

Reporting Changes for Calculated CA, Anion Gap and Calculated Total Bilirubin

On 10/24/21, the UVMHC Laboratory will be making several changes to the reporting of calculations for calculated calcium, anion gap, and calculated total bilirubin. In addition, the high critical limits for potassium and calcium included in our Dialysis Profiles will be updated. These changes come as the UVMHC prepares for the rollout of EPIC and EPIC Beaker at our partner institutions as part of Wave 2 and Wave 3, with a focus on standardization of practices/reporting in laboratory medicine.

Currently, UVMHC reports a calculated calcium with all total calcium measurements by co-measurement of serum albumin and application of the Payne formula. This formula was derived from 200 patient samples, many that had derangement of their serum protein composition, and has been shown in several studies to inappropriately classify calcium status in many patient populations.¹⁻⁴ Therefore, UVMHC will no longer include a calculated calcium with all total calcium measurements and, should a clinician want a calculated calcium that is adjusted for serum albumin concentration, they will need to specify this on the request and order the new test, Calculated Calcium (LAB9934).

Currently at UVMHC, if you wish to know your patient's anion gap (AGAP), it is calculated individually. Moving forward, when you order an Electrolytes Panel (LAB16) or any profile/panel that includes this set of analytes, UVMHC will calculate the AGAP $[Na \text{ mmol/L} - (Cl \text{ mmol/L} + TCO_2 \text{ mmol/L})]$ and report it as a calculated test result. The AGAP will be reported in the Lab Results Tree, enabling it to be trended and flagged for abnormality based on a defined reference range of 8-16 mmol/L.

One of two final calculation updates will be the inclusion of a calculated total bilirubin (Bu+Bc) with the following tests: Bilirubin, Direct & Indirect (LAB168) and Hepatic Function Panel (LAB20). Calculated total bilirubin is currently reported with Bilirubin, Neonate (LAB51) testing and this will not change. The second update will be the reporting of an Albumin/Globulin Ratio with the following tests: CMP (LAB17) and CMP (Oncology use only – inc MG) (LAB950). This ratio can assist in the identification of patients with a possible paraproteinemia that requires further evaluation.

Calcium

New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Calcium	LAB53	LAB53	FAH5974	17861-6
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Calcium	1230100011	CAL	FAH306	17861-6
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Calcium	LAB53	CA	FAH4962	17861-6

Calculated Calcium

New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Calculated Calcium	LAB9934	LAB9934	FAH5975	17861-6
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Calcium	1230100011	CAL	FAH306	17861-6
Calculated Calcium	12301001874	CALC2	FAH308	17861-6

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BMP				
New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
BASIC METABOLIC PANEL (BMP)	LAB15	LAB15	FAH5970	24321-2
Ask at Order Entry (AOE) Question				
Has the patient been fasting for 8 hours or more?	1230001101	FASTN2	FAH5347	49541-6
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Sodium	1230100005	NA	FAH253	2951-2
Potassium (K)	1230100006	K	FAH258	2823-3
Chloride (CL)	1230100007	CL	FAH4975	2075-0
CO2 (CO2)	1230100008	CO2	FAH4976	2028-9
Glucose, Serum	1230100012	SGL	FAH4902	46099-8
Calcium	1230100011	CAL	FAH306	17861-6
Blood Urea Nitrogen	1230100009	BUN	FAH4985	3094-0
Creatinine	1230100010	CREA	FAH4843	2160-0
GFR, Calculated	12301000892	CGFR	FAH5383	50210-4
Anion Gap <i>(new)</i>	1230100013	AGAP	FAH5971	33037-3
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
BASIC METABOLIC PANEL (BMP)	LAB15	BMP	FAH5194	24321-2

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CMP				
New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Comprehensive Metabolic Panel	LAB17	LAB17	FAH5972	24323-8
Ask at Order Entry (AOE) Question				
Has the patient been fasting for 8 hours or more?	1230001101	FASTN2	FAH5347	49541-6
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Potassium (K)	1230100006	K	FAH258	2823-3
Sodium	1230100005	NA	FAH253	2951-2
Chloride (CL)	1230100007	CL	FAH4975	2075-0
CO2 (CO2)	1230100008	CO2	FAH4976	2028-9
Alkaline Phosphatase	12301001846	ALKP	FAH4842	6768-6
Bilirubin, Total	12301002193	TBIL	FAH5243	1975-2
AST	12301001855	AST	FAH263	1920-8
ALT	12301001850	ALT	FAH264	1742-6
Albumin	12301001839	ALB	FAH4973	1751-7
Protein, Total	12301002127	TP	FAH5010	2885-2
Creatinine	1230100010	CREA	FAH4843	2160-0
GFR, Calculated	12301000892	CGFR	FAH5383	50210-4
Blood Urea Nitrogen	1230100009	BUN	FAH4985	3094-0
Calcium	1230100011	CAL	FAH306	17861-6
Glucose, Serum	1230100012	SGL	FAH4902	46099-8
Anion Gap <i>(new)</i>	1230100013	AGAP	FAH5971	33037-3
A/G Ratio <i>(new)</i>	12301011565	ALBGLO	FAH5973	1759-0
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Comprehensive Metabolic Panel	LAB17	CMP	FAH5009	24323-8

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ONCCMP (Oncology use only)				
New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
CMP (Oncology use only - inc MG)	LAB950	LAB950	N/A	24323-8
Ask at Order Entry (AOE) Question				
Has the patient been fasting for 8 hours or more?	1230001101	FASTN2	N/A	49541-6
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Potassium (K)	1230100006	K	N/A	2823-3
Sodium	1230100005	NA	N/A	2951-2
Chloride (CL)	1230100007	CL	N/A	2075-0
CO2 (CO2)	1230100008	CO2	N/A	2028-9
Alkaline Phosphatase	12301001846	ALKP	N/A	6768-6
Bilirubin, Total	12301002193	TBIL	N/A	1975-2
AST	12301001855	AST	N/A	1920-8
ALT	12301001850	ALT	N/A	1742-6
Albumin	12301001839	ALB	N/A	1751-7
Protein, Total	12301002127	TP	N/A	2885-2
Creatinine	1230100010	CREA	N/A	2160-0
GFR, Calculated	12301000892	CGFR	N/A	50210-4
Blood Urea Nitrogen	1230100009	BUN	N/A	3094-0
Calcium	1230100011	CAL	N/A	17861-6
Glucose, Serum	1230100012	SGL	N/A	46099-8
Magnesium	12301002067	MG	N/A	19123-9
Anion Gap <i>(new)</i>	1230100013	AGAP	N/A	33037-3
A/G Ratio <i>(new)</i>	12301011565	ALBGLO	N/A	1759-0
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
CMP (Oncology use only - inc MG)	LAB950	ONCCMP	N/A	24323-8

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DIALR (Dialysis use only)				
New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Dialysis Routine Profile	LAB2053	LAB2053	N/A	N/A
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Sodium	1230100005	NA	N/A	2951-2
Potassium (DK)	12301002770	DK	N/A	2823-3
Chloride (CL)	1230100007	CL	N/A	2075-0
CO2 (CO2)	1230100008	CO2	N/A	2028-9
Dialysis Calcium	12301002883	DCAL	N/A	17861-6
Albumin	12301001839	ALB	N/A	1751-7
Phosphorus	12301002108	PHOS	N/A	2777-1
Calcium Phos Product	12301001869	CALCPH	N/A	50675-8
BUN, Predialysis	12301002765	BUNPRE	N/A	11065-0
AST	12301001855	AST	N/A	1920-8
Alk Phos	12301001846	ALKP	N/A	6768-6
Magnesium	12301002067	MG	N/A	19123-9
Anion Gap <i>(new)</i>	1230100013	AGAP	N/A	33037-3
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Dialysis Routine Profile	LAB2053	DIALR	N/A	N/A

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DIALRH (Dialysis use only)				
New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Dialysis Routine Profile, Home Care	LAB3093	LAB3093	N/A	N/A
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Sodium	1230100005	NA	N/A	2951-2
Potassium (DKH)	12301002769	DKH	N/A	2823-3
Chloride (CL)	1230100007	CL	N/A	2075-0
CO2 (CO2)	1230100008	CO2	N/A	2028-9
Calcium	1230100011	CAL	N/A	17861-6
Albumin	12301001839	ALB	N/A	1751-7
Phosphorus	12301002108	PHOS	N/A	2777-1
Calcium Phos Product	12301001869	CALCPH	N/A	50675-8
BUN, Predialysis	12301002765	BUNPRE	N/A	11065-0
AST	12301001855	AST	N/A	1920-8
Alk Phos	12301001846	ALKP	N/A	6768-6
Magnesium	12301002067	MG	N/A	19123-9
Anion Gap <i>(new)</i>	1230100013	AGAP	N/A	33037-3
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Dialysis Routine Profile, Home Care	LAB3093	DIALRH	N/A	N/A

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Electrolytes				
New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Electrolytes	LAB16	LAB16	FAH5978	24326-1
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Sodium	1230100005	NA	FAH253	2951-2
Potassium	1230100006	K	FAH258	2823-3
Chloride	1230100007	CL	FAH4975	2075-0
CO2	1230100008	CO2	FAH4976	2028-9
Anion Gap <i>(new)</i>	1230100013	AGAP	FAH5971	33037-3
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Electrolytes	LAB16	LYT	FAH4974	24326-1

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TDBIL				
New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Total & Direct Bilirubin	LAB182	LAB182	FAH5976	1975-2
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Total Bilirubin	12301002193	TBIL	FAH5243	1975-2
Conjugated Bilirubin	12301001893	BILC	FAH4802	15152-2
Unconjugated Bilirubin	12301002219	BILU	FAH4803	1971-1
Delta Bilirubin	12301001907	BILD	FAH5248	1970-3
Calculated Total Bilirubin <i>(new)</i>	12301001868	CTBIL	FAH5246	1975-2
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Total & Direct Bilirubin	LAB182	TDBIL	FAH5245	1975-2
LIVR				
New Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Hepatic Function Panel	LAB20	LAB20	FAH5977	24325-3
Reportables	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Albumin	12301001839	ALB	FAH4973	1751-7
Protein, Total	12301002127	TP	FAH5010	2885-2
Alkaline Phosphatase	12301001846	ALKP	FAH4842	6768-6
ALT	12301001850	ALT	FAH264	1742-6
AST	12301001855	AST	FAH263	1920-8
Unconjugated Bilirubin	12301002219	BILU	FAH4803	1971-1
Conjugated Bilirubin	12301001893	BILC	FAH4802	15152-2
Bilirubin, Total	12301002193	TBIL	FAH5243	1975-2
Delta Bilirubin	12301001907	BILD	FAH5248	1970-3
Calculated Total Bilirubin <i>(new)</i>	12301001868	CTBIL	FAH5246	1975-2
Current Orderable Name	Epic Code	Atlas Code	Mayo Access ID	LOINC Code
Hepatic Function Panel	LAB20	LIVR	FAH4870	24325-3

For questions or concerns, please reach out to Clayton Wilburn, Medical Director of Clinical Chemistry, at (clayton.wilburn@uvmhealth.org).

References:

1. Payne RB, Little AJ, Williams RB, Milner JP. Interpretation of serum calcium in patient with abnormal serum proteins. Br Med J. 1973;4:643-646.
2. Steen O, Clase C, Don-Wauchope A. Corrected calcium formula in routine clinical use does not accurately reflect ionized calcium in hospital patients. Canad J Gen Int Med. 2016;11(3):14-21.
3. Smith JD, Wilson S, Schneider HG. Misclassification of calcium status based on albumin-adjusted calcium studies in a tertiary hospital setting. Clin Chem. 2018;64(12):1713-1722.
4. Slomp J, van der Voort PH, Gerritsen RT, Berk JA, Bakker AJ. Albumin-adjusted calcium is not suitable for diagnosis of hyper- and hypocalcemia in the critically ill. Crit Care Med. 2003;31:1389-1393.