20th July 2021

Associate Professor Azrina Md Ralib
Email: drazrina@gmail.com

Dear Associate Professor Azrina,

**MSA/CoA Annual Scientific Congress 2021 - Acceptance of Abstract for Best Paper MSA Award and Young Investigator Award Presentation**

We would like to inform you that your abstract as mentioned below has been shortlisted for the Best Paper for MSA Award and Young Investigator Award Presentation:

**Development and Validation of Estimates of Glomerular Filtration Rate Equation from Plasma Creatinine in the Malaysian Setting**

The date and time for the live presentation via the online platform are as follows:
Date : 7th August 2021
Time of Session : 1400hrs - 1600hrs

Please take note that:

- Only 10 minutes (7 minutes for presentation and 3 minutes for questions and answers) has been allocated for each paper.
- Rehearse your presentation to ensure that it will not exceed the maximum allowable time and do not have too many slides and spend too much time on the introduction and background.
- The main slides should be on the Introduction, Objective and then to concentrate on the Method, Results and Conclusion.

**Please make sure you have strong internet connection during presentation. Please check if the audio and video in your device is working properly.**

Thank you very much.

Yours sincerely

Dato Dr Jahizah Hassan
Co-Chairperson
Scientific Committee
MSA / CoA ASC 2021

Assoc. Prof Dr Azarinah Izaham
Co-Chairperson
Scientific Committee
MSA / CoA ASC 2021

ORAL PRESENTATION ABSTRACT FOR MSA AWARD AND YOUNG INVESTIGATOR AWARD

**ABSTRACT NO 12**

# Development and Validation of Estimates of Glomerular Filtration Rate Equation from Plasma Creatinine in the Malaysian Setting

**Azrina Md Ralib[1],** Farah Nadiah Mohd Hanafiah[1], Iqbalmunawwir Abd Rashid[1], Fatimah Dzaharudin[2], Mohamad Shahrir Abd Rahim[1]

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## INTRODUCTION

Accurate assessment of GFR in perioperative and intensive care patients is very important for diagnostic and therapeutic intervention. Clinically, GFR is estimated from plasma creatinine using equations such as Cockcroft Gault (CG), Modification of Diet in Renal Disease (MDRD) and Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equations. However, these were developed in the Western population. There was no equation that has been developed specifically in our population.

## AIM

We developed a new equation based on the radioisotope clearance using the gold standard of $^{99m}$Tc-DTPA clearance. We then performed an internal validation by comparing the bias and accuracy of the new equation compared to the CG, MDRD and CKD EPI equations with the gold standard of 99mTc-DTPA clearance.

## METHOD

This was a cross sectional study using the existing record of patients that was referred for $^{99m}$Tc-DTPA scan at the Nuclear Medicine Centre, International Islamic University Malaysia. The study has been approved by IIUM Ethics Committee. As this is a retrospective study utilizing routinely collected data, the ethics committee has waived the need for informed consent.

## RESULTS

Data of 187 patients was analysed from January 2016 to March 2021. Of these, 94 were randomized to the development cohort, and 93 to the validation cohort. A new equation of eGFR was determined as $16.637 * 0.9935^{Age} * (SCr/23.473)^{-0.45159}$. In the validation cohort, both CKD-EPI and the new equation had the highest correlation to measured GFR with correlation coefficient of 0.81 ($p<0.0001$). However, the new equation had the least bias and was the most precise (mean bias of -3.58 ± 12.01).

## CONCLUSIONS

The new equation which was developed specifically using our local data population was the most accurate with less bias compared to the other equation. Further study validating this equation in the perioperative and intensive care population is needed.

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ANNUAL SCIENTIFIC CONGRESS 2021 (VIRTUAL)

*MyAnaesthesia 2021: Dawn of a New Era*

6th - 8th August 2021

# Development of Estimates of Glomerular Filtration Rate Equations in the Malaysian Setting

# Development of Estimates of Glomerular Filtration Rate Equations in the Malaysian Setting

**Azrina Md Ralib[1], Farah Nadiah Mohd Hanafiah[1], Iqbalmunawwir Abd Rashid[1], Mohamad Shahrir Abd Rahim[2], Fatimah Dzaharudin[3], Mohd Basri Mat Nor[1]**

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# INTRODUCTION

- Accurate assessment of **glomerular filtration rate (GFR)** in perioperative and intensive care patients is important for
  - diagnostic
  - therapeutic intervention
- GFR is estimated from plasma creatinine using equations such as
  - Cockcroft-Gault (Cockcroft Gault 1976)
  - MDRD (Levey 1999)
  - CKD-EPI (Levey 2009)
- Limitations - developed in the Western populations

# STATEMENT OF PROBLEMS

- Ethnicity influences the performance of these equations (Rule, 2009)
- Racial coefficients has been added to improve accuracy e.g.
  - Chinese
  - Japanese
  - Korean
  - Thai
  - South African

(Matsuo 2010, Zelnick 2020, Jeong 2016, Praditpornsilpa 2011)

# JUSTIFICATION

- Local setting, three studies
  - Compared the established equations with $^{51}$Cr-EDTA clearance
  - Without addition of racial coefficient/developed new equation

(Jalalonmuhali 2017, Jalalonmuhali 2018, Jalalonmuhali 2018)

- A study in Singapore (Teo 2011)
  - Addition of racial coefficient against $^{99m}$Tc-DTPA clearance
  - No improvement in the performance of the CKD-EPI equation
  - 232 multi-ethnic group of patients
- To the best of our knowledge, there was no previous study that has **developed eGFR equation** specifically in our population.

# OBJECTIVES

1. Develop **a new equation** based on the gold standard of $^{99m}$Tc-DTPA imaging measured GFR
2. Perform an **internal validation** of the new equation compared to the other established equations

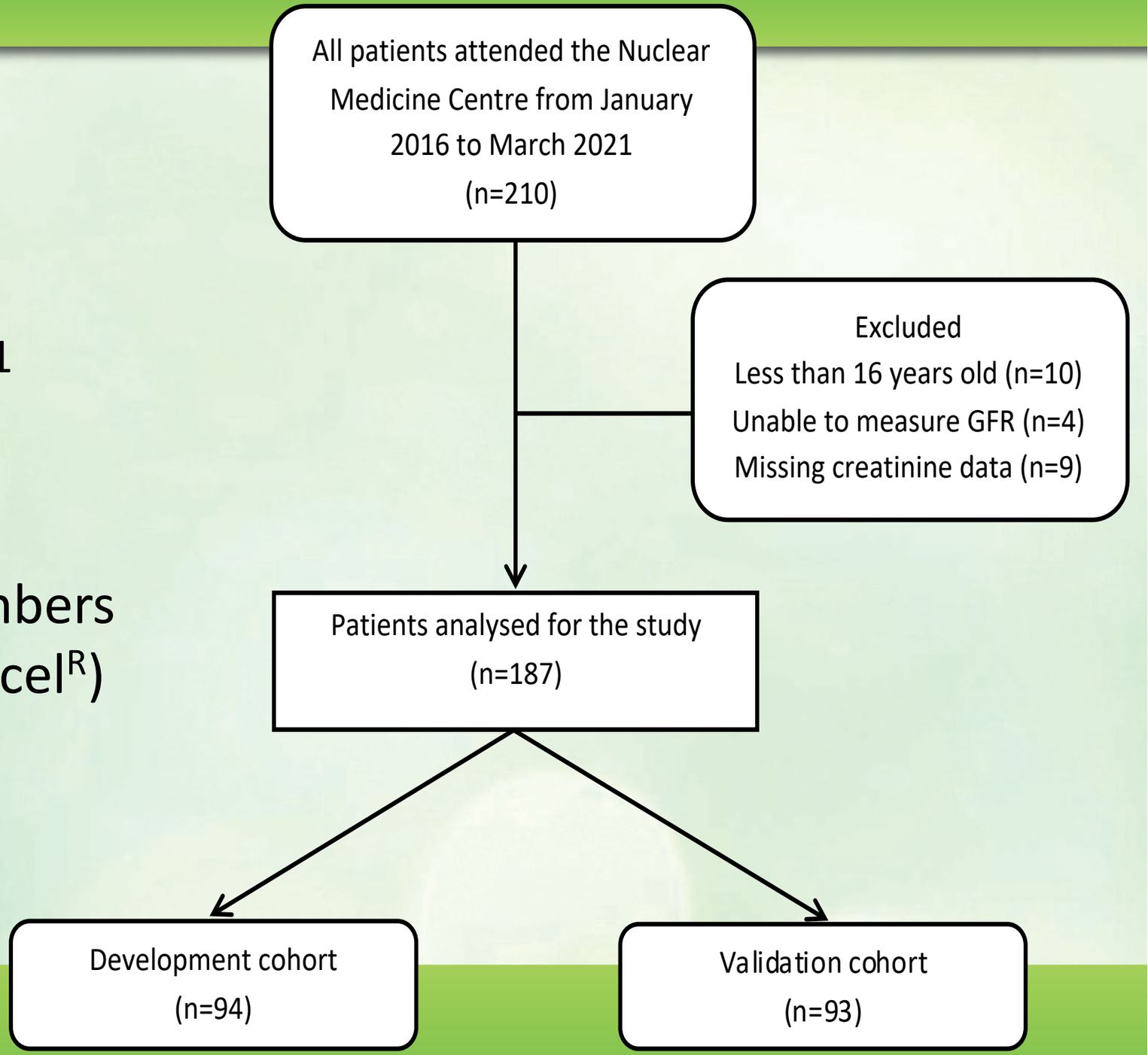
# METHODOLOGY

- Cross sectional study
- Patients whom was referred for $^{99m}$Tc-DTPA imaging at the Nuclear Medicine Centre, IIUM
- Retrospective study utilising routinely collected data
- Ethics committee approval (IREC Number 2019-153)
- The committee has waived the need for informed consent

# RESULTS

# Patient Flow

- 5 years
  - January 2016 to March 2021
- 210 patients screened
- 187 patients analysed
- Randomised (random numbers generated by Microsoft Excel$^{R}$)
  - 94: development cohort,
  - 93: validation cohort



# Demographic Data

| Variables | All Patients (n=187) | Development Cohort (n=94) | Validation Cohort (n=93) | p-value |
|---|---|---|---|---|
| Age (years) | 55.3 ± 14.2 | 55.9 ± 14.1 | 54.7 ± 14.3 | 0.56 |
| Gender (male) | 97 (51.9) | 46 (48.9) | 51 (54.8) | 0.41 |
| Weight (kg) | 65 ± 14 | 65 ± 15 | 65 ± 13 | 0.52 |
| Height (cm) | 158 ± 10 | 159 ± 10 | 158 ± 10 | 0.76 |
| Body Mass Index (kg/m$^2$) | 26.0 ± 5.4 | 25.9 ± 5.4 | 26.1 ± 5.4 | 0.54 |
| Ethnicity | | | | 0.36 |
| - Malay | 1165 (88.2) | 84 (89.4) | 81 (87.1) | |
| - Chinese | 16 (8.6) | 9 (9.6) | 7 (7.5) | |
| - Indian | 2 (1.1) | 0 (0) | 2 (2.2) | |
| - Orang Asli | 2 (1.1) | 1 (1.1) | 1 (1.1) | |
| - Others | 2 (1.1) | 0 (0) | 2 (2.2) | |

# Measured and Estimated GFRs

| Variables | All Patients (n=187) | Development Cohort (n=94) | Validation Cohort (n=93) | p-value |
|---|---|---|---|---|
| $^{99m}$Tc-DTPA Measured GFR (ml/min) | 40.6 ± 19.9 | 40.7 ± 20.1 | 40.4 ± 19.8 | 0.58 |
| Plasma Creatinine (μmol/l) | 124 (86 – 209) | 132 (86 – 214) | 117 (87 – 208) | 0.33 |
| $eGFR_{CG}$ (ml/min) | 46.2 (28.5 – 72.6) | 45.2 (26.8 – 71.1) | 49.2 (31.1 – 72.8) | 0.34 |
| $eGFR_{MDRD}$ (ml/min) | 49.4 (27.1 – 73.0) | 46.4 (24.9 – 66.7) | 50.8 (28.7 – 82.1) | 0.25 |
| $eGFR_{CKD-EPI}$ (ml/min) | 47.8 (26.0 – 74.7) | 46.8 (23.7 – 69.0) | 49.7 (28.2 – 85.8) | 0.24 |

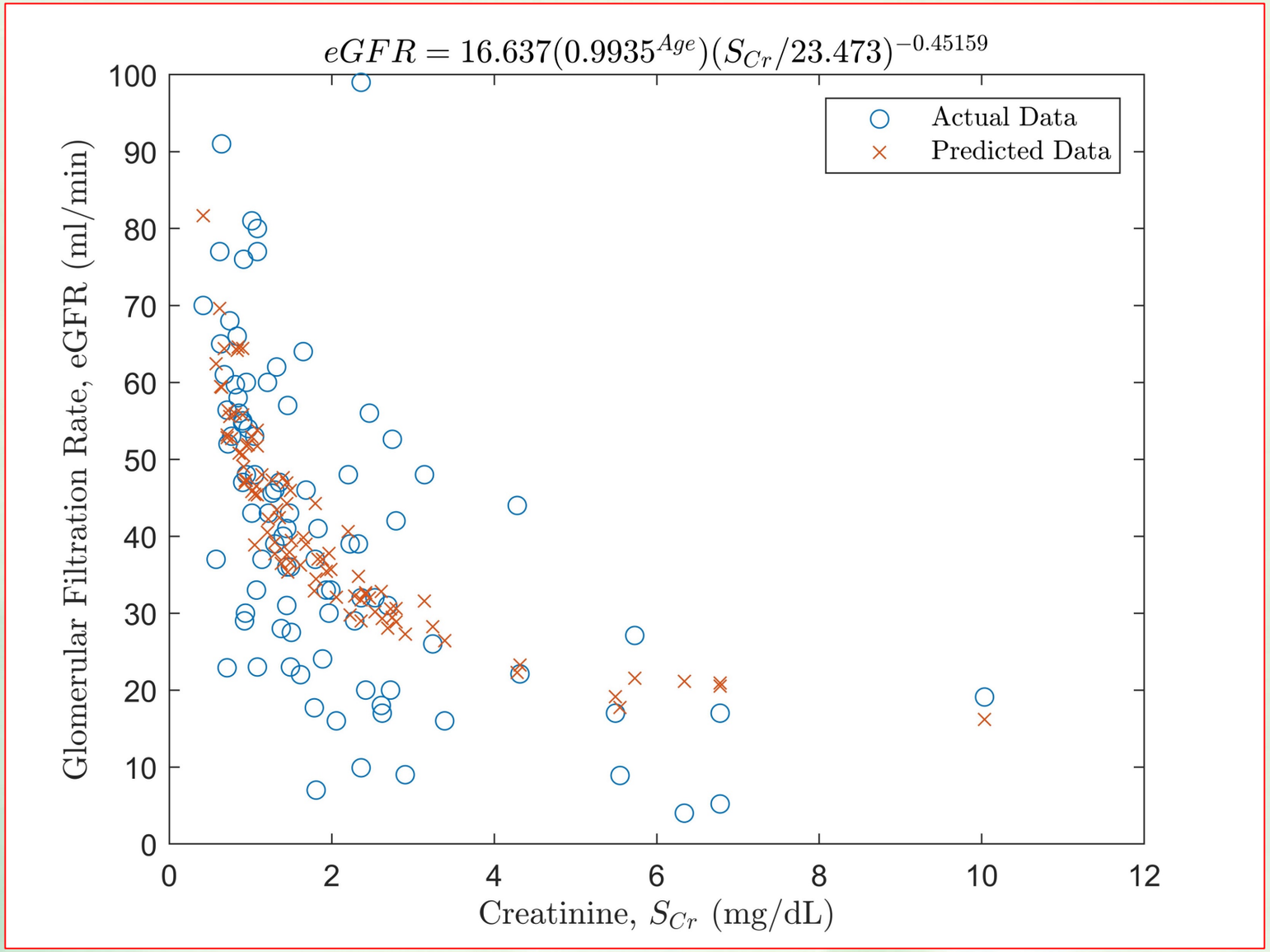
# Development Cohort (n=94)

# New eGFR Equation

- **Generalised least square algorithm** that predict the new equation from the actual data of 94 patients
- Regression coefficient of **age, gender and ethnicity** were added
- Final equation only has **age**, as the equation that best fit were similar for male and female
- A new equation of eGFR was determined as

$$GFR = 16.637 * 0.9935^{Age} * \left(\frac{S_{Cr}}{23.473}\right)^{-0.45159}$$

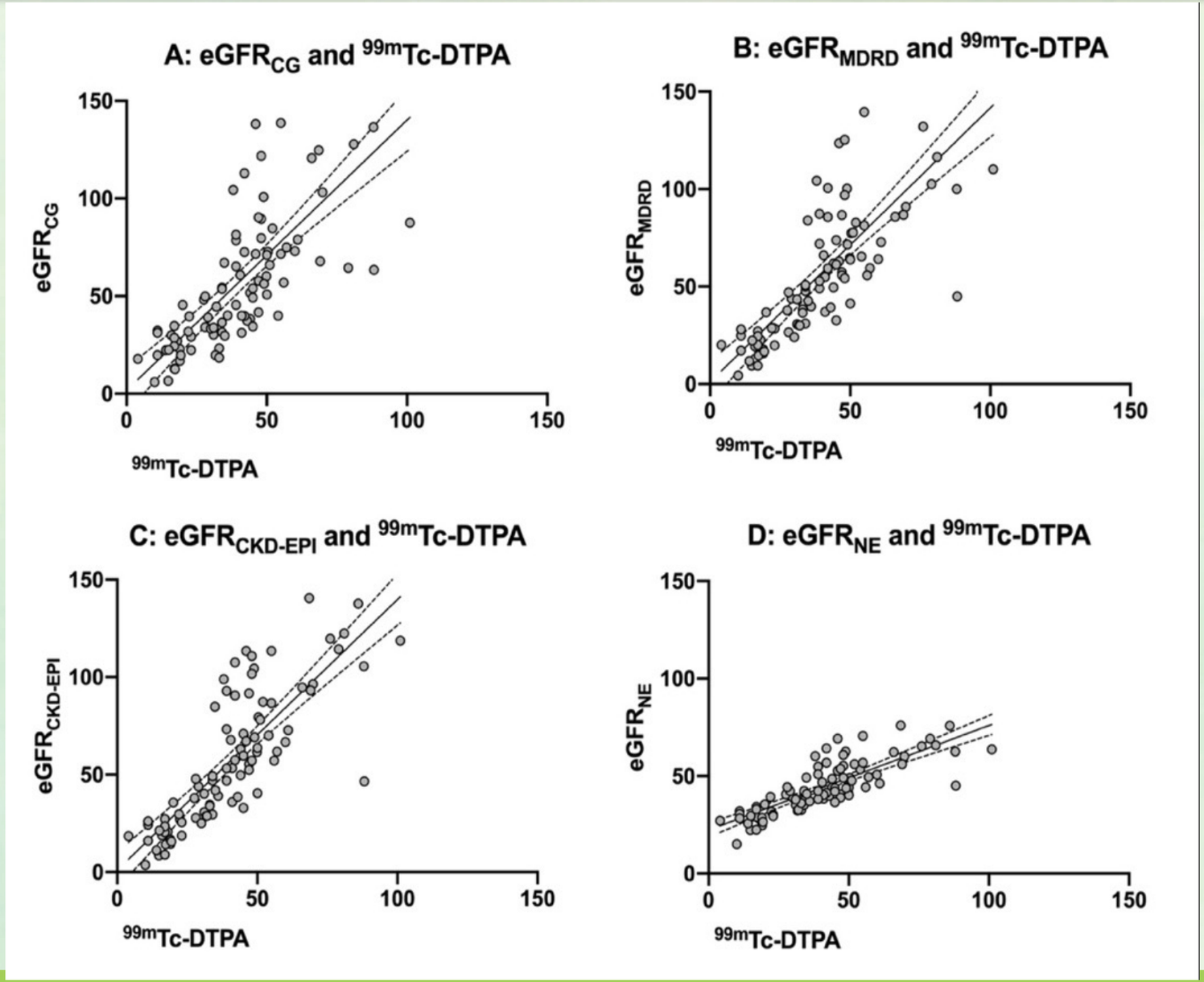
- The R-squared = 0.416
- F statistic of 237
- p<0.0001



# Validation Cohort (n=93)

# Correlation Analyses

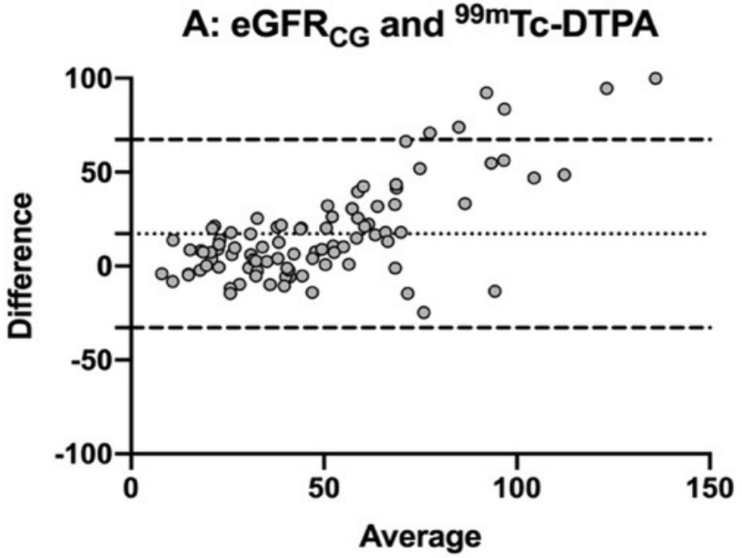
| | r | 95% CI |
|---|---|---|
| $eGFR_{CG}$ | 0.75 | 0.64 to 0.83 |
| $eGFR_{MDRD}$ | 0.78 | 0.68 to 0.85 |
| $eGFR_{CKD-EPI}$ | 0.81 | 0.72 to 0.87 |
| $eGFR_{NE}$ | 0.81 | 0.72 to 0.87 |

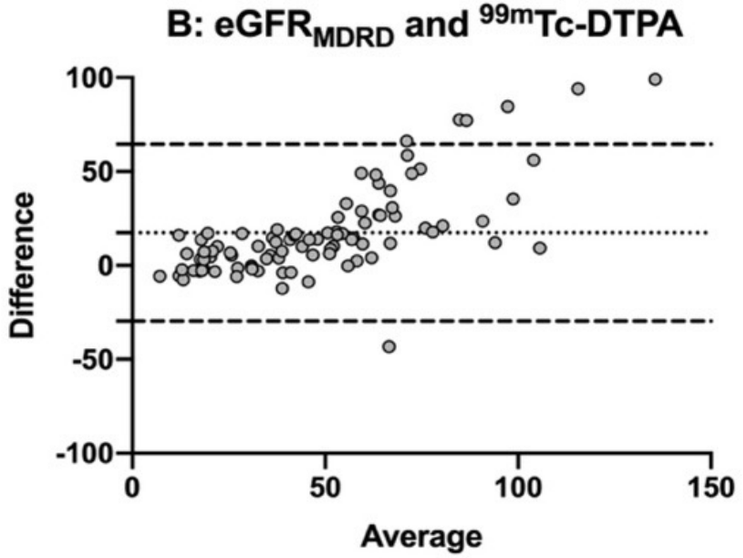


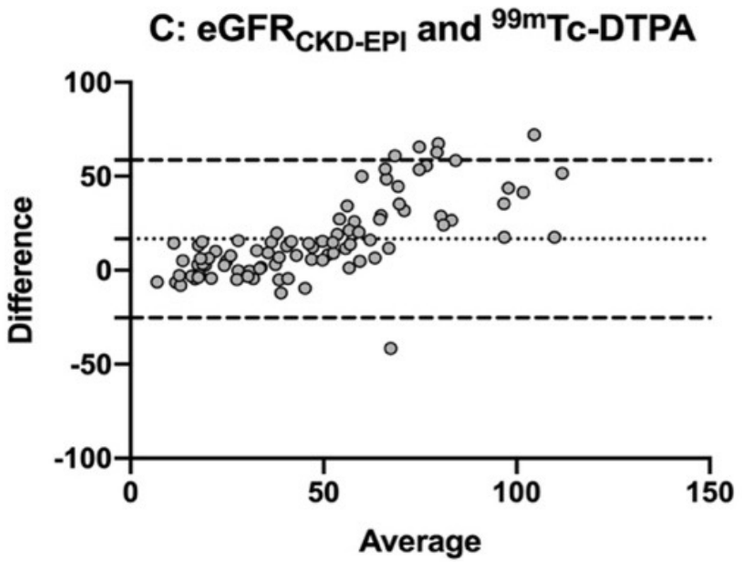
# Bias, Precision & Accuracy

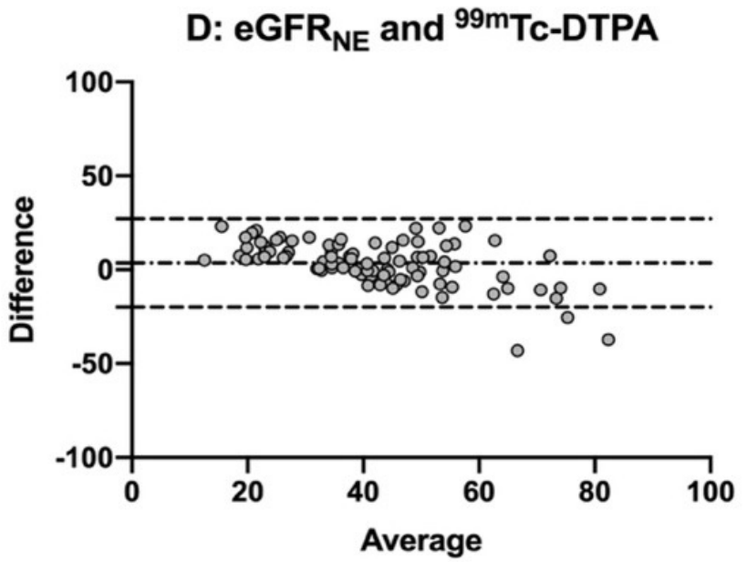
| | Mean Bias (ml/min) | Standard Deviation of Bias (ml/min) | Differences | Percent Differences | P30% | P50% |
|---|---|---|---|---|---|---|
| $eGFR_{CG}$ | 17.19 | 25.55 | 10.27 (-0.76 – 25.9) | 34.72 (-2.07 – 77.14) | 35.5 | 50.5 |
| $eGFR_{MDRD}$ | 17.42 | 24.03 | 12.04 (3.21 – 24.5) | 30.14 (7.88 – 61.23) | 28.0 | 45.2 |
| $eGFR_{CKD-EPI}$ | 16.64 | 21.40 | 12.27 (2.03 – 27.24) | 34.91 (6.53 – 58.70) | 26.9 | 46.2 |
| $eGFR_{NE}$ | 3.58 | 12.01 | 5.4 (-3.06 – 12.94) | 14.11 (-6.33 – 14.11) | 64.5 | 84.9 |

# Bland Altman Analyses



# Summary of Result in the Validation Cohort

- In the validation cohort, both CKD-EPI and the new equation had the highest correlation to $^{99m}$Tc-DTPA with correlation coefficient of **0.81** ($p<0.0001$)
- However, the new equation had the least bias and was the most precise **(mean bias of -3.58 ± 12.01)** and accurate **(P30 of 64.5% and P50 of 84.9%)** compared to the other equations

# Limitations

- **Single centre** whereby all of the patients were referred to the Nuclear Medicine Clinic → does not reflect the general population in Malaysia.
- **Retrospective study** → only use the available recorded data and the comorbidities were not documented properly
- Centre is in the East Coast of Malaysia where majority of population is Malay → unable to factor in the different **ethnicities** in the Malaysian population
- **Small sample size** for a robust equation to be developed.

# CONCLUSION

- The **new equation** which was developed specifically using our local data population was the **most accurate and precise, with less bias compared** to the other equations.
- Further study **validating** this equation in the perioperative and intensive care patients is needed.

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# ACKNOWLEDGEMENT


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***This may not seem very important, I know. But it is! So, I'm bothering telling you so.***

***Dr Suess, The Sleep Book***

SOUVENIR PROGRAMME & ABSTRACT BOOK

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**FP 01 ID 006** THE USE OF BISPECTRAL INDEX (BIS) MONITORING IN ELDERLY UNDERGOING SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS
Ng Ka Ting

**FP 02 ID 012** DEVELOPMENT AND VALIDATION OF ESTIMATES OF GLOMERULAR FILTRATION RATE EQUATION FROM PLASMA CREATININE IN THE MALAYSIAN SETTING
Azrina Md Ralib

**FP 03 ID 038** THE DIAGNOSTIC ACCURACY OF SERUM PROCALCITONIN AS SEPSIS BIOMARKER AMONG IMMUNOCOMPROMISED PATIENTS
Wan Rahiza Wan Mat

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Sebastian Sundaraj

**FP 05 ID 061** ESTIMATES OF GLOMERULAR FILTRATION RATE: COMPARISON OF DIFFERENT CREATININE BASED EQUATIONS
Farah Nadia Mohd Hanafiah

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**FP 07 ID 66** COMPARISON OF VISIBILITY AND SUCCESSFUL BLOCK BETWEEN ECHOPLEX+ AND STIMUPLEX® ULTRALINE 360° ECHOGENIC NEEDLES DURING ULTRASOUND-GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERY
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**FP 08 ID 087** COMPARING THE ASSOCIATION OF DIFFERENT FRAILTY SCREENING TOOLS WITH POSTOPERATIVE DELIRIUM
Cheong Jun Leong

**FP 09 ID 095** EVALUATION OF SUBLINGUAL ULTRASOUND ASSESSMENT AND OTHER CLINICAL PREDICTORS OF DIFFICULT INTUBATION AMONG OBESE PATIENTS
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**FP 10 ID 097** JELLY-BASED LUMBAR SPINE PHANTOM MODEL AS A SONOANATOMY TEACHING TOOL RELEVANT TO CENTRAL NEURAXIAL BLOCK
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