TRAINING UPDATE

Lab Location:	SGMC & WAH	**Date Distributed:**	10/6/2016
Department:	Core	**Due Date:**	10/19/2016
		Implementation:	**10/19/2016**

DESCRIPTION OF PROCEDURE REVISION

Name of procedure:

Creatinine by Dimension Vista® System SGAH.C925 v2

Description of change(s):

Section	Reason
4,5,6	Remove individual section labeling instructions and add general one
9.3	Change eGFR calculation frequency to once per 12 hours *(calculated by the LIS, this change is already implemented)*
10.5	Move patient review from section 6
15	Update to new standard wording, add reagent warning from section 4

This revised SOP will be implemented on October 19, 2016

Document your compliance with this training update by taking the quiz in the MTS system.

Technical SOP

Title	**Creatinine by Dimension Vista® System**
Prepared by	Ashkan Chini Date: 10/8/2015
Owner	Robert SanLuis Date: 10/8/2015

Laboratory Approval	**Local Effective Date:**	
Print Name and Title	**Signature**	**Date**
Refer to the electronic signature page for approval and approval dates.		

Review		
Print Name	**Signature**	**Date**

TABLE OF CONTENTS

1. TEST INFORMATION

Assay	Method/Instrument	Local Code
Creatinine, Serum/Plasma	Dimension Vista® System	CREAT
Creatinine, Urine, Random		UCRR
Creatinine, Urine, 24 hour		UCR24
Creatinine, Body Fluid		FCREAT
Creatinine Clearance		CRCL

Synonyms/Abbreviations
Serum/Plasma Creatinine, Random Urine Creatinine, 24 hour Urine Creatinine, Body Fluid Creatinine

Department
Chemistry

2. ANALYTICAL PRINCIPLE

The CRE2 method uses a modified rate blanked kinetic Jaffe technique. In the presence of a strong base such as NaOH, picrate reacts with creatinine to form a red chromophore. The rate of increasing absorbance at 510 nm due to the formation of this chromophore is directly proportional to the creatinine concentration in the sample and is measured using a bichromatic (510, 577 nm) rate technique.

$$\text{Creatinine} + \text{Picrate} \xrightarrow{\text{NaOH}} \text{Red Chromophore (absorbs at 510 nm)}$$

3. SPECIMEN REQUIREMENTS

3.1 Patient Preparation

Component	Special Notations
Fasting/Special Diets	N/A
Specimen Collection and/or Timing	Normal procedures for collecting and storing serum, plasma, urine, and body fluid (serous) may be used for samples to be analyzed by this method.
Special Collection Procedures	Preferred method for random urine is Urine Collection Kit with specimen transferred to Urine Chemistry Collection Tube (yellow top). 24 hour urine must be stored at 2 – 8 °C and analyzed within 4 days. **Creatinine Clearance**: a serum creatinine level must be drawn within 24 hours of the 24-hr urine collection beginning or ending time.
Other	Submit random urine specimens to Laboratory within 2 hours of collection. For Creatinine Clearance calculations, patient's height and weight are required.

3.2 Specimen Type & Handling

Criteria	
Type -Preferred	Plasma (Lithium Heparin), Urine and Body Fluid (serous fluid only)
-Other Acceptable	Serum
Collection Container	Plasma: Mint green top tube (PST) Serum: Red top tube, Serum separator tube (SST) Urine: Urine Collection Kit, sterile specimen container, 24 hour container Body Fluid: Sterile/Clean container or tube

Criteria		
Volume - Optimum **- Minimum**	1.0 mL 0.5 mL	
Transport Container and Temperature	Plasma/Serum/Body Fluid: Collection container or plastic vial at room temperature. Urine, Random: Urine Chemistry Collection Tube (yellow top) or container at room temperature submitted within 2 hours of collection. Urine, 24 hour: Collection container at room temperature.	
Stability & Storage Requirements	Room Temperature:	Plasma/Serum/Body Fluid: 24 hours Urine: Not recommended
	Refrigerated:	Plasma/Serum/Body Fluid: 7 days Urine: 4 days
	Frozen:	Plasma/Serum/Body Fluid: 3 months Urine: Not recommended
	Instrument on board aliquot stability	2 hours
Timing Considerations	Serum or plasma should be physically separated from cells as soon as possible with a maximum limit of two hours from the time of collection.	
Unacceptable Specimens & Actions to Take	Specimens that are unlabeled, improperly labeled, or those that do not meet the stated criteria are unacceptable. Urine samples in Urine Analysis Preservative Tubes and synovial fluid are NOT acceptable. Request a recollection and credit the test with the appropriate LIS English text code for "test not performed" message. Examples: Quantity not sufficient-QNS; Wrong collection-UNAC. Document the request for recollection in the LIS.	
Compromising Physical Characteristics	Gross hemolysis. Reject sample and request a recollection. Credit the test with the appropriate LIS English text code explanation of HMT (Specimen markedly hemolyzed)	
Other Considerations	Allow Red Top or SST to clot completely prior to centrifugation.	

NOTE: Labeling requirements for all reagents, calibrators and controls include: (1) Open date, (2) Substance name, (3) Lot number, (4) Date of preparation, (5) Expiration date, (6) Initials of tech, and (7) Any special storage instructions. Check all for visible signs of degradation. When placed onboard the analyzer, the instrument captures the date / time loaded and calculates and tracks the opened expiration.

4. REAGENTS

The package insert for a new lot of kits must be reviewed for any changes before the kit is used. A current Package Insert is included as a Related Document.

4.1 Reagent Summary

Reagents	Supplier & Catalog Number
Creatinine (CRE2)	Siemens, Flex® reagent cartridge, Cat. No. K1033A

4.2 Reagent Preparation and Storage

Reagent	**Creatinine**
Container	Reagent cartridge
Storage	Store at 2-8° C
Stability	• Reagent is stable until expiration date stamped on the reagent cartridges. • Sealed wells on the instrument are stable for 30 days. • Once wells 1 - 12 have been entered by the instrument, they are stable for 3 days.
Preparation	All reagents are liquid and ready for use.

5. CALIBRATORS/STANDARDS

5.1 Calibrators/Standards Used

Calibrator	Supplier and Catalog Number
CHEM 1 CAL	Siemens Dimension Vista®, Cat. No. KC110B

5.2 Calibrator Preparation and Storage

Calibrator	CHEM 1 CAL
Preparation	Allow CHEM 1 Calibrator to thaw and equilibrate to room temperature (22 – 28° C) for 1 hour. Before use, **gently** invert the calibrator vials at least 10 times to ensure that the contents are thoroughly mixed. **Do not vortex.**
Storage/Stability	• Store at -25 to -15° C • **Unopened calibrator** is stable until expiration date stamped on the box. • **Opened Calibrator:** once the stopper of the vial is punctured, assigned values are stable for 7 days when stored on board the Dimension Vista System.

5.3 Calibration Parameter

Criteria	Special Notations
Reference Material	CHEM 1 CAL
Assay Range	Plasma/Serum: 0.15 – 20.00 mg/dL Urine: 13.00 – 300.00 mg/dL
Suggested Calibration Level	See Reagent Package Insert for lot specific assigned values in mg/dL
Frequency	• Every new reagent cartridge lot. • Every 90 days for any one lot • When major maintenance is performed on the analyzer. • When control data indicates a significant shift in assay.
Calibration Scheme	2 levels, n = 5

5.4 Calibration Procedure

Auto Calibration:

1. Place the required calibrator vials in a carrier. Make sure the barcode labels are entirely visible through the slots.
2. Place the carrier in the loading area.
3. Position the carrier with the labels facing away from the user.
4. Press the **Load** button.
5. Automatic calibration requires that calibrators be on the instrument. As the time for processing approaches, the instrument reviews onboard inventory for the appropriate calibrators.

Manual Calibration:

1. Verify that calibrators and reagents are in inventory on the instrument.
2. Press **System > Method Summary > Calibration**.
3. Select a method from the sidebar menu. Press the **Order Calibration** button on the screen.
4. Verify that the information on the screen is correct. Verify that the calibrator lot is correct using the drop-down menu.
   a. When calibrating using Vials press **OK**.
   b. When calibrating using Cups, check the Use Cups box. This displays the rack and cup position fields. For additional cups use the positions in ascending order. Be sure to use the number of calibration levels and cups as specified in the method IFU. Scan the rack barcode and place calibrator cups in an adapter in position 1 on a rack. Press **OK** and load the rack on the instrument.
5. The status field in the calibration screen changes sequentially to Awaiting Scheduling, Preparing Calibrators and Processing.

5.5 Tolerance Limits

IF……	THEN……
If result fall within assay-specific specification, and QC values are within acceptable limits,	proceed with analysis
If result falls outside assay-specific specification, or QC values are out of Acceptable limits,	troubleshoot the assay and/or instrument and repeat calibration

6. QUALITY CONTROL

6.1 Controls Used

Controls	Supplier and Catalog Number
Liquid Assayed Multiqual Levels 1 & 3	Bio-Rad Laboratories Cat. No. 337 & 339
Liquichek Urine Chemistry Control Levels 1 & 2	Bio-Rad Laboratories Cat. No. 195 & 196

6.2 Control Preparation and Storage

Control	**Liquid Assayed Multiqual, Levels 1 and 3**
Preparation	Allow the frozen control to stand at room temperature (18-25°C) for 30 minutes or until completely thawed. A precipitate may be present that dissolves upon mixing. Before loading vials, gently swirl the contents to ensure homogeneous with no visible sign of precipitate. (Do not use a mechanical mixer)
Storage/Stability	Unthawed controls are stable until the expiration date at -20 to -50^{o}C. Once the product stopper is punctured, all analytes will be stable for 5 days when stored at 2 - 8° C.

Control	**Liquichek Urine Chemistry Control Levels 1 and 2**
Preparation	Before loading vials onto the instrument, gently swirl the contents to ensure homogeneity.
Storage/Stability	Stable until the expiration date when stored at 2-8°C. Once the product stopper is punctured, all analytes will be stable for 30 days when stored on-board Dimension Vista at 2-8^{o}C.

6.3 Frequency

Analyze all levels of QC material after every calibration and each day of testing (notated on the QC frequency sheets posted on the instruments).

Refer to the Dimension Vista® QC Schedule in the Laboratory policy Quality Control Program and in the Dimension Vista® Quick Reference Guide.

6.4 Tolerance Limits and Criteria for Acceptable QC

Step	Action
1	Acceptable ranges for QC are programmed into the instrument's Quality Control software system and Unity Real Time, and may be posted near the instrument for use during computer downtime.
2	**Run Rejection Criteria** • Anytime the established parameters are exceeded (if one QC result exceeds 2 SD), the run is considered out of control (failed) and patient results must not be reported. • The technologist must follow the procedure in the Laboratory QC Program to resolve the problem.
3	**Corrective Action**: • All rejected runs must be effectively addressed through corrective action. Steps taken in response to QC failures must be documented. Patient samples in failed analytical runs must be reanalyzed according to the Laboratory QC Program. Supervisors may override rejection of partial or complete runs only with detailed documentation and criteria for overrides that are approved by the Medical Director. Consult corrective action guidelines in Laboratory QC Program. Follow corrective action guidelines in the Laboratory QC Program. • Corrective action documentation must follow the Laboratory Quality Control Program.
4	**Review of QC** • QC must be reviewed weekly by the Group Lead or designee and monthly by the Supervisor/Manager or designee. • If the SD and/or CV are greater than established ranges, investigate the cause for the imprecision and document implementation of corrective actions.

6.5 Documentation

- QC tolerance limits are programmed into the instrument and Unity Real Time; it calculates cumulative mean, SD and CV and stores all information for easy retrieval.
- Quality control records are reviewed daily at the bench, weekly by the Group Lead or designee, and monthly by the Supervisor/Manager or designee.
- Refer to complete policies and procedures for QC documentation and for record retention requirements in the Laboratory QC Program.

6.6 Quality Assurance Program

- Each new lot number of reagent or new shipment of the same lot of reagent must be tested with external control materials and previously analyzed samples. Performance of the new lot must be equivalent to the previous lot; utilize published TEA for acceptability criteria.
- Training must be successfully completed and documented prior to performing this test. This procedure must be incorporated into the departmental competency assessment program.
- The laboratory participates in CAP proficiency testing. All proficiency testing materials must be treated in the same manner as patient samples.
- Monthly QC must be presented to the Medical Director or designee for review and signature.
- Monthly QC mean and SD are sent to Bio-Rad Laboratories for peer group comparison.
- Consult the Laboratory QC Program for complete details.

7. EQUIPMENT and SUPPLIES

7.1 Assay Platform

Dimension Vista® System

7.2 Equipment

- Refrigerator capable of sustaining 2–8°C.
- Freezer capable of sustaining range not to exceed -20 to -50°C.
- Centrifuge

7.3 Supplies

- Aliquot Plates
- System Fluids
- Assorted calibrated pipettes (MLA or equivalent) and disposable tips

8. PROCEDURE

Creatinine Flex® reagent cartridge Cat. No. K1033A is required to perform this test.

Creatinine is performed on the Dimension Vista® System after the method is calibrated (see Reference Material in Calibration section) and Quality Controls are acceptable.

NOTE: For all procedures involving specimens, buttoned lab coats, gloves, and face protection are required minimum personal protective equipment. Report all accidents to your supervisor.

8.1	Sample Processing
1.	A sample rack holding tubes or cups is placed on the rack input lane.
2.	The sample shuttle moves the rack to the barcode reader which identifies the rack and samples to the system.
3.	The rack moves into the sample server and to the rack positioner.
4.	At the same time, aliquot plates move from the aliquot loader into position.
5.	The aliquot probe aspirates the sample from the tubes or cups and dispenses it into the wells of the aliquot plates.
6.	After each aspirate-dispense action, the probe is thoroughly rinsed inside and out to prevent sample carryover.
7.	When sample aspiration is completed, the sample server moves the rack back to the sample shuttle, where it is placed on the output lane and can be removed by the operator.

8.2	Specimen Testing
1.	For QC placement and frequency, refer to the Dimension Vista® QC Schedule in the Laboratory QC Program.
2.	Follow the instructions, outlined in the Dimension Vista® Operator's Manual
3.	The instrument reporting system contains error messages to warn the user of specific malfunctions. Results followed by such error messages should be held for follow-up. Refer to the Dimension Vista® system manual "Error messages" section for troubleshooting.
4.	Follow protocol in Section 10.5 "Repeat criteria and resulting" for samples with results above or below the Analytical Measurement Range (AMR). Investigate any failed delta result and repeat, if necessary.
5.	Append the appropriate English text code qualifier messages to any samples requiring a comment regarding sample quality and/or any other pertinent factors.

Test Conditions	
Sample Volume:	13.2 µL
Reagent 1 Volume:	16.5 µL
Reagent 2 Volume:	30.6 µL
Reaction Time:	6 minutes
Test Temperature:	37° C
Wavelength:	510 & 577 nm
Type of measurement:	Bichromatic rate

NOTE: In the event that the test system becomes inoperable, notify supervision or designee for further direction. Patient specimens must be stored in a manner that maintains the integrity of the specimen.

9. CALCULATIONS

The instrument automatically calculates the concentration of Creatinine in mg/dL.
The LIS performs the following calculations.

9.1 Creatinine Clearance

Units for this formula:
Volume in mL
Height in inches
Weight in pounds

$$\left[\left(\frac{\text{Urine Creat.}}{\text{Serum Creat.}}\right) \text{ x } \left(\frac{\text{Volume}}{\text{number of hours x 60 min } (24 \text{ x } 60{=}1440).}\right)\right] \text{ X } \left[\frac{1.73}{\left(\sqrt[2.35294]{\left(\frac{\text{weight}}{2.2}\right)}\right) \text{ x } \left(\sqrt[1.3793103]{(\text{height x } 2.54)}\right) \text{ x } \left(\frac{71.84}{10000}\right)}\right]$$

9.2 24 hour Urine Creatinine

$$\frac{\text{Urine Creatinine X Volume in mL}}{100}$$

9.3 Estimated Glomerular Filtration Rate (eGFR)

For non-black individuals:
186 x (Serum Creatinine)$^{-1.154}$ x (Age)$^{-0.203}$ x (0.742 **if female**) x

For black individuals:
186 x (Serum Creatinine)$^{-1.154}$ x (Age)$^{-0.203}$ x (0.742 **if female**) x (1.210)

Notes:

- eGFR is only reported on patients 18 years of age or older.
- eGFR is calculated once per 12 ~~24~~ hours.
- If the creatinine result is corrected after initial reporting, verify that GFR has also been corrected

10. REPORTING RESULTS AND REPEAT CRITERIA

10.1 Interpretation of Data

None required

10.2 Rounding

No rounding is necessary. Instrument reports results up to two decimal points. Calculated values are reported as whole numbers.

10.3 Units of Measure

Creatinine and 24 hour creatinine: mg/dL
Creatinine Clearance: mL/min/m^2
eGFR: mL/min/1.73m^2

10.4 Clinically Reportable Range (CRR)

Serum/Plasma/Body Fluid: 0.15 – 60.00 mg/dL
Urine: 13.00 – 900.00 mg/dL

10.5 Review Patient Data

Each result is reviewed for error messages. Refer to the Dimension Vista system manual "Error messages" section for troubleshooting. Resolve any problems noted before issuing patient reports.

10.6 Repeat Criteria and Resulting

All repeats must replicate the original result within the total allowable error (TEa) of the assay. Refer to TEa listing for specific information.
Values that fall within the AMR or CRR may be reported without repeat. Values that fall outside these ranges must be repeated.

Serum/Plasma/Body Fluid:

IF the result is …	THEN…
< 0.15 mg/dL	Assure there is sufficient sample devoid of bubbles, cellular debris, and/or fibrin clots. Report as: < 0.15 mg/dL
≥ 20.00 mg/dL	**On Board Automated Dilution:** Results ≥ 20.00 mg/dL will automatically have repeat testing performed into the instrument using dilution factor of 2. No multiplication is necessary.
> 40.00 mg/dL	**Manual Dilution:** Using the primary tube, make the smallest dilution possible to bring the raw data within the AMR. Maximum allowable dilution: x 3 **Diluent**: Reagent Grade Water Enter dilution factor as a whole number on the "Enter Sample Data" screen.

Form revised 2/02/2007

> 60.00 mg/dL	If the recommended dilution does not give results within the clinically reportable range, report as: "> 60.00 mg/dL-REP" Bring to the attention of your supervisor prior to releasing result.

Urine:

IF the result is …	THEN…
< 13.00 mg/dL	Assure there is sufficient sample devoid of bubbles, cellular debris, and/or fibrin clots. Report as: < 13.00 mg/dL
≥ 300.00 mg/dL	**On Board Automated Dilution:** Results ≥ 300.00 mg/dL will automatically have repeat testing performed into the instrument using dilution factor of 3. No multiplication is necessary.
> 900.00 mg/dL	If the recommended dilution does not give results within the clinically reportable range, report as: "> 900.00 mg/dL-REP" Bring to the attention of your supervisor prior to releasing result.

Message	Code
Verified by repeat analysis	Append –REP to the result.

11. EXPECTED VALUES

11.1 Reference Ranges

Serum/Plasma:

Age	Female	Male
Adult (>18 years):	0.55 – 1.02 mg/dL	0.70 – 1.30 mg/dL
Pediatric:		
16 – 18 years	0.80 - 1.20	0.80 - 1.40
13 – 15 years	0.70 - 1.10	0.60 - 1.20
10 – 12 years	0.60 - 1.00	0.60 - 1.00
7 – 9 years	0.50 - 0.90	0.60 - 0.90
4 – 6 years	0.50 - 0.80	0.50 - 0.80
1 – 3 years	0.40 - 0.70	0.40 - 0.70
1 – 11 months	0.40 - 0.60	0.40 - 0.70
0 – 30 days	0.50 - 0.90	0.50 - 1.20

Body Fluid:
0.50 – 2.00 mg/dL

Urine:
30.00 – 125.00 mg/dL

24 hour Urine:
600 – 2500 mg/24 hours

Creatinine Clearance:
80 – 120 mL/min/m^2

11.2 Critical Values

None established

11.3 Standard Required Messages

Each eGFR result has the following comment automatically reported by the LIS:

The eGFR equation utilized is the MDRD for Adults (patients 18 and older). The equation does not require weight as we utilize a normalized body surface area of 1.73m^2.

The table below shows population estimates for mean (average) estimated glomerular filtration (eGFR) by age. These means are derived from the NHANES III survey of over 10,000 individuals, demonstrating that eGFR varies across age groups and that kidney function tends to decline with age.

Age Years	Mean eGFR
18-29	116 mL/min/1.73m^2
30-39	107 mL/min/1.73m^2
40-49	99 mL/min/1.73m^2
50-59	93 mL/min/1.73m^2
60-69	85 mL/min/1.73m^2
70+	75 mL/min/1.73m^2

12. CLINICAL SIGNIFICANCE

The creatinine method employs a modification of the kinetic Jaffe reaction. This method has been reported to be less susceptible than conventional methods to interference from non-creatinine, Jaffe-positive compounds. Creatinine is generally regarded as the most useful endogenous substance to measure for the assessment of kidney function. Creatinine measurements are used in the diagnosis and treatment of certain renal disease, in monitoring renal dialysis, and as a calculation basis for measuring other urine analytes.

13. PROCEDURE NOTES

- **FDA Status:** FDA Approved/cleared for plasma, serum and urine
- **FDA Status:** FDA Approved/modified for body fluid
- **Validated Test Modifications:** Testing validated for body (serous) fluid specimens

The instrument reporting system contains error messages to warn the operator of specific malfunctions. Any report slip containing such error messages should be held for follow-up. Refer to your Dimension Vista Operator's Guide.

The expected maximum observed standard deviations for repeatability using n = 5 replicates at the following Creatinine concentrations are:

CRE2 Concentration	Acceptable S.D. Maximum
1.00 mg/dL	0.06 mg/dL
10.00 mg/dL	0.29 mg/dL

14. LIMITATIONS OF METHOD

14.1 Analytical Measurement Range (AMR)

Serum/Plasma/Body Fluid: 0.15 – 20.00 mg/dL
Urine: 13.00 – 300.00 mg/dL

14.2 Precision

Material	Mean mg/dL	Standard Deviation (%CV)	
		Repeatability	Within-Lab
Serum Multiqual Control			
Level 1	0.53	0.02	0.02
Level 2	1.87	0.02	0.05
Level 3	7.23	0.05	0.08
Urine BioRad Liquichek			
Level 1	62	0.75	1.38
Level 2	145	1.53	2.93

14.3 Interfering Substances

Interfering Substances:
The CRE2 method was evaluated for interference according to CLSI EP7-A2. Bias, defined as the difference between the control sample (does not contain interferent) and the test sample (contains interferent), is shown in the table below. Bias exceeding 10% is considered "interference".

Substance tested	Substance Concentration	CRE2 mg/dL	Bias %
Acetone	18.75 mg/dL	1.5	<10
	37.5 mg/dL	1.5	+15
	75 mg/dL	5	<10
	150 mg/dL	5	+18
Bilirubin (unconjugated)	40 mg/dL	1.5	+30
Bilirubin (conjugated)	40 mg/dL	1.5	-16

Substance tested	Substance Concentration	CRE2 mg/dL	Bias %
Cefoxitin	1.25 mg/dL	1.5	<10
	2.5 md/dL	1.5	+13
	5 mg/dL	5	<10
Hemoglobin	1000 mg/dL	1.5, 5	<10
Lipemia (Intralipid®)	1500 mg/dL	1.5	+15
	2000 mg/dL	5	+16
Pyruvate	1.32 mg/dL	1.5	<10
	5.26 mg/dL	5	<10
	10.5 mg/dL	5	+16
Triglycerides	1500 mg/dL	1.5	<10
	2000 mg/dL	1.5	+13
	2500 mg/dL	5	<10
	3000 mg/dL	5	+12

14.4 Clinical Sensitivity/Specificity/Predictive Values

Not available

15. SAFETY

Refer to your local and corporate safety manuals and Safety Data Sheet (SDS) for detailed information on safety practices and procedures and a complete description of hazards.

CRE2 Flex® Reagent Cartridge is Corrosive. Contains sodium hydroxide. Causes severe burns and eye damage. Wear protective clothing, gloves and eye/face protection.

16. RELATED DOCUMENTS

1. Dimension Vista® Clinical Chemistry System Operator's Manual
2. Dimension Vista® Calibration/Verification Procedure
3. Dimension Vista® Cal Accept Guidelines
4. Dimension Vista® Calibration summary
5. Dimension Vista® Sample Processing, Startup and Maintenance procedure
6. Laboratory Quality Control Program
7. QC Schedule for Siemens Dimension Vista®
8. Laboratory Safety Manual
9. Safety Data Sheets (SDS)
10. Dimension Vista® Limits Chart (AG.F200)
11. Quest Diagnostics Records Management Procedure
12. Dimension Vista® System Error Messages Chart
13. Centrifuge Use, Maintenance and Functions Checks (Lab policy)
14. Hemolysis, Icteria and Lipemia Interference (Lab policy)
15. Repeat Testing Requirement (Lab policy)

16. Current Allowable Total Error Specifications
    at http://questnet1.qdx.com/Business_Groups/Medical/qc/docs/qc_bpt_tea.xls
17. Current package insert CRE2 Flex® Reagent Cartridge K1033A

17. REFERENCES

1. Ghoshal, Amit K. and Soldin, Steven J., Evaluation of the Dade Behring Dimension® RxL: Integrated chemistry system-pediatric reference ranges. Clinica Chimica Acta 2003; 331:144.
2. Package Insert, CRE2 Flex® Reagent Cartridge K1033A, Siemens Healthcare Diagnostics Inc., 6/3/2015.
3. Package Insert, CHEM I CAL, Siemens Healthcare Diagnostics Inc., 03/2015.
4. Package Insert, Liquid Assayed Multiqual, Bio-Rad Laboratories, 09/2015.
5. Package Insert, Liquichek Urine Chemistry Controls, Bio-Rad Laboratories, 11/2015.
6. Quest Diagnostics SOP ID 300SA357, Creatinine, Serum and Fluid.
7. Quest Diagnostics SOP ID CHA AC 042 Version 9, revised 12/2014.
8. Grady HJ et al., "Laboratory Test Handbook 4th ed." Jacobs DS ed, Cleavland, OH: Lexi-Comp Inc.,1996 p.117-118 "Simplified Calculation of Body Surface Area," by RD Mosteller, New England Journal of Medicine, October 22, 1987, 317(17), 1098.
9. Levey AS, Bosch JP, Lewis JB, Greene T, Rogers N, Roth D (March 1999). "A more accurate method to estimate glomerular filtration rate from serum creatinine: a new prediction equation. Modification of Diet in Renal Disease Study Group". Annals of Internal Medicine 130 (6): 461–70. PMID 10075613
10. Customer Notification, Dimension Vista CRE2 Flex reagent cartridge, Bias at low end of the urine AMR, VC-16-04 A.US.DMV June 7, 2016, Siemens Healthcare Diagnostics Inc.

18. REVISION HISTORY

Version	Date	Section	Reason	Reviser	Approval
0	7/6/16	Header	Add WAH	L Barrett	R SanLuis
0	7/6/16	5.3, 10.4, 14.1	Change lower limit of urine assay range	A. Chini	R. SanLuis
0	7/6/16	6.1, 6.2	Update QC product	A. Chini	R. SanLuis
0	7/6/16	7.2	Change freezer range to -50C	L Barrett	R. SanLuis
0	7/6/16	10.5	Edit urine lower limit resulting	A. Chini	R. SanLuis
0	7/6/16	17	Update QC references, add recall	A Chini	R SanLuis
1	9/26/16	4,5,6	Remove individual section labeling instructions and add general one	L Barrett	R SanLuis
1	9/26/16	9.3	Change eGFR calculation frequency to once per 12 hours	L Barrett	R SanLuis
1	9/26/16	10.5	Move patient review from section 6	L Barrett	R SanLuis

1	9/26/16	15	Update to new standard wording, add reagent warning from section 4	L Barrett	R SanLuis

19. ADDENDA

None