen in openly inserted catheters. Complication rates were calculated per catheter according to whether the catheter had been inserted by a urologist or a general surgeon. Urologists had complication rates of 0.9 and two per catheter when they were inserted laparoscopically and by open procedure respectively. General surgeons had complication rates of 0.8 (laparoscopic insertion) and 1.2 per catheter (open insertion).

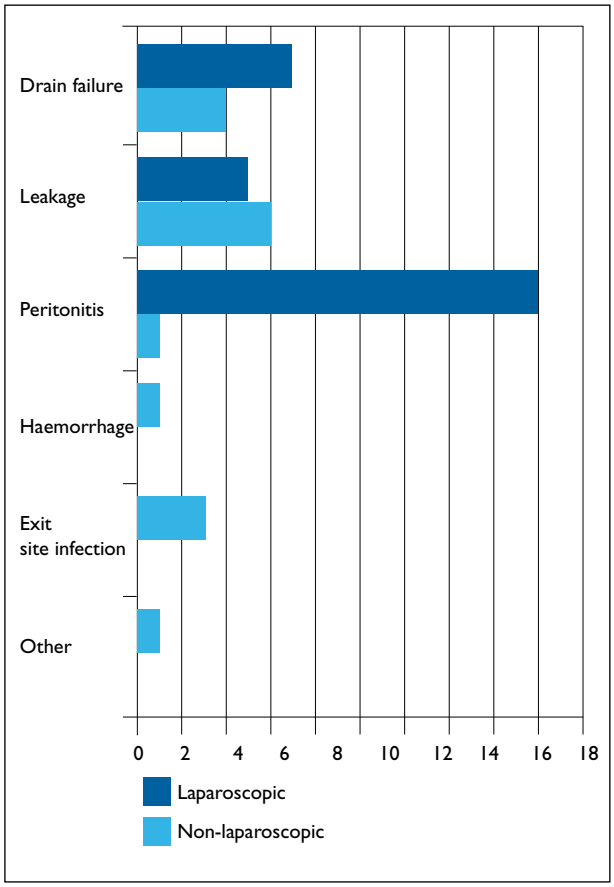

FIGURE 1 The number of complications recorded following catheter insertion.

There were eight complications seen in the first month following insertion, necessitating the removal of six catheters. These early complications comprised either leakage or drainage failure and were all seen in the acute renal failure group.

Our study suggests that there was no significant difference in complication rates comparing either method of insertion by urologists to general surgeons. A higher complication rate was seen following laparoscopic catheter insertion, although many of these catheters were inserted for chronic renal failure and would be expected to remain in situ for longer and thus would be more susceptible to complications. Analysis of early complications revealed an increased incidence of complications in catheters inserted for acute renal failure by general surgeons in the emergency setting without the benefit of elective preparation.

POST-TRANSPLANT ANAEMIA IN PAEDIATRIC ALLOGRAFT RECIPIENTS: A COMPARISON BETWEEN MYCOPHENOLATE MOFETIL AND AZATHIOPRINE

[1]A Lamb, [2]J Boyle, [1]I Ramage, [1]L Krischock
[1]Renal Unit, Royal Hospital for Sick Children, Glasgow; [2]Faculty of Medicine, University of Dundee, Dundee, UK

Aims: To compare the prevalence of post-transplant anaemia (PTA) in paediatric renal allograft recipients treated with mycophenolate mofetil (MMF) or azathioprine (AZA).

Methods: Data were collected from all renal allograft recipients aged <18 years between January 2002 and March 2009 at the Royal Hospital for Sick Children (RHSC), Glasgow. Prior to 2006 immunosuppression was AZA, tacrolimus and prednisolone and after 2006 MMF, tacrolimus, daclizumab and five days' prednisolone.

Results: Sixty-two renal allograft recipients, mean age 12.2 ±4 years, transplanted between January 2002 and March 2009; 56.5% were male, 95.2% were recipients of their first renal allograft and 53.2% were deceased donor recipients. Pre-transplant haemoglobin (Hb) levels were similar between the groups (11.2 ±1.6 g/dl taking AZA, vs 11.6 ±1.4 g/dl on MMF, not significant [NS]). Patients who received MMF following transplantation had a significantly lower mean Hb than those on AZA (9.9 ±1.2 g/dL vs 10.6 ±1.1 g/dL, p=0.015). At three months and one year post-transplantation, mean Hb was similar between the groups. However, significantly more patients receiving MMF were prescribed an erythropoietin-stimulating agent (ESA) at three months (25% vs 4%, p=0.025). This difference was maintained at one year, (22% vs 8%, NS).

Discussion: Use of MMF in our paediatric transplantation population has facilitated a steroid free immunosuppression regimen, but at the cost of lower haemoglobin levels. Continuation of ESAs in the peri- and post-transplant period, particularly in patients on MMF, is warranted.

HYPERPARATHYROIDISM PERSISTING AFTER RENAL TRANSPLANTATION

O Farhan-Alanie, M McMillan
University of Glasgow and Glasgow, Clyde & Forth Valley Renal Service

Abnormalities of calcium and phosphate metabolism are implicated not only in renal bone disease but also in premature cardiovascular disease. Hyperparathyroidism persisting after renal transplantation may contribute to risk in transplant patients. Parathyroid hormone (PTH) is measured routinely in dialysis patients, but may be overlooked in transplant patients. We assessed the changes in bone biochemistry (serum calcium, phosphate, alkaline phosphatase and PTH concentrations) following renal transplantation in our unit.

The study was performed in two phases, with data extracted from the Renal Unit database. The first, retrospective, phase assessed all 140 patients receiving renal transplants between 1 January 2007 and 15 June 2008. Bone biochemistry and renal function were assessed at four, eight and 12 months after transplantation, and compared with the pre-transplant values. Following transplantation the improvement in serum calcium x phosphate product mirrored the improvement in renal function, with maximum improvement achieved at four months after transplantation (calcium x phosphate product improved by mean + standard deviation [SD] 48+24%). Few PTH levels were available for this retrospective analysis, so we decided to collect four-month data, including PTH levels, in a prospective population.

This second phase of the study assessed 89 patients receiving renal transplants from 1 June 2009 to 31 May 2010. All those continuing after four months to attend locally for follow-up had measurements (mean + SD) of calcium (2.59+0.19 mmol/l), phosphate (0.79+0.22 mmol/l), alkaline phosphatase (175+184 U/l) and creatinine (123+60 µmols/l). PTH measurements were available in 51 patients, of whom 46 had paired, comparable pre- and post-transplant values (49+31, and 35+38 pmol/l). Analysis of paired data for the population confirmed a fall in parathyroid hormone level after transplantation ($p<0.001$), but PTH rose after transplantation in ten patients and 28 patients still had PTH>20 pmol/l. Post-transplant calcium x phosphate product correlated with creatinine ($p<0.05$) but not with PTH. Post-transplant PTH correlated with serum alkaline phosphatase ($p<0.001$) and with the difference between calcium and phosphate concentrations ($p<0.05$), but neither approach identified all patients with persisting hyperparathyroidism.

Our data show early improvement in hyperparathyroidism in most patients after transplantation. Some patients, however, remain hyperparathyroid and require identification and continuing monitoring.

AN AUDIT OF PATIENT SATISFACTION IN THE RENAL TRANSPLANT CLINIC SETTING

[1]M Kolhatkar, [2]S Methven, [3]J Traynor, [1]C Geddes, [1]S Rodger
[1]Glasgow, Clyde & Forth Valley Renal Service; [2]Renal Unit, Crosshouse Hospital, Kilmarnock; [3]Renal Unit, Monkland Hospital, Airdrie, UK

Background and aims: Patients' satisfaction in the outpatient clinic experience is dictated by a number of factors; waiting times, the facilities in the outpatient department and length and quality of the consultation itself. The configuration of outpatient transplant services in Glasgow changed considerably in 2009. The aims of this audit were twofold: to document the level of satisfaction in the new service and identify areas for further improvement.

Methods: A questionnaire was distributed to all return patients attending a renal transplant clinic in the Western Infirmary, Glasgow, for four consecutive weeks in May 2006 and 2007. This audit cycle was repeated in February 2010 at the renal transplant clinics in the New Victoria Hospital and Stobhill Hospital, Glasgow. The patients completed the questionnaire independently and anonymously during the visit and returned it to nursing staff. Comparison was made between the 2006, 2007 and 2010 responses. Changes in practice were introduced following the 2007 questionnaire; patients were invited to bring a urine sample to the clinic, and to have venepuncture performed while waiting to see the doctor.

Results: Demographic data (2010): The respondents were predominantly middle-aged white Scottish, and 42% were male. Forty two per cent were in employment and the majority had been transplanted >5 years. Patients attend the clinic frequently, with 90% of respondents attending every three months or less.

Waiting times: Comparing the new clinics (2010 audit) to the results from 2006 and 2007, improvements were demonstrated in waiting times for using the toilet to provide a urine sample, seeing the doctor and venepuncture.

Areas for improvement: Waiting time to see the doctor has been identified consistently throughout the audit cycles as an area that patients would like to improve; however the percentage highlighting this as an issue has fallen from 2006 to 2010.

Overall patient satisfaction is high (mean score: New Victoria Hospital 88.2%, Stobhill Hospital 77.5%).

Conclusion: Since the introduction of improvements identified by previous audit cycles, and the reconfiguration of transplant services in Glasgow, the waiting times reported by patients have fallen. Overall patient satisfaction is high, but a number of areas for improvement remain. It will require input from all members of the multidisciplinary team to achieve these improvements.