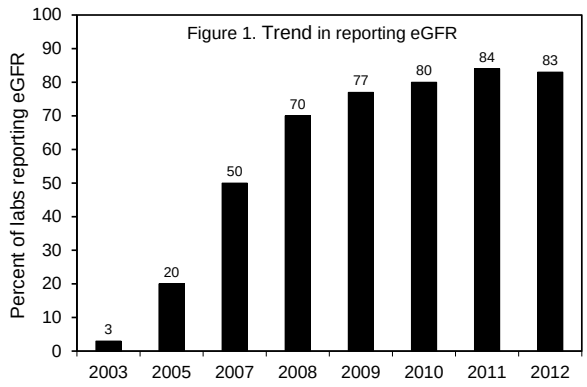
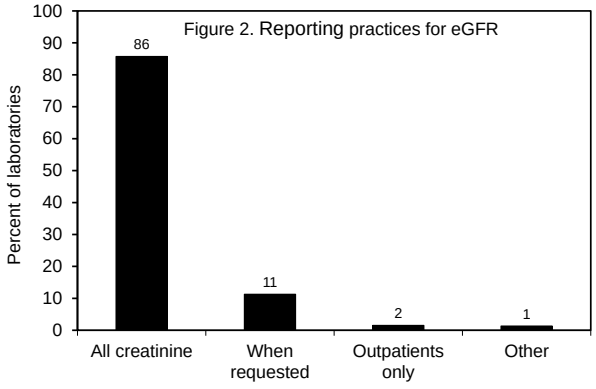
Reporting Estimated Glomerular Filtration Rate (eGFR) for Adults

Chronic kidney disease (CKD) is asymptomatic until substantial kidney damage has occurred. The public health goal of the National Kidney Disease Education Program (NKDEP) is to improve earlier identification of patients with CKD so they can be put on treatment to slow progression and reduce complications of the disease. The NKDEP recommends reporting eGFR along with serum (or plasma or whole blood) creatinine for adults because an eGFR value is more easily related to a patient's kidney disease condition than is a creatinine concentration. The typical upper reference interval for creatinine corresponds to loss of approximately half of kidney function for many demographic groups which makes creatinine alone less useful as a criterion to identify people at risk for CKD.

The general chemistry C-B Survey, June 2012, included questions regarding practices for reporting eGFR from serum creatinine results for adult patients. Of the 5059 laboratories that responded, 83% were reporting eGFR as recommended by the NKDEP (Figure 1) which has been a consistent percent for the past few years. Figure 2 shows that 86% reported eGFR with all creatinine results as recommended by NKDEP because most computer systems are not able to discriminate clinical conditions when eGFR is less reliable. The clinician is able to determine the suitability of an eGFR result for a patient's condition. There are clinical conditions when selective reporting of eGFR is appropriate as practiced by 11% of respondents. For example, the patient must be in a stable metabolic state for creatinine to be a useful biomarker for GFR. Consequently, eGFR may not be useful for some inpatients and those with acute kidney injury.





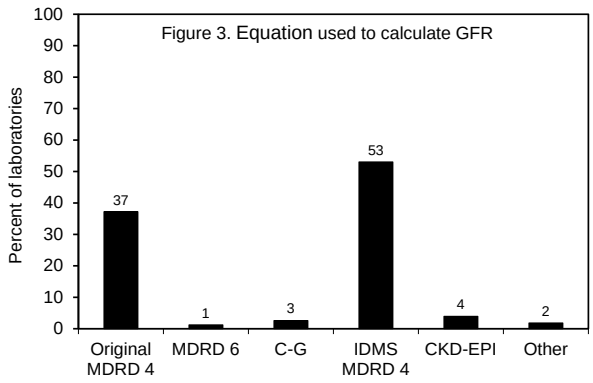
The NKDEP web site cautions that there are also clinical conditions when creatinine is less reliable as an indicator of kidney function due to alterations in the rate of production of creatinine from muscle. These conditions include: very large or very small body size or muscle mass, nutritional status (e.g. meat increases and a vegan diet decreases blood creatinine concentration), clinical conditions which decrease muscle mass (e.g. cancer, paraplegia, amputation), pregnancy which increases GFR and decreases creatinine concentration, and patients with serious comorbid conditions or with metabolically unstable kidney function.

Figure 3 shows that 53% of laboratories were using the isotope dilution mass spectrometry (IDMS) traceable version of the MDRD 4-variable equation (1) and 4% were using the newer CKD-EPI equation (2) which is also intended for use with standardized creatinine values. All major global manufacturers have now standardized calibration to be traceable to an IDMS reference measurement procedure. Consequently, all laboratories should be reporting standardized creatinine results and using an equation that is suitable for standardized creatinine values.

Of concern in Figure 3 are the 37% of laboratories that are still using the original MDRD 4-parameter equation or those using the 6-parameter MDRD or Cockcroft-Gault equations. IDMS traceable calibration caused a method dependent 5-30% reduction in creatinine concentrations compared to older calibration schemes (3). Thus, when an IDMS traceable creatinine result is used with an older estimating equation,

the eGFR will be erroneously high. Laboratories using an older equation should change to either the IDMS traceable version of the MDRD equation or to the CKD-EPI equation.

Please note that Siemens Dimension and Vista Jaffe creatinine methods still have non-standardized calibration. However, Siemens issued a bulletin in March, 2011 that provided a correction factor to enable reporting IDMS traceable results for the Jaffe methods used with Dimension and Vista analyzers. Of the respondents to this survey who used these Siemens methods, only 22% were using the correction factor to report standardized creatinine results. It is recommended that users of the Dimension or Vista Jaffe methods apply the correction factor to report IDMS-traceable creatinine results and use one of the eGFR equations suitable for use with standardized creatinine values.



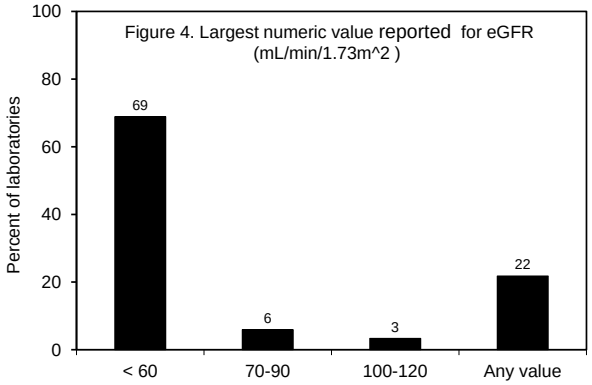


Figure 4 shows that 31% of laboratories are reporting eGFR values above 60 mL/min/1.73 m^2. However, Figure 3 indicates that only 4% of laboratories are using the CKD-EPI equation. Laboratories reporting numeric values for eGFR above 60 mL/min/1.73 m^2 should be using the CKD-EPI equation. The MDRD equation should not be used to calculate values greater than 60 mL/min/1.73m^2 because the values are biased lower than true measured GFR values. The new CKD-EPI equation uses the same variables as the MDRD equation and is more accurate than the MDRD equation at values above 60 mL/min/1.73m^2 (2).

Additional information on reporting eGFR is available at the NKDEP web site: http://www.nkdep.nih.gov/.

References:

1. Levey AS, Coresh J, Greene T, et al. Expressing the Modification of Diet in Renal Disease Study Equation for Estimating Glomerular Filtration Rate with Standardized Serum Creatinine Values. Clin Chem 2007;53:766-72.
2. Levey AS, Stevens LA, Schmidet CH, et al. A New Equation to Estimate Glomerular Filtration Rate. Ann Intern Med. 2009;150:604-12.
3. Miller WG, Myers GL, Ashwood ER, et al. Creatinine Measurement: State of the Art in Accuracy and Inter-Laboratory Harmonization. Arch Pathol Lab Med 2005;129:297-304.

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