Introduction:

- Proteinuria is important diagnostic test and a bad prognostic marker for Chronic Kidney Diseases (CKD) with or without diabetes mellitus1 and cardiovascular diseases. 
- Total proteinuria consists of albuminuria from glomeruli, filtered immunoglobulins as well as tubular proteins like Tamm-Horsfall protein. Detection and quantification of urinary albumin is vital for diagnosis and management of most renal disorders. 
- Urinary total protein is <150 mg/dL. Normal Albumin excretion is <20 mg/dL. Microalbuminuria is defined as albumin excretion of 300 mg/dL or ACR of 30 mg/gm or more. Screening for microalbuminuria in form of ACR is normal practice in diabetic clinics for a while. This has become very user friendly for the GPs. 
- There is moderate to high correlation between spot urine protein creatinine ratio (PCR) and 24 hour urinary protein excretion.2-7 Urinary albumin concentration correlates well with urinary total proteinuria also with 24 hour urinary protein over a very wide range of the levels of proteinuria8 9 10 11. 
- Spot urinary PCR predicts actual 24 urine protein excretion with reasonable accuracy in patients with lower levels of protein excretion but is unreliable for higher levels of proteinuria6 12. At an early state of renal involvement in many chronic disorders, UAE (Urinary Albumin Excretion) increases by several folds compared to total protein which could remain normal13.
- Urinary total protein measurements have possible analytical inaccuracies14 while urinary albumin measurement is easy to standardise. 
- Since 2006, eGFR is reported for each s.creatinine value reported from the lab in UK. Identification of significant proteinuria for nephrology referral (>1 gm/day) is important in primary care with prevalence of CKD around 10%. 
- 24 hour urine test for estimation of proteinuria is not practical in primary care setting to identify CKD. The test should be simple, comparable and reproducible in a similar way as in patients with microalbuminuria like diabetes. It should maintain uniformity of diagnostic testing for proteinuria for CKD patients. 
- Because of technical reasons higher urinary Albumin requires further dilutions with increase in the cost with each dilution to report ACR value.

Objective:

- Aim of our study was to review our current guideline of ACR > 60 mg/mmol and to compare with PCR > 100mg/mmol for nephrology referral of patients with proteinuria>1gm/day. 
- To establish a value of ACR for nephrology referrals for proteinuria from primary care to avoid any misses of significant proteinuria.

Methods:

- Following DOH (Department of Health) initiative for identification of CKD, we decided to measure and report ACR value for each request of urinary protein measurement to maintain consistency with microalbuminuria and to create less confusion amongst the primary health care professionals.

Results:

- After about 6 months of having practiced ACR reporting, we decided to review our cut off value of ACR > 60 mg/mmol for referral for proteinuria from primary care. 
- 100 consecutive 24 hour urine specimens from adult nephrology outpatient and inpatient departments with available relevant data were reviewed. 
- Urinary ACR, PCR and 24 hour urinary protein values were compared and a cut off value of ACR was identified for 24 hour urinary protein level of greater than 1 gm per day to avoid any misses of significant proteinuria. 
- Comparable graphs were produced and sensitivity, specificity, positive predictive p-values, Negative predictive p-values were compared.
- Cost of the tests were also reviewed.

Table 1. Sensitivity, Specificity, positive predictive value, Negative predictive value for all 39 specimens with proteinuria >1 gm/day

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<thead>
<tr>
<th>ACR</th>
<th>Sensitivity %</th>
<th>Specificity</th>
<th>Positive predictive value</th>
<th>Negative predictive value</th>
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<td>40</td>
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- Only 2 out of 100 (2%) specimens analyzed did not fit referral criteria for both PCR and ACR. With exclusion of these two specimens, from 3739 specimens >1 gm/day proteinuria, calculated comparative sensitivity, specificity, positive and negative predictive values were (Table 2): For ACR>45mg/mmol - 95%, 100%, 100%, 96%, For PCR>100mg/mmol - 81%, 93%, 83%, 88% respectively.

Conclusion:

- ACR has better specificity and positive predictive value compared to PCR>100mg/mmol 
- ACR > 60mg/mmol is poor in identifying significant (>1 gm/day) proteinuria from primary care. 
- Cut off value of ACR over 45mg/mmol has higher statistical value compared to ACR>60mg/mmol and PCR>100mg/mmol. 
- ACR >45mg/mmol is acceptable value for referral for significant proteinuria.
- Reporting of a specific value of ACR>45mg/mmol is not necessary for monitoring and managing progression of proteinuria as 24 hour urine measurements are still required to quantify proteinuria in these cases after referral to secondary care.

References: