Point of Care Abbott iSTAT Hydroxycarbamide interference in Creatinine results

Sharkey RS, Riddoch FC, Phillips B
Point of Care Testing, Berkshire and Surrey Pathology Services, Frimley Health NHS Foundation Trust

Background

The virtual Hospital at Home Frailty team for Frimley Park hospital have adopted the routine use of the Abbott iSTAT for blood gas and electrolyte analysis in patient's homes, this service is vital in enabling patients to remain and be treated in their own environment, without having to be transferred and admitted into hospital. CHEM8+ cartridges which use electrochemical detection are used to gain Creatinine results on lithium heparin blood samples.

During routine patient testing, a creatinine result of 623umol/L was recorded on a patient, this led to their immediate transfer into the hospital with concern of acute kidney failure. A serum sample was taken and sent to the laboratory for analysis on the Abbott Alinity C analyser. The laboratory Creatinine result was reported as 91umol/L.

Following the departments quality reporting structure, the Point of Care team were alerted to this discrepancy and started an investigation. The patient's therapeutic regime was assessed, and it was discovered that the patient was on hydroxycarbamide (aka hydroxyurea). Review of the iSTAT performance characteristics revealed Hydroxycarbamide as a known interfering substance for Creatinine, resulting in falsely elevated results.

Investigation

					Istat Chem8+	Laboratory	Radiometer ABL90FP
POC Result Legend					Crea	Crea	Crea
	Flagging high >Critical			Units	umol/L	umol/L	umol/L
	Flagging high > RR			Arterial RR	[64 - 104 (M)] [49-90 (F)] [49 - 104 (U)]	59 - 104	59 - 104 M 45 - 90 F
	Flagging <RR			Venous RR			
	Flagging <Critical Limit			Critical Limits	>250		>250
Sample no		M/F	Sample Type	Date/Time			
1		M	V	24/01/2023 14:35	109	112	N/A
2		F	V	24/01/2023 18:38	87	87	N/A
3		F	V	27/01/2023 18:52	98	93	N/A
4		F	V	29/01/2023 14:54	120	117	N/A
5		F	V	30/01/2023 13:30	419	50	61
6		M	V	31/01/2023 13:46	53	53	N/A
7			V	02/02/2023 12:49	150	145	N/A
8		F	V	03/02/2023 10:04	67	65	N/A
9		F		02/06/2023 10:48	45	48	N/A
10		F		02/06/2023 12:45	100	90	N/A
11		F		02/09/2023 11:19	91	91	N/A
12		F		02/09/2023 11:07	117	120	N/A
13		F		02/10/2023 14:23	134	127	N/A
14		F		02/05/2023 17:39	97	97	N/A
15		M		31/01/2023 13:46	53	53	N/A
16		M		02/11/2023 10:40	101	103	N/A
17		F		02/11/2023 11:28	56	55	N/A
18		F		02/11/2023 12:02	54	52	N/A
19		F		02/12/2023 13:42	61	63	N/A
20		F		02/12/2023 11:46	60	73	N/A
21		F		02/11/2023 10:19	85	84	N/A
22		M		02/11/2023 11:41	N/A	148	N/A
23		F		14/2/2023 10:09	73	73	76
24		F		17/2/2023 19:44	107	105	N/A
25				17/2/2023 14:02	104	Inocrrect MRN	Inocrrect MRN
26		F		18/2/2023 10:25	68	70	N/A
27		F		17/2/2023 19:09	115	109	N/A
28		F		18/2/2023 18:12	100	N/A	N/A
29		F		19/2/2023 10:22	41	47	N/A

Creatinine (Crea)
Creatinine is measured amperometrically. It is hydrolyzed to creatine in a reaction catalyzed by the enzyme creatinine amidohydrolase. Creatine is then hydrolyzed to sarcosine by creatine amidinohydrolase. The oxidation of sarcosine, catalyzed by sarcosine oxidase, produces hydrogen peroxide (H_2O_2). The liberated hydrogen peroxide is oxidized at the platinum electrode to produce a current which is proportional to the sample creatinine concentration.

$$\text{Creatinine} + H_2O \xrightarrow{\text{Creatinine Amidohydrolase}} \text{Creatine}$$

$$\text{Creatine} + H_2O \xrightarrow{\text{Creatine Amidinohydrolase}} \text{Sarcosine} + \text{Urea}$$

$$\text{Sarcosine} + O_2 + H_2O \xrightarrow{\text{Sarcosine Oxidase}} \text{Glycine} + \text{Formaldehyde} + H_2O_2$$

$$H_2O_2 \longrightarrow O_2 + 2H^+ + 2e^-$$

Substance	Test Concentration (mmol/L)	Analyte	Interference (Yes/No)	Comment
Hydroxyurea	0.92	Glu	Yes	Increased results. Use another method.
		BUN	Yes	Increased results.
		Crea	Yes	Increased results. Use another method.

Discussion

A network wide review of Virtual ward iSTAT users identified a further case of falsely raised Creatinine results with patients on Hydroxycarbamide (iSTAT 419umol/L lab50umol/L)
We implemented a change of practice in the training of clinical users to include more emphasis on interfering substances and guidance on which patient samples to be sent directly to the laboratory and not to be tested on the iSTAT. This training improvement will help prevent unnecessarily transfer to hospital and by allowing the patients to be treated in their home, improve patient experience. The widening of patient groups managed under Virtual ward teams brings with it a greater need for POCT teams to recognise the need to educate users on drug interferences..

References

Alinity CHEM 8 IFU 765859-01 Rev. B

Acknowledgements

Our thanks to the BSPS POCT staff network for their experience shared on the assessment.