

ABSTRACTS OF SOCIETIES

Scottish Renal Association

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Prediction of Glomerular Filtration Rate in the General Population is Improved by the Mayo Clinic Quadratic Equation.

C Tait, J Davidson, A Severn

Ninewells Hospital and Medical School, Dundee, DD1 9SY

Background: Currently, reports of estimated glomerular filtration rate (eGFR) in the UK are derived from the 4-variable modification of diet in renal disease (MDRD) formula. This was developed from a cohort with kidney disease (CKD) and excluded healthy subjects. The equation has been known to underestimate GFR in the healthy population as a result of this. There is evidence that the Mayo Clinic quadratic equation (MCQ), which was developed from both healthy individuals and those with CKD, may be more accurate in estimating GFR.^{1,2} **Objective:** To assess the accuracy of the Mayo Clinic quadratic equation for estimation of GFR, in individuals belonging to the Tayside population attending for measurement of actual GFR. **Design:** Prospective study. **Setting:** Ninewells Hospital and Medical School, Dundee, UK. **Participants:** Patients attending Nuclear Medicine for actual GFR measurement (n=36) - females (n=28), males (n=8). Age of participants ranged from 21 to 81 and actual GFR measurements from 19-122ml/min/1.73m². **Measurements and Methods:** Serum creatinine levels, actual glomerular filtration rate, age and sex of participants were recorded. Data was incorporated into the MCQ and 4-variable MDRD equations to produce eGFR values for each participant. Measured GFR was plotted against MDRD and MCQ estimates, and slopes, intercepts and correlation coefficients calculated. Bland Altman analysis was also performed. **Results:** In 80.6% of subjects the MCQ was more accurate in its prediction of GFR compared with the MDRD equation. In females, plotting MCQ eGFR against measured GFR produced a slope of 0.856, intercept of 12.29 and a correlation co-efficient of 0.915, compared with 0.820, 15.77 and 0.657 respectively for MDRD eGFR against measured GFR. In males, MCQ eGFR against measured GFR produced a slope of 0.794, intercept of 5.20 and a correlation co-efficient of 0.933, compared with 0.697, 8.70 and 0.728 respectively for MDRD eGFR against measured GFR. The MCQ underestimated GFR in all male subjects, and in 25% of females. The MDRD underestimated GFR in 75% of males and in 33% of females. Despite the higher level of underestimation in males, the MCQ was still 75% more accurate than the MDRD in male subjects. Overall, the MCQ underestimated GFR slightly less than the MDRD did - (47.2% compared with 50%). **Limitations:** The scale of the study was limited by relatively low number of actual GFR measurements carried out each month and hence number of potential participants. Although the ranges for age and GFR were variable and the population relatively independent, co-morbidities were unknown. It is therefore unknown just how demographically reflective this group was of the general population. **Conclusions:** Although small scale, this study implies that the MCQ should be considered for use within the general population, in those whom GFR is unknown. A larger study is needed.

For references, see www.smj.org.uk

Endothelin Receptor Antagonism and Renin Inhibition as Treatment Options for Scleroderma Kidney: A Case Report

I MacIntyre, N Dhaun, C Bellamy, D Kluth

Department of Renal Medicine and Department of Pathology, Royal Infirmary of Edinburgh.

Introduction: Scleroderma renal crisis (SRC) is an important complication of scleroderma associated with significant morbidity and

mortality. Current treatment of SRC focuses on renin-angiotensin-aldosterone system (RAAS) blockade. Here we present a case of SRC in a patient on maximal, clinically-tolerated RAAS blocking treatment.

Case Presentation: A 60 year-old woman was referred to the renal clinic in March 2008 with blood and protein in the urine. She had a past history of hypertension controlled on four agents including maximal dose of an angiotensin receptor blocker. She had proved intolerant of angiotensin converting enzyme inhibitors due to cough. The patient had also been diagnosed with mixed connective tissue disease which had been treated with prednisolone and methotrexate (1995-2005). More recently (mid-2007), she had been diagnosed with pulmonary fibrosis with associated severe pulmonary arterial hypertension. High dose prednisolone was started for this. Renal assessment showed the patient to have ~4g/d of proteinuria. This had increased from 0.1g/d over 4 months. Renal function, over the same period, had declined (serum creatinine rising from 80 to 115µmol/l). Blood pressure (BP) was now 150/80. Immunology revealed a positive antinuclear antibody with a speckled staining pattern and positive anti-Sm/RNP antibody. A renal biopsy was performed. This showed aneurysmal blood vessel dilatation with severe luminal narrowing- a pathological diagnosis of a malignant vascular injury (thrombotic microangiopathy), and a clinical diagnosis of a scleroderma renal crisis was made. In April 2008 the patient was started on an endothelin (ET) receptor antagonist for treatment of her pulmonary arterial hypertension. Within 4 weeks proteinuria fell dramatically to 1.2 g/d. This was in the absence of any BP change. In June 2008 the patient's nifedipine dose was doubled to 20mg bd due to worsening Raynaud's syndrome. This reduced both systolic and diastolic BP by ~10 mmHg, respectively. Proteinuria did not change. In July the patient was started on the direct renin inhibitor, aliskiren. Systolic BP fell by a further ~20 mmHg. Proteinuria fell to the microalbuminuria range. Over the period of time that these treatments were introduced serum creatinine rose from ~115 to a peak of ~150µmol, a rise of ~30%. To date, the effects on BP and proteinuria have persisted, and renal function has since improved. **Conclusion:** In patients with SRC, the direct renin inhibitor, aliskiren, provides an additional mechanism to block the RAAS. ET receptor antagonists are a novel class of drug that may offer therapeutic benefits in SRC on top of standard treatment.

An Audit of Blood Pressure Management to Support the Implementation of SIGN Guideline 103 in Rural General Practice in Orkney.

FM Doyle¹, CGM Millar¹, C Siderfin³, C Black²

¹Renal Unit, Aberdeen Royal Infirmary

²Department of Population Health, University of Aberdeen

³NHS Orkney

Background: SIGN published guidelines for the diagnosis and management of chronic kidney disease (CKD) in 2008, recognising the increasing recognition of CKD in primary care and the challenges encountered in its management. Blood pressure management forms a cornerstone of caring for the CKD patient within the guidelines. SIGN highlighted the need to understand current clinical practice prior to implementing the new guideline and highlighted the need to develop audit tools based around these recommendations. **Aim:** To report on the current prevalence and management of CKD stage 3-5 in primary care and compare these with the recommendations as set out in SIGN guideline 103. **Method:** A selection of Orkney general practices - 2 island-based and 2 on the Mainland - participated in this study. The CKD register of each practice was accessed and data regarding individual patient's demographics, blood pressure, proteinuria and hypertension management were collected. This was analysed using STATA version 10. A survey was sent to members of the Orkney Kidney Patients' Association asking for their views on the sample patient information sheet on CKD in SIGN 103. **Results:** 285 patients were registered on the four practice CKD registers as having CKD stage 3-5 of which 228 were suitable for inclusion in the final analysis. The overall prevalence of CKD stages 3-5 was 3.6%. In terms of each CKD stage the prevalence was 2.0% stage 3A, 1.4% stage 3B, 0.2% stage 4 and 0.1% stage 5. 99.1% (n = 226) had a blood pressure recorded in the previous 15 months and 74.6% (n = 170) had a current prescription for

an ACE-I or ARB. 48.6% had a recorded ACR. Of 10 patients with an ACR >50, only 2 had a systolic blood pressure \leq 130 mmHg on each of their four previous recordings. **Conclusions:** This audit revealed inconsistencies in the definitions used to define a CKD patient. A majority of patients were receiving an ACE-I or ARB, however further work is required to ensure suitable exclusion or quantification of proteinuria and if new blood pressure targets for proteinuric patients are to be met.

Management of Blood Pressure, Cardiovascular Risk, and Anaemia at a Chronic Kidney Disease Clinic

J Hawkins, M McMillan

University of Glasgow and Renal Unit, Western Infirmary, Glasgow

Background: Good management of chronic kidney disease (CKD) aims to reduce mortality and morbidity through the deceleration of advancing renal failure and the control of associated complications, such as accelerated cardiovascular disease. Clinical guidelines exist to promote evidence-based care. The National Institute for Health and Clinical Excellence (NICE) published its most recent CKD guidance in September, 2008 (NICE 73), and has previously issued guidelines on anaemia management in CKD (NICE 39). We used these guidelines to audit the management of blood pressure, cardiovascular risk and anaemia in patients with advanced CKD attending the Western Infirmary, Glasgow, at the time of publication of NICE 73. **Methods:** Patients with advanced CKD were identified by being listed in September 2008, as attending low clearance clinics. Their electronic records were analysed for concordance with NICE guidelines using clinical data recorded up to October 20, 2008. Statistical analysis was through Minitab 15. **Results:** One hundred and forty-nine patients were identified. Nine were excluded from data analysis: four had started dialysis in the intervening month and one had received a transplant. One had not attended the clinic for more than a year and three had incomplete data on record. Of the remainder, 84 (60%) were male. Mean (range) age was 66 (23-91) years. Mean (range) estimated glomerular filtration rate (eGFR) was 13 (4-35) ml/min; 97 patients (69%) had stage 5 CKD. Mean (range) systolic blood pressure was 144 (100-228) mmHg. Although 124 (88%) of the patients were on antihypertensive medication, only 14 patients (10%) satisfied NICE's criteria for blood pressure control. Of the 99 patients for whom the guidelines would advise angiotensin blockade, only 50 had an active prescription for these drugs. Antiplatelet therapy and statins were each prescribed in 88 (63%) patients. NICE 73 advised use for secondary prevention of cardiovascular disease. There was insufficient detail in the electronic record to say how many patients required primary and how many secondary prevention of cardiovascular disease. Mean (range) haemoglobin was 11.3 (8.2-13.8) g/dl. Eighty-one (58%) patients were being treated with an erythropoiesis-stimulating agent. Eighty-two patients (59%) met the recommendations of NICE 39. **Conclusions:** The most important finding in this project is the failure in a clinic setting to achieve blood pressure control to the evidence-based targets of NICE 73.

Blood Pressure, Proteinuria and Non-Traditional Risk Factors in Chronic Kidney Disease: How Attained Levels Associate with Risk of Renal Replacement Therapy.

PC Thomson¹, CJ Deighan¹, CM Stirling¹, A Raja², GJ Prescott², K Simpson¹

¹Renal Unit, Glasgow Royal Infirmary, 84 Castle Street, Glasgow, G4 0SF

²Department of Public Health, University of Aberdeen, Aberdeen, AB25 2ZD

Introduction: Preventing progression of chronic kidney disease (CKD) focuses on pharmacological control of blood pressure and reduction in proteinuria. In this study we examine the association between variables including systolic blood pressure (SBP, mmHg), diastolic blood

pressure (DBP, mmHg) and urinary protein to creatinine ratio (PCR, mg/mmol) on risk of starting renal replacement therapy in a CKD population over a 20-year period of observation. **Methods:** A retrospective analysis of data recorded retrospectively from between 1974 to 1985 and recorded prospectively from 1985 and 2005 held on the electronic patient record (EPR) of a large tertiary referral renal unit in Glasgow, United Kingdom, was performed. The EPR was interrogated to identify all patients with an estimated creatinine clearance (ECC) of <50ml/min (Cockcroft & Gault) and progressive renal dysfunction. Initial data and data averaged over the follow-up period were available for a range of variables including SBP, DBP and PCR. Univariate and multivariate analysis were performed with regard to an outcome of commencement on renal replacement therapy (RRT) for established renal failure (ERF). **Results:** 1739 patients fulfilled our inclusion criteria with mean follow-up of 57.6 months. 549/1739 (31.6%) patients started renal replacement therapy for ERF. Univariate analysis demonstrated a significant association ($p < 0.05$) between shorter time to commencing RRT and primary renal diagnosis, increased age, higher calcium phosphate product, urate, total cholesterol, body mass index, eosinophil count, ferritin, HbA1C, cholesterol to HDL ratio, average SBP, initial and average DBP, initial and average urinary PCR and lower initial ECC, haemoglobin, serum HDL and serum albumin. Multivariate Cox regression analysis demonstrated independent association with shorter time to commencement on RRT with increasing initial SBP ($p = 0.035$), average UPCR ($p < 0.001$), BMI ($p = 0.005$), serum ferritin ($p = 0.01$), serum urate ($p = 0.021$), and decreasing haemoglobin ($p = 0.002$). Primary renal disease was also found to demonstrate an independent association with outcome ($p < 0.001$). An escalation of risk association was seen with increasing increments of (i) average UPCR from 1.758 (0.878, 3.522), $p = 0.111$ with UPCR 50-100mg/mmol up to 11.014 (4.920, 24.657), $p < 0.001$ with UPCR >500mg/mmol; (ii) BMI from 1.753 (0.920, 3.341), $p = 0.088$ with BMI 20-24.99 up to 3.484 (1.438, 8.441), $p = 0.006$ with BMI >35; and (iii) with differing primary renal diagnoses from interstitial nephritis with lowest risk of 0.496 (0.300, 0.821), $p = 0.006$ to adult polycystic kidney disease with greatest risk at 3.999 (2.250, 7.105), $p < 0.001$. **Conclusion:** Increasing SBP and urinary PCR as measured in routine clinical practice have a particularly strong independent association with shorter time to commencing RRT in patients with progressive CKD.

Blood Pressure, Proteinuria and Non-Traditional Risk Factors in Chronic Kidney Disease: How Attained Levels Associate with Risk of Death.

PC Thomson¹, CJ Deighan¹, CM Stirling¹, A Raja², GJ Prescott², K Simpson¹

¹Renal Unit, Glasgow Royal Infirmary, 84 Castle Street, Glasgow, G4 0SF

²Department of Public Health, University of Aberdeen, Aberdeen, AB25 2ZD

Introduction: Mortality rates are high in patients with progressive chronic kidney disease (CKD). Intervention has focused on pharmacological control of blood pressure and reduction in proteinuria. In this study we examine the association between variables including systolic blood pressure (SBP, mmHg), diastolic blood pressure (DBP, mmHg) and urinary protein to creatinine ratio (PCR, mg/mmol) on mortality in a CKD population over a 20-year period. **Methods:** A retrospective analysis of data recorded retrospectively from between 1974 to 1985 and recorded prospectively from 1985 and 2005 held on the electronic patient record (EPR) of a large tertiary referral renal unit in Glasgow, United Kingdom, was performed. The EPR was interrogated to identify all patients with an estimated creatinine clearance (ECC) of <50ml/min (Cockcroft & Gault) and progressive renal dysfunction. Initial data and data averaged over the follow-up period were available for a range of variables including SBP, DBP and PCR. Univariate and multivariate analysis were performed with death as the primary endpoint. **Results:** 1739 patients fulfilled our inclusion criteria with mean follow-up time of 78.3 months. 581/1739 (33.4%) died during follow-up. Univariate analysis demonstrated a significant association ($p < 0.05$) between earlier mortality and primary renal

diagnosis, increased age, calcium phosphate product, urate, eosinophil count, ferritin, HbA1C, urinary sodium, C-reactive protein, white cell count, initial and average SBP, average DBP, initial and average PCR and decreased initial ECC and serum albumin. Multivariate Cox regression analysis demonstrated independent association with earlier mortality and increasing average SBP ($p < 0.001$), average UPCr ($p < 0.001$), serum urate ($p < 0.001$), and decreasing serum albumin ($p = 0.017$). Primary renal disease was also found to demonstrate an independent association with mortality ($p < 0.001$). A J-shaped survival curve was seen with incremental rises in average SBP with level of 120-129mmHg associated with lowest risk. An escalation of risk association was seen with (i) increasing increments of UPCr from 1.642 (1.056, 2.553), $p = 0.028$ with 101-200mg/mmol up to 4.979 (3.025, 8.195), $p < 0.001$ with UPCr > 500 mg/mmol; and (ii) with differing primary renal diagnosis from glomerulonephritis with lowest risk of 0.483 (0.289, 0.807), $p = 0.005$ to diabetic nephropathy with greatest risk at 2.477 (1.203, 5.101), $p = 0.014$. **Conclusion:** SBP < 119 mmHg and > 139 mmHg and urinary PCR > 100 averaged over follow-up have a particularly strong independent association with earlier mortality in patients with progressive CKD.

Antihypertensive Therapy For Kidney Transplant Recipients: A Systematic Review And Meta-Analysis

P Masson¹, NB Cross², A Webster², P O'Connell², J Craig²

¹Department of Renal Medicine, Royal Infirmary of Edinburgh, UK

²Centre For Kidney Research, Children's Hospital at Westmead, Sydney, Australia

Aims: To assess the relative effects of different classes of antihypertensive agents on patient and graft survival, graft function, cardiovascular events, acute rejection, proteinuria, blood pressure and anaemia in kidney transplant recipients. **Data Sources:** A comprehensive search of MEDLINE, EMBASE, CENTRAL, DARE, Science Citation Registry, reference lists of identified studies, and abstracts of conference proceedings. **Methods:** We included trials of any antihypertensive agent in kidney transplant recipients which were administered for two weeks or more, compared with placebo/no treatment or another class of antihypertensive agent. Summary estimates of treatment effects were combined using a random effects model and expressed as relative risks for dichotomous outcomes, and weighted mean difference for continuous outcomes, both with 95% CI. **Results:** Data from a total of 60 trials of 76 intervention comparisons involving 3627 participants were retrieved. Indication for treatment varied: hypertension 25 trials (1407 participants), erythrocytosis six trials (111 participants), LVH two trials (131 participants), chronic allograft nephropathy one trial (28 participants). In the majority (37 trials, 2291 participants), the indication was not provided or treatment was investigated for effect on reducing concomitant cyclosporine use. Calcium channel blocker (CCB) therapy was the most commonly allocated treatment (1612 participants, 49 trials), followed by ACE inhibitors (706 participants, 27 trials) and angiotensin receptor-2 blockers (ARB; 367 participants, 16 trials). As trials permitted use of additional agents to treat hypertension, similar blood pressure control was achieved among all studied drug class comparisons. Recipients allocated to ACEi compared to placebo or no treatment had lower GFR (WMD -6 ml/min, 95% CI -11.9 to 0.0), higher serum potassium (WMD 0.44 mmol/L, 95% CI 0.10 to 0.78) and lower haemoglobin (WMD -8.7 g/L 95% CI -12.1 to -5.3). Recipients allocated to CCB, compared to placebo or no treatment, had lower risk of graft loss (RR 0.71, 95% CI 0.53 to 0.94), higher GFR (WMD 4.8ml/min, 95% CI 1.9 to 7.6 ml/min) and lower creatinine (WMD -6.5 mmol/L, 95% CI -11.9 to -1.1). Recipients allocated to CCB compared to ACEi experienced less acute rejection (RR 0.61, 95% CI 0.46 to 0.82), had higher GFR (WMD -10.6 ml/min, 95% CI 6.0 to 15.2), lower creatinine (WMD -12.9 mmol/L, 95% CI -17.6 to -8.1), more proteinuria (WMD 0.28g/24h, 95% CI 0.10 to 0.47), less hyperkalaemia (RR 0.27, 95% CI 0.13 to 0.53) and higher haemoglobin (WMD 11.5g/L, 95% CI 7.2 to 15.8). **Conclusions:** These data indicate that CCB should be favoured as first line treatment in kidney transplant recipients requiring antihypertensive treatment, and suggest that CCB may prevent graft loss and improve graft function, irrespective of indication. Further prospective randomised trials in patients receiving newer immunosuppression regimens are required.

Rhabdomyolysis following co-prescription of Fusidic Acid and Atorvastatin, with review of Statin Antimicrobial Drug Interactions.

S Teckchandani, S Robertson, A Almond, K Donaldson, C Isles

Renal Unit, Dumfries & Galloway Royal Infirmary, Dumfries, DG1 4AP

Background: The placebo corrected incidence of rhabdomyolysis among patients randomised to active treatment in the statin trials is around 1.6/100,000 patient years. It is likely to be higher than this in everyday clinical practice when statins are knowingly or inadvertently co-prescribed with drugs that interfere with their metabolism. **Case report:** We report a case of rhabdomyolysis which occurred when fusidic acid was co-prescribed with atorvastatin, potentiating the toxicity of both drugs. **Literature Review:** We found two other cases of rhabdomyolysis with fusidic acid and atorvastatin and three with fusidic acid and simvastatin in the literature, review of which suggests that the risks of rhabdomyolysis vary with the extent an individual statin is dependent for its metabolism on the cytochrome P450 3A4 isoenzyme and the degree to which this isoenzyme's activity is inhibited by a particular antimicrobial. Thus, the risks of a statin-macrolide drug interaction causing rhabdomyolysis are generally greater with simvastatin than atorvastatin, and also with erythromycin than clarithromycin. Of note, the interaction between statins and fusidic acid did not feature in the 6 of 7 recent reviews of statin toxicity. **Conclusion:** To the list of important statin antimicrobial drug interactions we feel should now be added fusidic acid, another CYP450 3A4 enzyme inhibitor with a potential to cause rhabdomyolysis co-prescribed with simvastatin and atorvastatin.

A Web Interface to Proton: Transforming a 25 Year Old Renal IT System

RG Phelps, K Zarins

Royal Infirmary of Edinburgh

Proton is an electronic record system that remains widely used in the UK despite its age: it was installed in Edinburgh in 1985. Although many aspects of it seem arcane (interaction is through a terminal emulator; navigation is through the numeric keypad rather than via mouse and drop-down menus), its speed of response and a remarkable capacity to be developed in response to changing demands have ensured its continuing utility.

We have built a system that interfaces the Proton database with a modern web environment enabling interaction with Proton data via, with authentication, any web browser on the NHS N3 network. The system, wProton, has been built using open source tools including the MySQL database, Python programming language, Django web application framework and Apache web server. This design affords the advantages of modern web applications, such as capacity for email and to make PDF and graphics documents, and very importantly, should be able to draw on the huge word-wide web developer resource to implement further enhancements.

At present wProton provides:

- Forms for creation and distribution of discharge summaries and prescriptions (described elsewhere)
- Enhanced plotting of reciprocal creatinine/eGFR
- Views of blood test results, BP and weight recordings, optionally annotated against national standards for dialysis.
- Current inpatient lists for handover purposes, with easily editable summary/comments/to-dos
- A messaging system for users without hospital email
- Mechanisms to maintain personal and public lists of patients with personal and public notes.
- Patient-related reminders by email

In its current form, wProton is a nascent technology that relies on the continuing maintenance of Proton. However it illustrates how powerful

modern web applications can be applied to healthcare purposes without the use of proprietary applications, and could be the basis of a Proton-independent EPR that would have in a modern system the same key advantage of user configurability that gave Proton such an extraordinary (in IT terms) span of useful life.

Immediate Definitive Discharge Summaries in the Renal Unit. Audit of first year activity

R Phelps, K Zarins

Royal Infirmary of Edinburgh

Background: The Renal unit introduced in November 2007 a novel system designed to improve the content and timeliness of discharge documentation. The initiative was driven by experience of the consequences of poor peri-discharge communication, particularly of patients that continue in frequent contact with health professionals, such as dialysis patients, or patients with ongoing complex or often changing management plans, such as patients given immunosuppression. **Action:** A system (wProton) was constructed to enable generation of an enhanced immediate discharge document that would for most patients also suffice as the definitive discharge summary. The system comprised a set of secure web forms backed by an application that exchanged data with the existing renal patient management system (Proton). Junior doctors were asked to first update Proton in the usual way (including discharge prescriptions, diagnoses and problem list), then add via the web forms the minimum of additional coded and textural information to adequately summarise the admission under headings including: reason for admission, changes to medication, outstanding issues. Completed forms provided controls to print the full summary and discharge prescription, to orchestrate distribution, follow up and referrals, and, behind the scenes, sent discharge documents by secure email directly to appropriate health professions, such as responsible consultants and dialysis doctors, and to the hospital patient information system, TRAK. **Outcome:** wProton has been used to generate over 1000 discharge summaries since its introduction in November 2007. The overall impact has been very favourable. Junior doctors prefer the system despite the onus of typing, and all carers greatly appreciate the up to date notification of their patients' movements and changes in management, and on-line access to summary and prescription documents. It is now rare to see a patient post-discharge without useful summary information. As an objective assessment of the efficiency of discharge summary generation, Trak was queried for the delay in coding discharges from ward 206 during the first 9 months of 2008, 2007 and 2006. In its first year, 2008, wProton was used for 443 discharges (89% of all renal discharges), with median coding delay of 6 days. The delay was 78% reduced on that in 2007 and 2006 ($p < 0.001$, Mann Whitney), and was significantly less than that for renal and non-renal discharges (27 days) where wProton was not used ($p < 0.001$, Mann Whitney) (Figure 1). Note delay in coding depends on the efficiency of coding (by the coding team as well as that of summary generation. Informal feedback from GPs has been entirely positive (no complaints); a formal assessment is in process. **Conclusion:** Unified immediate and definitive discharge summaries have greatly improved communication within the multidisciplinary team responsible for the care of renal patients, substantially reduced the delay in generation of discharge summaries, and objectively, the delay in discharge coding. Investigation of delayed summaries identified some weaknesses including: tight coupling to usual discharge process missed patients that died or were transferred; considerable variability in Trak and Proton registration of admissions; poor capacity to cope with rapid readmission. These issues have been addressed in a new version that will be audited in 2009.

Renal Hemeoxygenase Deficiency with Aging: A Novel Correctable Cause of Acute Kidney Injury.

D Ferenbach, J McKay, N Nkejabega, D Kluth, J Hughes.

Centre for Inflammation Research, The Queen's Medical Research Institute, University of Edinburgh.

Introduction: We hypothesised that defective induction of endogenous tissue protective responses such as the anti-inflammatory enzyme hemeoxygenase-1 (HO-1) might underlie the association of increased age with susceptibility to renal ischaemia reperfusion injury (IRI). We therefore examined HO-1 expression in young and old mice before and after renal IRI, and the therapeutic efficacy of the HO-1 inducer Hemearginate (HA). **Methods:** Young (8-12 wk) and old (52-60 wk) FVB/N mice were used. Selected animals received HA (30mg/kg wt) or vehicle 24h pre IRI. Following right nephrectomy, IRI was induced by left renal pedicle clamping (20 mins). Blood and tissue was collected 24 hrs post IRI and stained for F4/80 (M ϕ), GR1 (PMN), CD3 (T cells), B220 (B cells) and HO-1 prior to quantification by computer image analysis. Acute tubular necrosis (ATN) was determined by counting the percentage of necrotic tubules in the outer medulla. **Results:** There was no baseline difference in serum creatinine (Cr) or urinary protein:Cr ratio. Baseline kidneys of old mice showed no leukocyte influx, capillary loss or scarring compared to young mice. Old mice exhibited comparable baseline HO-1 expression but reduced cortical and medullary HO-1 upregulation following IRI (Cortex- 11.5 ± 4.8 vs $25 \pm 7.5\%$ staining; old vs young; $p < 0.05$; Medulla- 0.8 ± 0.3 vs $6.5 \pm 1.3\%$ staining; old vs young; $p < 0.05$). Old mice exhibited worse renal function (Cr 120 ± 35 vs 38 ± 6 $\mu\text{mol/L}$; old vs young; $p < 0.01$) and ATN (75 ± 1.2 vs $55 \pm 0.4\%$ ATN; old vs young; $p < 0.01$). HA pretreatment of old mice induced HO-1 (cortex 0.81 ± 0.29 vs $44 \pm 6.1\%$ staining $p < 0.001$, medulla 0.14 ± 0.08 vs $2.52 \pm 0.83\%$ staining $p < 0.05$; control old vs old+HA). HA treatment resulted in functional (Cr 129 ± 32 vs 50 ± 6 μmol , old vs old+HA $p = 0.02$) and structural protection (58 ± 13 vs $21 \pm 7\%$ ATN old vs old+HA $p < 0.05$). No difference in F4/80+, CD3+ or B220+ cell infiltration was evident between groups whilst old mice exhibited increased PMN infiltration (23 ± 7 vs 7 ± 6 GR1+ PMN/hpf; old vs young; $p < 0.05$), which was entirely abolished by HA therapy (32.3 ± 6.9 vs 1.7 ± 0.7 GR1+ PMN/hpf old vs old+HA; $p < 0.005$). **Conclusion:** Reduced HO-1 upregulation following renal IRI increases structural and functional injury in old mice and represents a therapeutic target in the aged population.

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Conflicts of Interest: We declare no conflicts of interest.

Reversible Unilateral Ureteric Obstruction is Characterised by Profound Loss of Myofibroblasts and Alteration in Matrix Constituents

MA Vernon, SN Hartland, M Clay, JP Iredale, J Hughes

Centre for Inflammation Research, Queen's Medical Research Institute, University of Edinburgh.

Introduction and Aims: Fibrotic scarring generated by glomerular and interstitial myofibroblasts is a key determinant of the progression of CKD. This study examined myofibroblasts, extracellular matrix deposition, matrix metalloproteinases (MMPs) and tissue inhibitors of MMPs (TIMPs) in reversible unilateral ureteric obstruction. **Methods:** Male FVB/N mice (6-8 wks) underwent unilateral ureteric obstruction (UUO) for 7 days (d7UUO). UUO was reversed in some groups and kidneys removed after a further 7 (d7/14) or 14 (d7/21) days. Control d7 sham and normal mice were included. Tissues were immunostained for F4/80 (macrophage marker), -smooth muscle actin (SMA, myofibroblast marker) and collagen III and analysed by computer image analysis. Real time PCR (RT-PCR) was used to determine the expression of TGF β , MMP-2, -9, -12 and -13, TIMP-1 and TIMP-2. Each group consisted of at least 7 mice. **Results:** At d7UUO obstructed kidneys

exhibited prominent macrophage infiltration ($8.41 \pm 1.81\%$ area), interstitial SMA+ myofibroblasts ($16.13 \pm 1.74\%$ area) and collagen III deposition ($17.78 \pm 1.07\%$ area). Following reversal of UUO, there was a profound loss of myofibroblasts at d7/14 which returned to normal levels over time (d7UUO= $16.13 \pm 1.74\%$ area, d7/14= 5.14 ± 1.41 , d7/21= 2.21 ± 0.56). This coincided with a 2.6-fold reduction in TGF expression at d7/14. Collagen III expression was reduced in the cortex at d7/21 (d7UUO= $17.99 \pm 1.63\%$ area, d7/21= 7.17 ± 1.57) but remained unchanged in the medulla. Macrophage infiltration was unchanged following UUO reversal. No clear change in pattern was evident in MMP/TIMP expression. **Conclusion:** Reversal of UUO results in a rapid and profound loss of myofibroblasts. There is also partial resolution of collagen deposition that is limited to the renal cortex. The mechanisms underlying myofibroblast loss is unclear but may include active killing or reduced support from mitogens or survival factors. The persistent macrophage infiltrate suggests involvement in the reparative features evident following UUO reversal. Further studies will dissect the mechanisms underlying these novel findings.

Analysis of Aluminium and Trace Elements in Haemodialysis Water from Scottish Renal Units 1999-2007.

CE Nolan, A Duncan, RA Mactier, K Simpson

Glasgow Royal Infirmary

Introduction: Haemodialysis exposes a dialysis patient to over 300 litres of water per week through a non-selective membrane. It is essential that the water used has appropriate chemical and microbiological purity, and this is highlighted in the current Renal Association Clinical Practice Guidelines for Haemodialysis. The maximum levels of chemical contaminants in water for dialysis have been established by AAMI, ISO 13959, and the European Pharmacopoeia, although these standards differ in the number and limits of the contaminants specified. In Scotland, aluminium is one of nine trace elements which are routinely measured. Historically, dialysate water contamination was the main cause of aluminium toxicity, and monitoring has largely eliminated this. However, on-going monitoring is performed as aluminium and heavy metal poisoning have significant clinical consequences. **Aims:** To perform a critical analysis of aluminium and trace element data derived from RO dialysis water in order to help drive best practice in regards to the monitoring of these elements, and possibly recommend alterations to the current monitoring guidelines. **Methods:** Analysis and interpretation of retrospective data collected by the Trace Elements Laboratory at Glasgow Royal Infirmary from 1999-2007. **Results:** Non-standardised labelling of RO water samples from different units made data analysis difficult. Of 12237 RO water aluminium levels, only 244 (2%) were high. The number of readings analysed from each dialysis unit, and the proportion of high aluminium readings varied among different units and also by the year of sampling. Of 242 high aluminium readings (excluding 2 quality control readings), 151 (62.4%) were repeated within 28 days. Of these, 27 (18%) were also found to be high. The time taken to repeat a reading from an RO after a high reading was reported varied between individual units. Analysis of aluminium levels from individual RO's determined that it was not possible to reliably predict the leakiness of an RO using serial aluminium levels. The numbers of high levels of other trace elements in RO water was variable. **Conclusions:** Clearer, precise labeling of RO specimens would promote easier data analysis. However, from the samples received, only a small proportion of aluminium and other trace element levels were high. In fact, it could be argued that copper and silver levels do not need to be monitored routinely. There was great variation in the number of samples received from each unit, inferring that most units are not following the current guidelines to monitor RO water aluminium levels every 3 months. Finally, high aluminium levels do not appear to be automatically repeated in some units, and even when they are, this can often take up to 28 days.

Impact of Change to a Primary Immunosuppression Regimen of Basiliximab, Low Dose Tacrolimus, Mycophenolate and Prednisolone on the Outcome of Kidney Transplantation

RK Wan, M Mazonakis, L Thomson, M Clancy, E Murio, CC Geddes.

Renal Unit, Western Infirmary, Glasgow

Introduction: In 2007 our kidney transplant centre changed from a ciclosporin (CyA)/azathioprine (Aza)/prednisolone (Pred) primary immunosuppression regimen (with basiliximab induction and mycophenolate mofetil [MMF] for those at immunologically high risk) to a Tacrolimus(low dose)/MMF/Pred regimen with basiliximab induction. The aim of the analysis was to assess the impact of this change on the incidence of acute rejection, transplant function, viral infection and markers of bone marrow suppression. **Methods:** Baseline data and data during the first year after transplant were collected from the electronic patient record for all consecutive kidney-only transplants from 01.01.06 – 09.11.07. All patients had surveillance for BK viraemia in the post transplant period and patients who were CMV IgG negative receiving a kidney from a CMV positive donor had three months of valganciclovir prophylaxis and CMV surveillance by PCR. **Results:** 139 patients were identified. Five patients were excluded from analysis due to early graft loss within two weeks. Sixty eight of the remaining patients had the CyA based regimens; 26 patients on a CyA/Aza/Pred regimen, 42 patients on a CyA/MMF/Pred regimen. Sixty six of the remaining patients received the Tac/MMF/Pred regimen. Baseline characteristics are shown in the table. Minimum follow up was 12 months. The incidences of biopsy proven acute rejection in the first year in these three groups were 34.6, 26.2 and 19.7% respectively ($p=0.43$). eGFR at 12 months was significantly lower in the CyA based regimen compared to the Tac based regimen (44.0 v 55.3 ml/min/ $1.73m^2$; $p=0.001$) (assigning '0' to the two patients in each group who returned to dialysis within one year). These differences were consistent when living donor transplants were excluded from the analysis. The incidence of BK viraemia in the first six months was significantly higher in the CyA/MMF/Pred group compared to the Tac/MMF/Pred group (38.1 v 18.2% ; $p=0.02$). One patient in each group developed BKV nephropathy. There were no significant differences in the incidence of CMV infection and no significant difference in the incidence of anaemia, leucopaenia or thrombocytopaenia. **Conclusion:** A change to a Tac(lowdose)/MMF/Pred immunosuppression regimen with basiliximab induction in our unit has been associated with better transplant function at one year, a trend to reduced acute rejection and significantly reduced incidence of BK viraemia, with no increase in myelosuppression.

An Unusual Cause of Renal Transplant Dysfunction in Pregnancy.

PB Mark¹, IV McCrea², G Baxter², MA McMillan¹

¹Renal Unit, Western Infirmary, Glasgow.

²Radiology, Western Infirmary, Glasgow.

Background: Although pregnancy can cause hydronephrosis in native kidneys, renal transplant dysfunction during pregnancy due to obstruction is rare. **Case Report:** A twenty year old female renal transplant patient presented with a positive pregnancy test at estimated six weeks pregnant. Pre-pregnancy transplant function was excellent with serum creatinine $101 \mu\text{mol/L}$. She had an episode of acute cellular rejection at 10 weeks gestation treated with intravenous corticosteroids. At 22 weeks gestation she represented with serum creatinine $462 \mu\text{mol/L}$. Transplant ultrasound demonstrated moderate hydronephrosis with the transplanted kidney squashed between the gravid uterus and the liver. A nephrostomy was inserted under ultrasound guidance with improvement of transplant function. An antepartum haemorrhage occurred at 31 weeks leading to delivery by caesarean section of a 1.27kg healthy male baby. The nephrostomy tube was clamped five days postpartum, and then removed. Hydronephrosis did not recur on follow up ultrasound but renal function did not return to pre-pregnancy levels. Transplant biopsy performed four weeks postpartum showed chronic tubulointerstitial damage with no evidence of rejection. **Discussion:** Renal transplant hydronephrosis

due to the gravid uterus is rare and is not mentioned in recent reviews of management of pregnancy in renal transplant recipients. The gravid uterus may obstruct a transplant kidney and cause allograft dysfunction in pregnancy.

Line Surveillance in the Haemodialysis Population in Fife.

L Clark¹, K Buck¹, K Morris²

¹Department of Renal Medicine, Queen Margaret Hospital, Fife.

²Department of Microbiology, Victoria Hospital, Fife.

Background: Catheter related infections are a major cause of morbidity and mortality in the haemodialysis population. A line surveillance project was set up in collaboration with the Microbiology Department to determine the frequency of dialysis catheter insertions and rates of line related infections among NHS Fife's haemodialysis population. **Methods:** Data was prospectively collected from August 2008 to February 2009. All chronic haemodialysis patients with any type of central venous catheter (CVC) in the renal unit, Queen Margaret Hospital, Dunfermline and the satellite renal unit in Victoria Hospital, Kirkcaldy were identified. Included in the study were patients with a catheter in situ at the commencement of the study. The dates and reasons for line insertion and removal were documented. Episodes of exit site infections, tunnelled infections and bloodstream infections were identified by dialysis staff and the medical staff using the Centre for Disease Control and Prevention (CDC) definitions. The type of organism identified was documented. Total number of catheter days was calculated beginning from August 2008 to provide an overall infection rate per catheter days. **Results:** There were a total number of 68 lines in 45 patients during the six month period. The most common reason for line insertion was an immature fistula (26.5%). There were 15 line related infections during that time. Thirteen of these involved a bacteraemia and the remaining two were exit site infections. The pathogens isolated were *coagulase negative Staphylococcus* (53.3%), *Staphylococcus aureus*, including one case of MRSA (26.7%), *Candida sp.* (13.3%) and *Pseudomonas sp.* (6.7%). In only three cases line salvage was successful; the remaining infections resulted in removal of the line. One patient had two separate bacteraemic episodes associated with one line. The incidence of catheter related sepsis was 3.3 per 1000 catheter days. There were four deaths (8.9%) during this six month period; however, death was only partly attributable to catheter related sepsis in one patient. **Conclusions:** Catheter related infection remains a common problem within our haemodialysis population. Our infection rates are comparable with findings in other studies. However, there is still substantial room for improvement. The surveillance is ongoing and will be able to assess the effect of the recent introduction of CVC care bundles in the unit. Further studies are required to assess the efficacy and safety of anti-microbial line locking in reducing infection rates further.

Cardiac Troponin T as an Adverse Prognostic Biomarker in Established Renal Failure.

A Grieve¹, A Ansari¹, G Smith², W Smith¹.

¹Renal Unit, Monklands Hospital, Airdrie.

²STAMS, University of Strathclyde, Glasgow.

Introduction and Aims: Troponin (Tn) proteins are the gold standard of biomarkers in myocardial injury. Both TnT and TnI are sensitive and specific in reflecting myocardial damage; however they do not indicate the mechanism of injury. Troponins can be altered in non-cardiac conditions. Many hypotheses have been put forward for the elevation of troponins in dialysis patients; but how do we interpret the results? This study measured TnT in our haemodialysis population and outcome (mortality) was audited over 36 months. **Methods:** An unselected cohort of long-term hospital haemodialysis patients was studied. No patients had cardiac symptoms at the time of analysis. Analyses were performed on predialysis monthly bloods for TnT, TnI, CRP, PTH, and cholesterol.

All patient records were reviewed for ECGs and echocardiograms, and evidence of diabetes mellitus. The standard diagnostic thresholds for myocardial damage were used (TnT > 0.03mcg/l, TnI > 0.2ng/ml). Outcome and mortality data were recorded and cohorts were followed up for 36 months. Statistical analyses were performed using SPSS computer software. **Results:** 141 patients entered the study. Mean age 60yrs, mean duration of haemodialysis 39 months. ECG's were reviewed in 89% of patients and echocardiograms in 74%. Ischaemic heart disease was diagnosed in 41 patients (29%) and diabetes mellitus in 29 (20.5%) patients. TnT was elevated in 63 of 141 patients (45%) and TnI was elevated in 5 of 135 patients (3.7%). Logistic regression analysis showed that TnT was a very significant factor (OR: 1.25, p<0.001) and that low cholesterol was significant (OR:-0.387, p<0.071) in relation to outcome (death). Diabetes mellitus, history of ischaemic heart disease, ECG and echocardiography findings, and duration of dialysis had no significant association with outcome. Actuarial survival curves over 36 months showed a significant difference in outcome between patients with normal and raised TnT values (Cox log rank p<0.005). Mortality rates at 12, 24 and 36 months in the normal TnT group were 19%, 32% and 34% respectively. Mortality rates at 12, 24 and 36 months in the raised TnT group were 42%, 63% and 73% respectively. **Conclusions:** The results of this study suggest that elevated TnT is a strong negative prognostic factor for patients on haemodialysis and perhaps TnT should be used as a routine biomarker to assess those patients most at risk. TnT was marginally elevated in almost half of the haemodialysis patients whereas TnI was normal. TnI should therefore be considered as the biomarker of choice when assessing chronic haemodialysis patients for myocardial ischaemia. The results of this study also suggest that low cholesterol is a significant negative prognostic factor in this group of patients and further work needs to be done to assess the reasons and significance of these findings.

Renal Biopsy Registry Over 20 Years in a Single Renal Unit.

J Smith, W Smith

Renal Unit, Monklands Hospital, Airdrie

Introduction and Aims: First performed over a hundred years ago, renal biopsy has developed into an essential tool for establishing the diagnosis in acute and chronic kidney disease. This study examines results obtained from all renal biopsies performed at one regional renal unit over 20 years from 1989 and 2008. **Methods:** Information was collected for all renal biopsies performed by the renal unit between 1989 and 2008 using a regularly updated database of biopsy results. Pathological diagnoses were categorised with the aid of the ERA-EDTA Primary Renal Diagnosis codes and groupings. Where a diagnosis was uncertain or information in the database incomplete, clarification was sought from formal pathological reports. **Results:** In total, 974 renal biopsies were performed between 1989 and 2008, 63.1% male and 36.9% female patients. The mean age at biopsy was 52.3 years (range 13-88). The most common primary diagnosis was IgA nephropathy (16.1%), followed by membranous glomerulonephritis (10.0%), diabetic nephropathy (6.8%), and minimal change glomerulonephritis (6.2%). 115 (11.8%) biopsies either yielded non-specific results, or insufficient tissue for diagnosis, and 39 (4.00%) of the biopsies contained histologically normal tissue. Differences were identified in the frequency of certain diagnoses between the years 1989-1998, and 1999-2008. Diabetes as a primary diagnosis rose from 3.1% to 9.1%, whereas the incidence of hypertensive nephrosclerosis (7.9% to 2.5%) and minimal change disease (8.1% to 4.9%) fell, perhaps reflecting changes in clinical practice, the threshold for performing biopsy, and inter-observer differences in reporting of the biopsies. **Conclusion:** The database of renal biopsies examined in this study provides valuable information regarding the frequency and nature of renal biopsy diagnoses over the last twenty years, and has identified areas in which there have been significant changes in the frequency of histological diagnosis over that time period. Such information is useful from an epidemiological point of view, as well as in the targeting and planning of renal services in the future.

Renal Biopsy and Plasma Exchange - A Potentially Risky Combination?

S Robertson, J Traynor, L Mitchell, K Douglas and the Scottish Advisory Network for Therapeutic Apheresis Services (SANTAS)

Renal biopsy in Scotland has been recently shown to be a procedure with only small risk.¹

We report two cases from two different centres of major haemorrhage (fatal in one case) after renal biopsy and plasma exchange. The first was a 77 year old man who suffered a relapse of ANCA Associated Vasculitis causing acute renal failure requiring dialysis. In order to assess the potential for renal recovery and therefore to tailor the immunosuppressive treatment a renal biopsy was performed. He had seven plasma exchanges of four litres on each occasion.

Ten days post renal biopsy, he suddenly developed abdominal pain and hypotension and, at laparotomy, was found to have bled from his renal biopsy site. He developed DIC and died in ITU despite all efforts to normalise his clotting. In the second case, in a different centre, an 81 year old lady with *de novo* ANCA-associated vasculitis suffered life-threatening haemorrhage requiring embolisation of the affected kidney, in association with a series of four daily plasma exchange procedures immediately following renal biopsy. This prompted us to review our management and to ask other centres whether their management would have been different in this case. We were asked to join the SANTAS group (Scottish Advisory Network for Therapeutic Apheresis Services) to discuss present practice in the event of a patient requiring renal biopsy and then immediate plasma exchange. On initial discussions with this group it became clear that present practice differs amongst centres in Scotland.

We will report the results of a survey performed with all Scottish apheresis and plasma exchange centres to assess the differences in practice.

We would suggest that the publication of the MEPEX trial², suggesting that patients with ANCA associated vasculitis who present with creatinine > 500 may have improved prognosis if plasma exchange is a part of their immediate management, is likely to have increased the number of patients with this disease receiving plasma exchange very soon after renal biopsy and, therefore, at risk of bleeding from the biopsy site.

We aim to work with SANTAS to develop clinical guidelines to follow if plasma exchange is to be used shortly after renal biopsy. These guidelines will consider the timing of the exchanges, the type of replacement fluid used and the frequency of exchanges. The assessment of clotting factors and their relative depletion secondary to plasma exchange and their ability to recover will also be discussed. This should allow us to advise on which factors should be measured and when.

Working together with SANTAS and the Renal Biopsy Registry we aim to monitor the frequency of major bleeding complications in patients who require renal biopsy and immediate plasma exchange in Scotland.

For references, see www.smj.org.uk

ABSTRACTS OF SOCIETIES

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Abstracts presented for the Anne Holman Medal

Pulmonary Embolism Found Incidentally on Multi Detector Computed Tomography (MDCT) in an Unselected Outpatient Group.

C Farrell, G Ritchie, M Jones, F Girvan, JT Murchison.

Lothian University Hospitals Trust, Royal Infirmary of Edinburgh, Old Dalkeith Rd, Little France, Edinburgh.

Background and aims: To evaluate the incidence of unsuspected pulmonary embolism (PE) in a population of outpatients undergoing contrast enhanced MDCT for indications other than investigation of pulmonary embolism. **Methods and Results:** Outpatients undergoing CT of the chest over a six month period were retrospectively identified. Images were reviewed by two trainees and a consultant radiologist. Data including referring specialty, age, embolism level, scan indication and quality were recorded. Reports were reviewed to see if the embolism was noted at the time of initial reporting. 440 scans were reviewed. PE was identified in 10 of 440 patients, a prevalence of 2.23%. One pulmonary embolus was in the main pulmonary artery, three were in lobar arteries and six in segmental or subsegmental arteries. Patients over the age of 60 were more likely to have an embolism (9/300, 2.9%) compared to those under 60 (1/140, 0.7%). Nine of the 10 positive scans were carried out for the investigation of known (5/10) or suspected (4/10) malignancy. Seven of the 10 emboli were reported at the time of initial scan reporting. **Conclusion:** The outpatient population has a significant incidence of unsuspected PE. PE should be actively sought when reporting scans performed for alternative indications.

Review of the Current Use of CT KUB to Diagnose Renal Colic in the Royal Infirmary of Edinburgh from December 2007 – February 2008

AW Yong

Specialty Registrar, Clinical Radiology, Royal Infirmary of Edinburgh, 51 Little France Crescent, Old Dalkeith Road, Edinburgh EH16 4SA

Background: Acute loin pain presents frequently amongst patients who attend the Accident and Emergency department. No specific standardised protocol is available in the investigation of suspected acute renal colic prior to CT KUB examination. CT KUB is used routinely to investigate patients with acute loin pain at the Royal Infirmary of Edinburgh. This audit aimed to evaluate its utilisation from December 2007 – February 2008 and to design a guideline to improve its application in the future. **Methods:** Retrospective review of notes of 156 patients who underwent CT KUB for the investigation of suspected renal colic. **Results:** Ureteric stones were present in 65 patients (42%). Eighty-eight patients (56%) had negative CT KUB results. Three results (2%) were equivocal. Out of the negative examinations, 26% (23/88) had significant alternative diagnoses. Interestingly, 42% (65/156) of the CT KUBs were completely normal. The positive rate in males was 55% (55/100), whilst female patients had a much lower positive rate at 18% (10/56). **Conclusion:** The significant percentage of negative CT KUB results implies that an improvement in current practice is crucial. A flow-chart guideline is recommended as a filtering tool to aid assessment of patients with suspected renal colic prior to CT KUB examination. It is anticipated that this would improve radiology workflow, facilitate diagnosis of renal colic and ultimately save patients from unnecessary radiation.

Difference in the Clinical Outcome of the Graf's and Harcke's Ultrasound Hip Screening Method.

A Romsauerova, S Sanjay

Radiology Department, Ninewells Hospital, NHS Tayside, Dundee, UK

Background: In the UK, two main screening methods (Graf's and the Harcke's) are used for detection of congenital hip dysplasia (CHD). We aimed to see if comparing practice across four hospitals in Tayside would provide an idea about the superiority of either method. **Methods:** We retrospectively identified records of all patients screened for CHD between January 2006 and July 2008. An age at first scan, reason for scanning, degree of dysplasia, frequency of follow-up scans and treatment instituted was extracted from the radiology information system. **Results:** 1496 hip screenings were performed. A significantly greater number of abnormal scans were identified by Harcke's method compared to Graf's method (22% vs 15.5% Pearsons $p=0.014$). Harcke's method graded 75%, 17%, 8% (as mild, moderate, severe) versus Graf's method 89%, 7%, 4% (as mild, moderate, severe). Treatment was instituted in 71% and 31% of abnormal scans detected by Harcke's versus Graf's respectively. Graf's method resulted in 61% rescans compared to the 29% in Harcke's method. **Conclusion:** Harcke's method appears to pick up a greater number and severity of dysplasia and fewer recalls for confirmation of diagnosis. To ensure delivery of similar standards of care it is essential to follow similar screening methods across the region.

High Resolution CT for Assessing Pathological Change in a Cohort of COPD Patients.

G Mair¹, JT Murchison¹, M Connell¹, JJ Miller², W MacNee².

¹Department of Clinical Radiology, Edinburgh Royal Infirmary.

²MRC Centre for Inflammation Research, Queen's Medical Research Institute, University of Edinburgh.

Background: Chronic obstructive pulmonary disease (COPD) is a heterogeneous condition; most patients have a degree of both emphysema and airways disease. CT has previously been used to quantify both. We assessed emphysema and airways disease in a cohort of COPD patients using CT and compared these measures to clinical parameters. **Methods:** High-resolution CT of 129 COPD patients were performed. Clinical information to assess the degree of COPD was collected. Software developed in-house was used for analysis. The percentage of pixels less than -950 Hounsfield units was used as a measure of emphysema. Two airways (one upper, one lower zone) were followed out to the 6th generation for 56 of the patients. Cross sectional measurements were taken and %WA (wall thickness as a percentage of total airway area) was calculated. **Results:** Emphysema correlated strongly with %WA ($r=-0.44$, $p=0.001$) and several clinical measures of COPD. Airway dimensions in 1st to 3rd generation bronchi correlated with several clinical parameters. There were fewer associations with the distal airways. **Conclusion:** Future treatments for COPD will be aimed at either airways disease or emphysema. CT provides a good measure of emphysema and this correlates well clinically. Airway dimensions are best associated for the larger airways.

MR Angiogram of the Renal Arteries Without Intravenous Contrast: NATIVE True FISP – Pilot Study Using a Novel MR Sequence.

P Guntur Ramkumar¹, T Sudarshan¹, S Gandy^{1,2}, B Jagpal¹, JG Houston¹

¹Department of Clinical Radiology, Ninewells Hospital and Medical School, Dundee, DD1 9SY, UK.

²Department of Medical Physics, Ninewells Hospital and Medical School, Dundee, DD1 9SY, UK.

Background: MR angiogram assessment of the renal arteries is usually

performed in patients with renal impairment. Recent reports suggest a causative link of gadolinium to nephrogenic systemic fibrosis in these high-risk patients. The aim of this pilot study was to perform an analysis of the technical and diagnostic qualities of a new non-intravenous contrast MRA sequence (NATIVE) used in the assessment of the renal arterial disease. **Methods:** Eleven consecutive patients with suspected renal arterial disease were included in a prospective study. All the patients underwent both the NATIVE and conventional contrast enhanced MRA (CEMRA) on a 1.5T MRI unit (Siemens, Erlangen). NATIVE sequence was performed before CEMRA. Twenty-one kidneys were assessed in total. Two independent observers analysed the number of identified renal arteries including the accessory arteries and also calculated the degree of stenosis using a quantitative scoring method. The NATIVE results were compared against the CEMRA data and the inter and intra-observer variabilities were calculated. **Results:** NATIVE sequence was diagnostically adequate in all the patients and identified all 27 renal arteries that were seen in CEMRA, including the accessory arteries. The intraobserver statistics showed almost perfect agreement ($\kappa=0.81$) between the NATIVE and CEMRA images in the evaluation of renal artery stenosis. The interobserver agreement for evaluation of the NATIVE images was also noted to be substantial ($\kappa=0.74$). **Conclusion:** NATIVE is a promising and developing MR sequence, which could play a major role in vascular assessment without the need for intravenous contrast. Initial results from this pilot study are promising but further work is required to define its value compared to CEMRA.

Abbreviations in Radiology

S Pal, RD White, G Watson, I Zealley

Department of Clinical Radiology, Ninewells Hospital Dundee

Background: Abbreviations are commonly used in medicine. In separate contexts and specialties the same abbreviation may have a different meaning. An article discussing abbreviations in general practice triggered this study.¹ We are bound by paragraph 41b in the General Medical Council's Good Medical Practice (2006) 'to communicate effectively with colleagues within and outside the team'.^{2,3} **Methods:** 600 radiology request cards from three imaging modalities were analysed. Abbreviation frequencies were summated. Relevant members of the radiology team were asked what they thought abbreviations occurring >1% of the time meant. **Results:** On 200 chest x-ray requests there were 139 different abbreviations, 27 occurring >1% of the time. 15% ($n=4$) of these were felt to be context dependent. On 200 ultrasound requests there were 134 different abbreviations, 59 of these occurred >1% of the time. 5% of these were felt to be context dependent ($n=3$). On 200 CT request cards there were 290 different abbreviations. 31 occurring >1% of the time. 10% ($n=3$) of these were decided to be context dependent. **Conclusion:** Most abbreviations are eventually discernable, ambiguity arises in the minority. We conclude that abbreviations in radiology are a safe method of communication.

For references, refer to www.smj.org.uk