

Triennial POCT Blood Glucose Analyser (BGA) Operator Training & Certification

Practical Tips on Capillary Blood Glucose & QC Testing

Ms Loo Kit Man, NC (Diabetes), PWH
Ms Theresa Yeung, ANC, M&T, PWH

NTEC Diabetes Nursing Service Sub-Committee
May-June 2024



Run down (3pm to 4:30pm)

2:45pm to 3pm	Registration
3pm to 3:45 pm	Practical tips on capillary blood glucose & QC testing (Ms Loo Kit Man, NC of Diabetes, PWH)
3:45pm to 4:15pm	Nova StatStrip BGA Training (Ms Nette Ho, Bio-Asia) Contour Plus Elite BGA Training (Mr Ricky Wong, Ascensia)
4:15 to 4:20pm	Q&A
4:20 to 4:30pm	On-site QC skill assessment ➤ select the meter used the in the parent ward ➤ pair up ➡ perform one level (either hi- or lo level of QC) ➤ Scan the QR code after completion of QC test ➤ Fill in the evaluation survey (CNE pt: 1.5)

Content

- BGA operator training & certifying procedure
- Information about the new tendered BGAs
- Factors affecting the accuracy of capillary blood glucose testing and the preventive measures
- skills in the operation and performing internal quality control testing of the blood glucose analyzers with or without connectivity functions
- Tips on performing capillary blood glucose measurements
- Alternate site method for glucose testing

NTEC POCT Coordinating Committee

Chairman

- Michael Ho Ming CHAN Dr, NTEC CC(PATH)/PWHCP Cons(CP)

Members

- Mr Wai Keung Wong, (SO, Med, CP PWH)
- Ms Kit Man LOO (Nurse Consultant, M&T, PWH)
- Ms Theresa YEUNG (ANC, M&T PWH)
- Ms Choy Wing Yee (APN, M&T PWH)
- Ms Lai Chui Yee (APN, MED, AHNH)
- Ms Leung Wing Shan (APN, MED, AHNH)
- Ms Grace LIN (Nurse Consultant, MED, NDH)
- Ms Sau King Yeung (ANC, MED, NDH)

What is POCT?

Classification of Complexity of Testing for POCT/ Devices*

- Laboratory test performed outside Pathology Laboratories
- Performed by non-laboratory professionals

Complexity of Testing*	Level I	Level II
Description	Low complexity of testing	Moderate to high complexity of testing
Type of POCT/ Devices	1. Glucometers, e.g. Bayer Contour® TS system, Roche Accu-Chek® Performa system. 2. Haemoglobinometers, e.g. HemoCue® Haemoglobin system. 3. Blood ketone	All types of POCT/ devices NOT classified as Level I.
POCT Operator Requirement	Well-trained hospital staff, including ancillary staff.	Well-trained professional staff (doctors, nurses, medical technologists, other specialists).

* Urine dipstick tests which are simple to perform with little potential for adverse medical consequence are exempted from compliancy to this Policy. However it should be noted that performance of these tests should adhere to the manufacturer's instructions. Exempted tests include urine test strips for glucose, protein, ketone, red blood cells, pH, bilirubin and urobilinogen.

* Factors considered include complexity of testing methodology, potential analytical interference, clinical importance, medical-legal implications, availability of positive patient identification, etc.

HA Point of Care testing Policy

- ✓ All BGA POCT operators must receive training, supported by written materials
- ✓ The competency of a trained staff shall be documented **before s/he is allowed to operate the POCT device** (maintain traceable record)
- ✓ POCT operators' certification should be revalidated at an interval of **3 yrs**
- ✓ POCT committee – organize triennial training for trainers
- ✓ **BGA link nurse** - responsible for training in-house staff

BGA Operator (HCPs /non HCPs) Training and Certification every 3 years

BGA Operator / BGA Link Nurse

1 Knowledge

Attend triennial training / study the on-line educational materials

- Video: POCT concepts (Dr Michael Chan)
- Practical Tips on Capillary Blood Glucose & QC Testing (DM Nurse)
- BGA operation training ppt and video (BGA companies)

2 Quiz @ iLearn

HCP and non-HCP quiz (for PCAs)

3. Internal QC test assessment (perform both if you have both BGAs in your clinical area)

- **Contour Plus / Elite BGA**
assessed by the BGA link nurses
- **NOVA Statstrip Glucose Connectivity Meter**
± assessed by the BGA link nurses
captured by the central server

Date	Venue
13/5/2024	SH
20/5/2024	PWH
30/5/2024	PWH
3/6/2024	PWH
4/6/2024	AHNNH
5/6/2024	SH
12 /6/ 2024	NDH
18/6/2024	AHNNH
19/6/2024	NDH

Nursing teaching staff from

- CUHK*
- HKMU*
- TWC*
- HKU SPACE

*Students will receive personal NOVA Statstrip barcodes after completion of training and passed the assessment

The role & responsibility of BGA link nurses

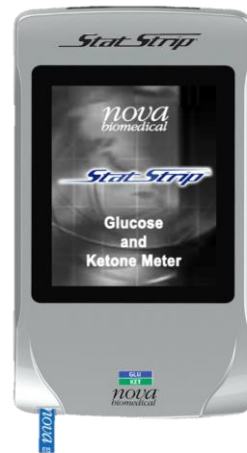
- ✓ Act as a **resource person** and ensure all in-house BGA operators are certified with record keeping
- ✓ Perform **internal QC skills assessment** for in-house staff
- ✓ monitor both **internal and external QCs are done properly and regularly**
- ✓ Register new BGAs if necessary on POCT web for external QC result reporting
- ✓ Keep **internal QC record** for BGAs without connectivity functions **for 3 yrs** (For Contour Plus / Elite users)

<u> </u> Hospital, NTEC <u> </u> (BGA) Internal QC Record									
Clinic / Unit / Ward: _____ Serial Number of BGA: _____ Hi / Lo Control Solutions Expiry Date: _____ Opened on: _____ To be discarded on: _____					Perform QC testing at least once daily / before use, repeat under the following conditions: 1. A new bottle / pack of strip is opened 2. QC testing result is out of the acceptable range. 3. Patient's CBG result is questionable. 4. BGA is dropped. 5. Accuracy of blood ketone result is questioned. 6. Battery of BGA has been changed.				
Please change a new form when changing a new BGA / control solution									
Quality Check Operator			Test Strip		Acceptable Range				Corrective Action(s) / Remarks
Date	Time	Initials	Expiry Date	Lot Number	Control Solution Hi mmol/L	Within Range (Y / N)	Control Solution Lo mmol/L	Within Range (Y / N)	

Please keep this record for 3 years Last modified Dec 2020

BGA with Connectivity Functions

NOVA Statstrip Glucose Connectivity Meter



Contract starts from 1 July 2020 to 30 Jun 2028

A/V in NTEC, UCH, TKOH, PYNEH, RH

New BGA Contract

Ascensia Contour Plus

Ascensia Contour Plus Elite

Contract starts from

1 Jan 2024 to 31 Dec 2025 $\pm$ 1 year extension

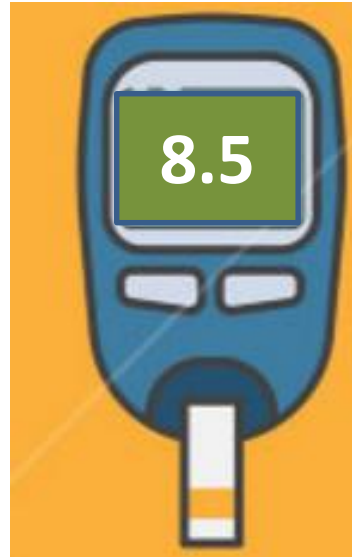
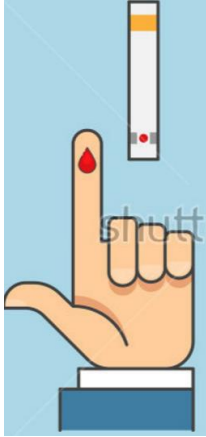


Same blood glucose strips
and control solutions

Content

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- skills in the operation and performing internal quality control testing of the blood glucose analyzers with or without connectivity functions
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- Alternate site / method for glucose testing

Are these meters accurate?



HA meter



Patient's
meter

BGA Accuracy standards (ISO: 15197:2013)

95% of blood glucose results should reach the following standards

- glucose under 5.6 mmol/L - Within ± 0.83 mmol/L of laboratory results
- glucose 5.6 mmol/L or more - Within $\pm 15\%$ of laboratory results



Meter A

glucose measured
by central lab is
10 mmol/L



Meter B

The accuracy
of both meters
are acceptable

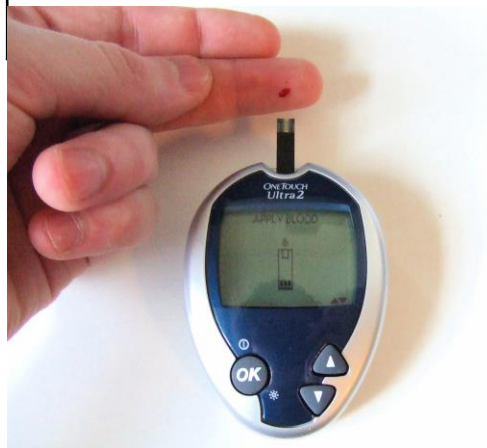
Factors for inaccurate blood glucose results happened at different phases with the use of POCT BGAs for blood glucose measurements

Point-of-Care Blood Glucose Testing for Diabetes Care in Hospitalized Patients: An Evidence-Based Review

Journal of Diabetes Science and Technology
2014, Vol. 8(6) 1081–1090
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sagepub.com/journalsPermissions.nav
DOI: 10.1177/1932296814538940
dst.sagepub.com


Rajesh Rajendran, MBBS, AHEA, MRCP (UK)¹ and
Gerry Rayman, MD, FRCP (UK)¹

Preanalytical Factors (obtaining the sample)	Analytical Factors (performing the assay)	Postanalytical Factors (reporting the results)
46 to 68%	7 to 13%	18 to 47%



Preamanalytical factors

➤ Instrument / test strips

- Test strip - expired? , deteriorated?, correct QC procedure?
- BGA – No calibration?



➤ Operator (Inappropriate sampling technique/ wrong patient, blood sample contamination)

Analytical factors

BGA

- **Extreme physical environment** (e.g., high altitude, humidity, heat, or cold)
- **BGA blood glucose analysis method** (e.g GDH-PQQ method BGA used in patients receiving treatment containing maltose **falsely ↑ BS**)

Nonstandard physiology of the patient

Extreme haematocrit level (too low or too high)	falsely ↓ BS or falsely ↑ BS
Severe hypertriglyceridemia	falsely ↓ BS
Poor capillary perfusion such as hypotensive	finger tip glucose lower than venous or arterial samples
Edematous patients / drip arm	falsely ↓ BS as dilution of capillary sample
Food residue on fingers containing glucose	falsely ↑ BS
Hyperoxia (falsely ↓ BS), hypoxia (falsely ↑ BS)	
Drugs interferences (such as ascorbic acid, acetaminophen, or D-xylose...)	
Uremia	falsely ↑ BS

Patient / operator factors –when obtaining a blood sampling



✓ Get a round drop of blood



✗ If the blood smears or runs, do not use as alcohol / sweat on the skin may cause underestimation of the blood glucose result.

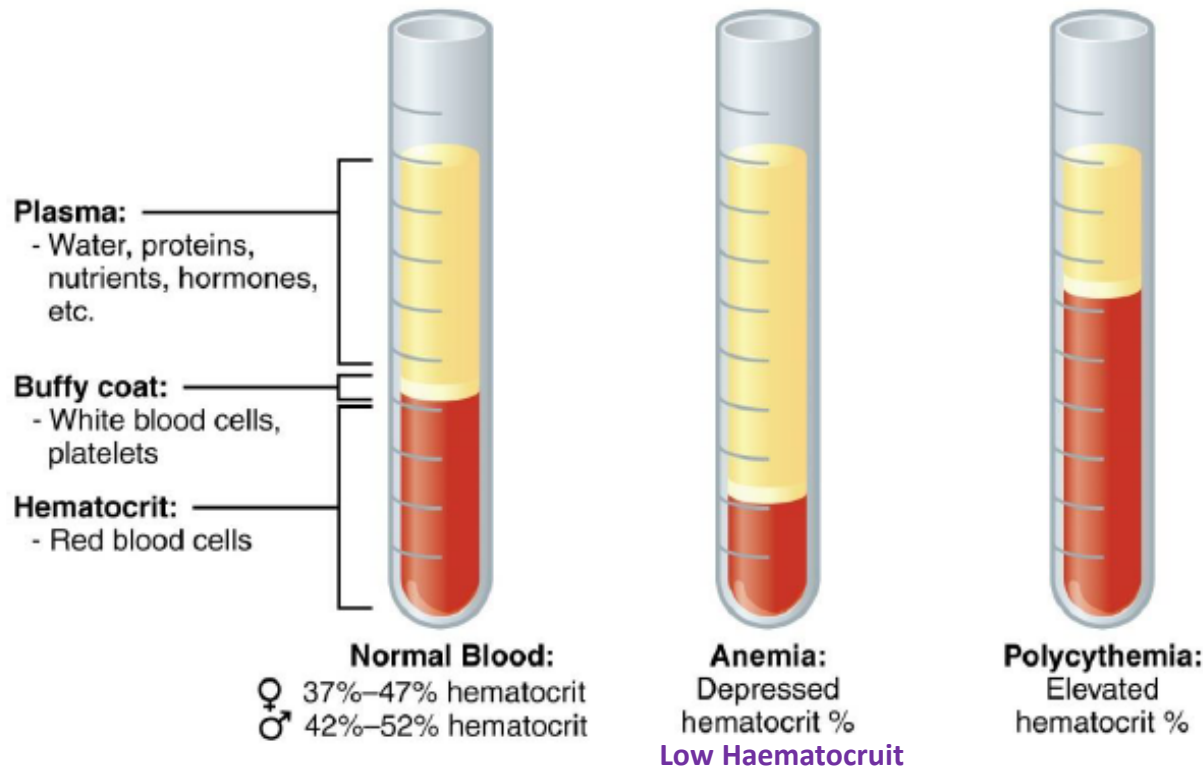
Lancet used in NTEC

Preferred site for obtaining a CBG sample : The side of the finger, halfway between the nail and the pad of the finger (avoid the tip)	Lancet, 1.8mm x 28G (purple)	Lancet, 1.4mm x 23G (green)
	Recommended to be used in most of the patients 	For patients with very thick skin 

Patient Factors (I)

Let's recap

If the **plasma glucose conc.** in all specimen tubes being the same,



then the **whole blood glucose conc.** in the right specimen tube will be **about half** of that in the middle specimen tube

Effect of Haematocrits on [Glucose]

1. Neonates

- – higher Hct → lower [glucose]

2. Patients with DKA

/ Hyperglycaemic hyperosmolar non-ketotic syndrome (HHNS)

- – higher Hct → lower [glucose]

3. Patients with anaemia in general

- – lower Hct → higher [glucose]

3



Anemia:
Depressed
hematocrit %

1 2



Polycythemia:
Elevated
hematocrit %

High Haematocrit

Effect on Haematocrit on glucose

Hyperglycaemic hyperosmolar non-ketotic syndrome (HHNS)

URGENT

CHAN, [REDACTED] K [REDACTED] () M/32Y 05P6211309
AE [REDACTED] U Dr. MAN, Chi Yin
Reference: CYM026

Whole Blood Glucose (POCG)	Sample Type
mmol/l	
24.3	VEN

Feb 17 2005 20:49 05P6211309



Polycythemia:
Elevated
hematocrit %

Date Collected: 17/02/05 20:53
Date Arrived: 17/02/05 21:20

Random Plasma Glucose >99.0 mmol/l
Test repeated. Result Phoned.

>99.0

>99.0

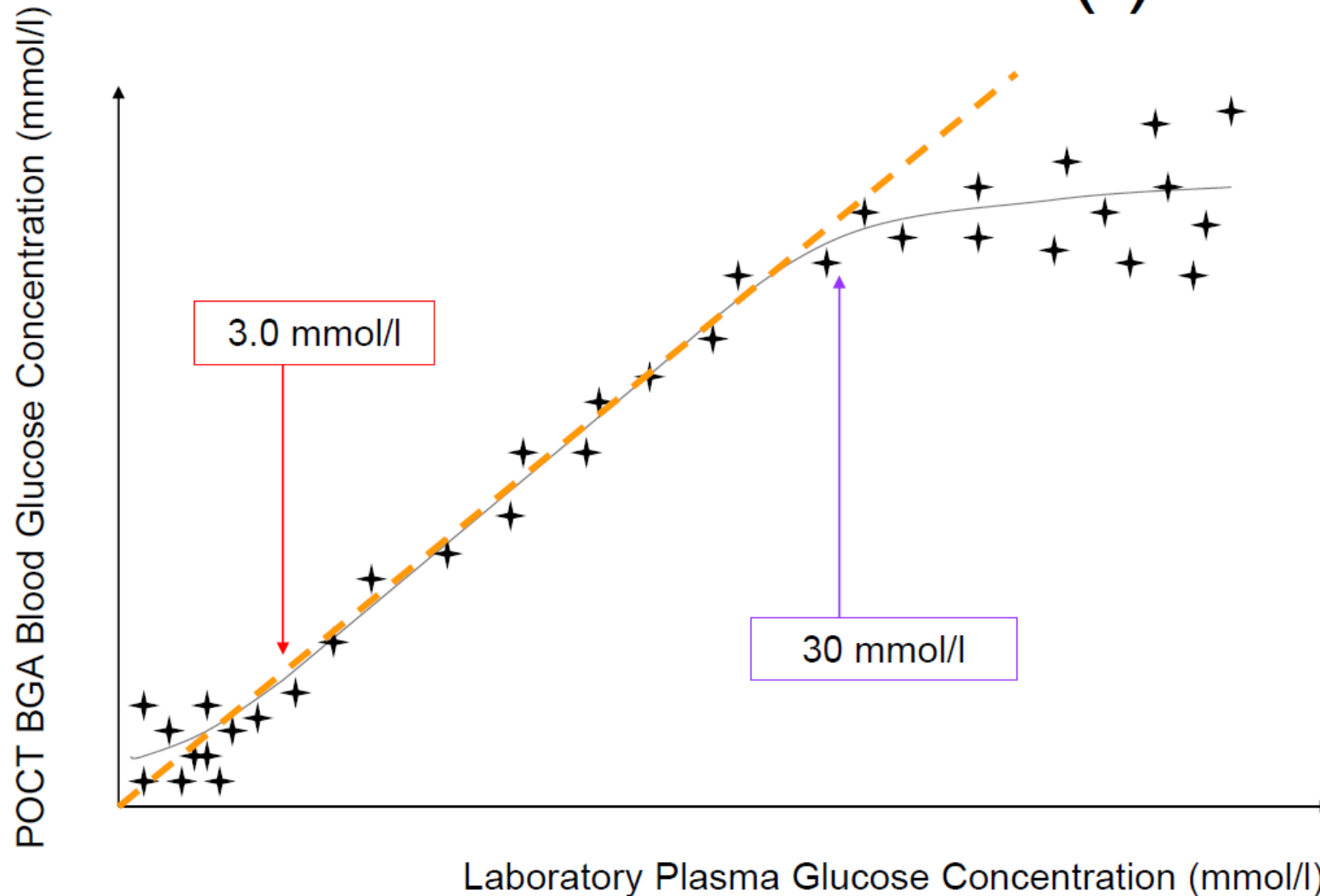
****Signout Comment****
GLUCOSE PHONED TO MR YEUNG AT 2330

*** This Laboratory is NATA & RCPA accredited ***

falsely low blood glucose result
measured by the POCT BGA device

- Severe dehydration
- Haematocrit (HCT) is greater than 0.8 L/L

Non-linear Reaction (I)



Non-linear Reaction (IV)

This sample was analysed by a certified POCT User.
This report is for documentation only. The POC
glucose result cannot diagnose hypoglycaemia. Please
send a sample to the laboratory for confirmation if
the POC glucose is <3.0 or >20 mmol/l.

Post analytical factors

- Misreading of result display (operator's factor)
- Data entry error (operator's factor)

A POCT Incident:-

- **4.1 mmol/L** were charted on the CBG Record Form while **3.2 mmol/L** were recorded in the CMS.

Date	Time	URINE		Blood Sugar Result		Meter Number	A-Arterial C-Capillary V-Venous	Signature
		Sugar	Ketone	Lab	POCT			
14/6	7p				13		C	
	1p				16.9		C	
15/6	2A				6.7		C	
	3A				6.0		C	
	4A				9.3		C	
	5P				20.1		C	
	7P				15.3		C	
	1A				11.4		C	
16/6	3A				8.5		C	
	7A				7.7		C	
	11A				11.9		C	
	2P				11.5		C	
	7P				2.2		C	
17/6	11A				13.2		C	
	3P				9.4		C	
	7A				5.3		C	
	11A				6.5		C	
	3P				7.8		C	
18/6	7A				1.9		C	
				R/C	2.9			
					2.9			
	11A				3.5		C	
	2P				2.2		C	
	7P			R/C	7.2		C	
19/6	3A				3.9		C	
				R/C	8.2			
	7A				4.2		C	
	11A				3.2		C	
	7P				4.9		C	

BGA with connectivity functions : viewed CBG readings at ePR

PWH	02/12/14	Urine Catecholamines					
PWH	25/11/14	CBC					
PWH	25/11/14	PT, INR & APTT					
Most recent from the left		Page 1 of 5	Return to list view				
Hospital Code	PWH	PWH	PWH	PWH	PWH	PWH	PWH
Collect Date	08/01/15 07:49	08/01/15 06:01	07/01/15 18:59	07/01/15 07:18	06/01/15 20:00	29/10/14 10:33	29/10/14 05:26
Type, Specimen	CAP	CAP	CAP	CAP	CAP	CAP	CAP
Glucose, Whole Blood, POCT	9.7	11.2	14.1	7.8	14.1	5.6	5.7



CAP (capillary)

Sample Type

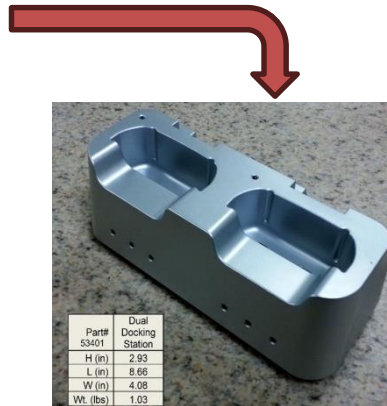
				mmol/l
05-Mar-2017	20:17	17P4743594	CAP	18.3
05-Mar-2017	21:04	17P4743635	CAP	18.8
05-Mar-2017	22:09	17P4745259	CAP	16.9
05-Mar-2017	22:55	17P4745022	CAP	17.6
05-Mar-2017	23:51	17P4746425	CAP	16.0
06-Mar-2017	02:05	17P4745039	CAP	14.7
06-Mar-2017	02:46	17P4745266	CAP	12.7
06-Mar-2017	04:27	17P4745273	CAP	13.6
06-Mar-2017	05:40	17P4745699	CAP	14.1
06-Mar-2017	07:32	17P4748575	CAP	11.1

If patients' CBG results cannot be found in CMS. It may be due to

1. blood glucose testing was not done successfully
2. wrong patient's barcode was used in testing
3. result has not been uploaded at the docking station

New Enhancement
NOVA Statstrip Glucose Connectivity Meter

1. Uploading of CBG data via Hosp Wifi to CMS - **not a must via docking station**



Wifi

05-Mar-2017	20:17	17P4743594	18.3
05-Mar-2017	21:04	17P4743635	18.8
05-Mar-2017	22:09	17P4745259	16.9
05-Mar-2017	22:55	17P4745022	17.6
05-Mar-2017	23:51	17P4746425	16.0
06-Mar-2017	02:05	17P4745039	14.7
06-Mar-2017	02:46	17P4745266	12.7
06-Mar-2017	04:27	17P4745273	13.6
06-Mar-2017	05:40	17P4745699	14.1
06-Mar-2017	07:32	17P4748575	11.1

New Enhancement

2. Availability of POCT glucose results at ePR during IPMOE

Drug Admin by Patient X

Cancel PREPARE DRUG 0 Patient Verification 14/03/2023 13:00

ALL ORAL & MISC INJECTION INFUSION PRN/STAT PD OVERDUE INTRATHECAL

Start Review End Drug 13/3 TODAY 14/3 15/3 Counter Sign Onhold

14/Mar Sodium Chloride 0.9% continuous IV infusion: 500 mL over 8 Hour(s) Q8H

14/Mar Famotidine (PEPCIDINE) tablet oral: 20 mg BD PRN

14/Mar Tramadol IM: 50 mg

Latest result from ePR within 7 days

Test	Result	Date
Glucose, Capillary Blood, POCT	---	---
Glucose, Whole Blood, POCT	5.7 mmol/L	14/03/2023 11:51
Potassium	(Cancelled)	14/03/2023 09:20
INR	1.2	13/03/2023 17:21
Platelet	681 H x10 ⁹ /L	13/03/2023 17:21

Given by: IP, MOE SAFETY (MED) Checked by: Countersign No. of due / overdue remaining: 0 Proceed

Cancel

PREPARE DRUG 0

ALL

ORAL & MISC

INJECTION

INFUSION

PRN/STAT

PD

OVERDUE

INTRATHECAL

Start
Review
End Drug

09/5

TODAY
10/5

11/5

Counter
Sign

Onhold

INJECTION

04/May Influenza (Vaxigriptetra) 2023/2024 Campaign vaccine
- <Special Drug> *
- IM: 0.5 mL once for 1 DOSE(S)
MC V

INJECTION

09/May Insulin Aspart Human Analog (NOVORAPID) flexpen
- 100 U/mL <Special Drug> *
- SC bolus: 18 unit(s) before breakfast and
SC bolus: 16 unit(s) before lunch and
SC bolus: 12 unit(s) before dinner
MC V

INJECTION

05/May Insulin Aspart Human Analog (NOVORAPID)
- 100 U/mL <Special Drug> *
09/May SC bolus: 18 unit(s) before breakfast and
SC bolus: 16 unit(s) before lunch and
SC bolus: 10 unit(s) before dinner
MC V

MIS

26/Apr Heparinoid (HIRUDOID) cream W
- affected areas: BD
V

1200	☒	0700	☒	0700
1800	☐	1200	☒	1200
		1800	☒	1800

Latest result from ePR within 7 days

Test	Result	Date
Glucose, Capillary Blood, POCT	---	---
Glucose, Whole Blood, POCT	9.8 mmol/l	10/05/2024 17:14
Potassium	4.7 mmol/l	08/05/2024 10:42
INR	---	---
Platelet	142 * x10 ⁹ /L	08/05/2024 10:42

Given by:

FUNG, Hoi Kei(MED)

Checked by:

Countersign

Scan QR Code

No. of due /
overdue
remaining:

1

Proceed ▶

New Enhancement – link to eVital

Contour Plus Elite

- not applicable to NTEC as using NOVA

Link between glucometer and eVital system

Bluetooth connectivity

✓: Avoid manual input, reduce transcription **error** & workload



NOVA Statstrip meter

- linked up to eVital ~ 4Q 2024

SAG (endocrinology) - eVital alert
- CBG glucose <4 mmol/l & ≥ 15 mmol/l

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Quality Assurance Programme (1)

Internal Quality Test



- All actively-in-use BGAs: **at least once daily.**
- non-daily-use BGAs: once before use.

Repeat QC test if:

- ✓ QC testing results is out of the acceptable range
- ✓ a new bottle/pack of test strips is used
- ✓ The BGA is dropped
- ✓ accuracy of CBG result is questioned
- ✓ Change of batteries of BGA

QC Tests with Glucose Control Solutions

- Clearly **mark an open & discard date** for all opened control solution / test strips
 - NOVA control solution **(3 mths)** / Contour Plus Elite **(6 mths)**
 - NOVA Statstrip Strips have to be used within 6 months after first opening
 - Contour Plus Elite strip - till expiry date once opened
- Do not use the solution sol. / strips past discard date / expiry date printed on the label
- In order to min. crystallizing of glucose on the tip of control solution, when apply glucose solutions control
 - Shake the control solution well according to manufacturer's claim
 - Contour Plus / Elite - shake well about 15 times
 - NOVA strat – gently mix well
 - Discard the first drop and wipe off the dispenser tip to prevent contamination
 - Squeeze the vial and produce another drop then apply
 - Wipe the tip of the dropper again before recap



How to apply control solution to the tip of the test strips?



OR



A hanging drop of control solution is preferred (to minimize touching the tip of the dropper and increase risk of contamination)

Apply a drop of control solution on the top of a clean lid of the control solution bottle

Ensure the meter is placed on a **downwards / horizontal** level when applying control solution



Blood or control solution dripping into the port causes damaging the meter



A NOVA Statstrip Glucose Connectivity Meter costs ~ \$7000

Quality Assurance Programme(2)

External Quality control Test



- Treat as **patient's blood glucose testing**, perform internal QC test first, then external QC
- External QC control solutions are supplied by PWH Department of Chemical Pathology monthly
- Report QC results on line

If external QC test failed will receive a pair of fresh specimens from Dept of Chem Path for repeating the test

Reasons of Out of Control Testing

Check Item	Possible problems
Operator skills	➤ improper technique
Test strip	➤ deteriorated test strips such as expired / uncapped bottles / broken foil wrap
Control solutions	➤ expired / deteriorated
BGA	➤ BGA malfunction ➤ Non-calibrated BGA

Action: Repeat QC test

if still fail ➔ change BS strip / control solutions / meter ???

which one should be changed first ??

Change control solution firstas low cost

How to report external QC results / register a
new BS meter (by link nurses)
in the NTEC POCT web?

General System		Protected System (Individual User ID and Password is needed)			
[Clinical]	[Admin]	[Clinical]		[Admin]	
Chemwatch DB	Dr. Eye Dictionary	CDARS	NRS	24-hours HOIT Call Center	e-LeaveEnquiry
Common Loc Table	EPRL	Dr. On-call NTEC PWH	Pager Enquiry by Dr.Code	331 UMS	e-SDA
CUHK Paediatrics Guidelines	ESD	Endo - eDashboard	PAS Mgm Information	331 User ID Enquiry	GCRS-SRE Apply SRE Account
Doctors' Work Hours Calculator	e-HR	ePR	POCT-EQAPS	ADS	GMS
ECPath iHOME	e-Learning	Fit Test Booking System (FTBS)	OTMS	PWH SH	iConT
ECRI	HA IT Call Centre Web	Handhygiene On-line Quiz	OTPLUS	AMS-MM	iCQI
e-KG	HLISS	HA AIRS	O & T Scoliosis System	CCE Corner Admin	iLearn
Easy Link 醫社通	IT e-KB	HA PRRS v2	SESAS	CLIP	iGP
Health Informatics	Individual Leave Balance Enquiry	HA CFMS		CMMS AHNH BBH NDH PWH SCH SH TPH	iPPG
iDrug	NTEC AHNH BBH NDH PWH SCH SH TPH	iDrug Admin System		CSRS	MEP
	PWH Green Hospital	iMedical Report		eAM	MICC
	VNC	iMedical Report		EIS HAMIS	NDHCaMS
				NTEC EasyGO App AHNH DMH TDH	

NTEC Intranet

NTEC-EQAPS 1.0 (System Mes

Point-of-Care

Blo

For & For S

ntecapp21.home/eqaps/sysmesg.asp

Home

Reporting Forms

Enquiry

System Admin

Logout

NTEC-EQAPS

User Name: Kit Man LOO User Id: (lkm254)

Reporting Forms -> Testing Glucometer [New Data Entry]30-May-2024 10:55:34

System Message

Result reporting for the current month has closed. Please report QC data between 1st – 18th of each month.



- ✿ [Whats New](#)
- ✿ [Mission and Vision](#)
- Structure**
- ✿ [Organization Chart](#)
- ✿ [People](#)
([Staff/CallList/Roster](#))
- ✿ [Resource](#)
([Facility/Location/Equip](#))
- Process**
- ✿ [Plan](#)
- ✿ [Policy/Protocol/Guideline](#)
[NTEC PPG](#)
- ✿ [Program](#)
[NTEC CQI](#)
- ✿ [Service](#)
- ✿ [Form](#)
- Outcome**
- ✿ [Report](#)
- ✿ [Audit](#)

- Home
- Reporting Forms
- Enquiry
- System**
- Logout
- Analysers Registration**

NTEC-EQAPS 1.0

Welcome to Point-of-Care Testing - External Quality Assurance Programme

1. NTEC Point-of-Care Testing Glucometer BGA Link Nurse Nomination Form
2. Web Reporting & Registration Video / Reporting Instruction
3. Training videos for BGA Operations
4. Reviewing your EQAP Results / Annual End of Cycle (EOC) Report
5. Tips on Data Interpretation

Links for In

1. Nursing Pro

- Home
- Reporting Forms
- Enquiry
- System Admin**
- Logout

NTEC-EQAPS 1.0

System Admin -> Analysers Registration

User Name: Kit Man LOO User Id: (

5-Mar-2017 2

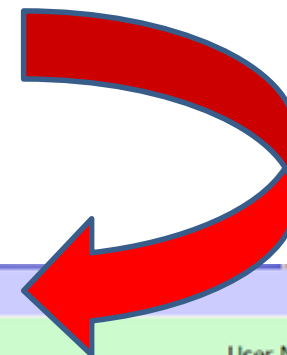
Total No. of Analyser(s) Registered : 2828

Create New

☐ Hospital	--select one--
☐ Department	--select one--
☐ Location/Unit	--select one--
☐ BGA Manufacturer	--select one--
☐ BGA Model	--select one--
☐ Status	--select one--

Hospital	Department	Location	Nickname	Manufacturer	BGA Model	Serial Number
AHNH	A&E	A&E	ahnaeae01	Roche	Accu-chek Advantage III	8548274639
AHNH	A&E	A&E	ahnaecub10	Roche	Accu-chek Advantage II	8548264203

BGA registration



Total No. of Analyser(s) Registered : 3

 Create New Analyser Registry

☒ Hospital	(PWH) Prince of Wales Hospital ▾
☒ Department	Medicine & Therapeutics ▾
☒ Location/Unit	DMEC ▾
☒ BGA Manufacturer	Nova Biomedical ▾
☒ BGA Model	StatStrip ▾
☒ Status	Active ▾

Hospital	Department	Location	Nickname	Manufacturer	BGA Model	Serial Number	Reg. Date	Action
PWH	M&T	DMEC	672	Nova Biomedical	StatStrip	196027320197	2021/02/19	edit delete
PWH	M&T	DMEC	673	Nova Biomedical	StatStrip	196042420216	2024/05/20	edit delete
PWH	M&T	DMEC	674	Nova Biomedical	StatStrip	196026120197	2024/05/20	edit delete



**Management for
NOVA /Contour Plus Elite
Glucometer Breakdown**

Arrangement for NOVA Glucometer Breakdown

Notify Vendor (BioAsia) (by phone / CM) for inspection

- If beyond repair BioAsia may arrange one-for-one replacement → update EAM record accordingly.
- **For urgent situation**, → on-loan glucometer can be borrowed from the laboratory during non-office hours using **loan form**.

Arrangement for Contour Plus Elite Glucometer Breakdown

- Notify Vendor (Ascensia) (by CM) for inspection (Asset number is A/V)

6. Problem Shooting

- Technical support for Nova StatStrip Glucose Meter:
 - Bio-Asia emergency contact - telephone number: 27870906
- Technical support for Contour Plus Glucose Meter:
 - Ricky Wong - telephone number: 81004792
 - Vicky Tang - telephone number: 98269221
 - Customer Hotline - telephone number: 81006386

Management of purchasing Contour Plus
Elite (replacement / new service)

Management for Contour Plus Elite Glucometer Breakdown

- **EAM asset number** will be assigned to each meter & periodic preventive maintenance will be arranged
- once breakdown – send usual EAM repair
- If beyond repair & condemnation is needed. Please seek approval from POCT Committee for replacing a new blood glucose meter by filling the application form



New Territories East Cluster
PRINCE OF WALES HOSPITAL

FORM/POCT/APPLI

Version: 2.0

Application for Endorsement and Acquisition of POCT Device/Equipment

PART A (To be completed by the applicant)

From: _____ To: Chairman, NTEC POCT Coordinating Committee
Department: _____ Tel: _____

1. Quantity, location and description of POCT device requested

2. Estimated cost (To be borne by Department)

(a) Unit cost HK\$: _____ Total cost HK\$: _____
(b) Cost of connection to LIS, e.g. server, ports etc., if any HK\$: _____
(c) Estimated cost of consumables per annum HK\$: _____

3. Purpose

For ☐ Replacement (Complete Section 4)
☐ Additional item(s) (Complete Section 5)
☐ New item(s) (Complete Section 6)

4. For Replacement

Details of POCT device to be replaced:

(a) EAM no. and location: _____
(b) Date of purchase (if available): _____
(c) Breakdown frequency in the past 12 months: _____

5. For Additional item(s)

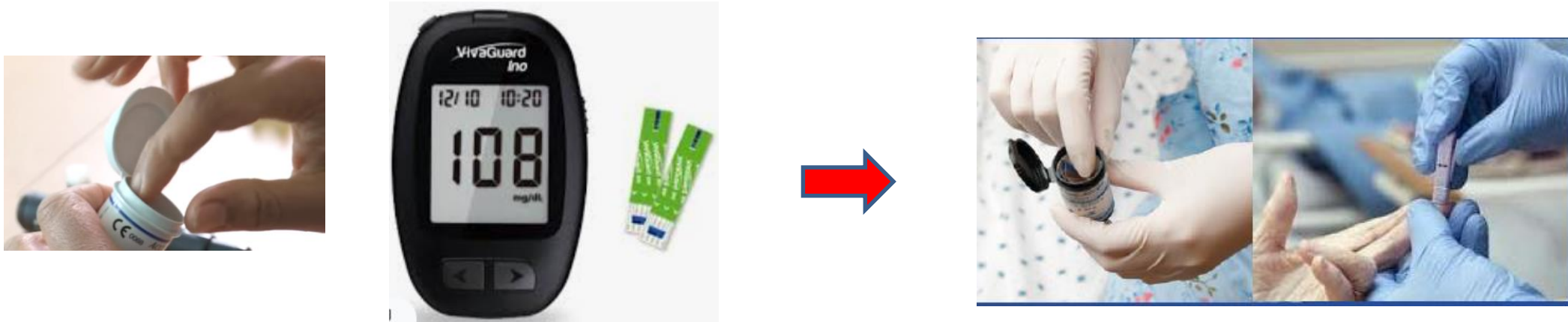
(a) Number of existing POCT device(s) with similar functions: _____

Content

- BGA operator training & certifying procedure
- Information about the new tendered BGAs
- Factors affecting the accuracy of capillary blood glucose testing and the preventive measures
- skills in the operation and performing internal quality control testing of the blood glucose analyzers with or without connectivity functions
- **Tips on performing capillary blood glucose measurements**
- Alternate site / method for glucose testing

Strategies of Risk Reduction of Infection Transmission to patients during point of care testing

- multi-use vials was found to have a **contamination rate** from 25.7%¹ & 45%² respectively
- Meter contamination was ~ 30.2%³
- **hand hygiene and change of gloves** between patient for each testing / during taking strips from vials to minimize the contamination of glucose test strips
- **effective meter cleaning** and disinfection for every testing event



1. Vanhaeren, S., Duport, C., Magneney, M., Dumé, L., Dumenil, A. S., Doucet-Populaire, F., & Decousser, J. W. (2011). Bacterial contamination of glucose test strips: not to be neglected. American journal of infection control, 39(7), 611-613.

2. Pérez-Ayala, M., Oliver, P., & Cantalejo, F. R. (2013). Prevalence of bacterial contamination of glucose test strips in individual single-use packets versus multi-use vials.

3. Geaghan, S. M. (2014). Infection transmission associated with point of care testing and the laboratory's role in risk reduction. EJIFCC, 25(2), 188.

Content

- BGA operator training & certifying procedure
- Information about the new tendered BGAs
- Factors affecting the accuracy of capillary blood glucose testing and the preventive measures
- skills in the operation and performing internal quality control testing of the blood glucose analyzers with or without connectivity functions
- Tips on performing capillary blood glucose measurements
- **Alternate site / method for glucose testing**

What to do if patient has finger tip injury and blood sampling from finger tip is inaccessible?

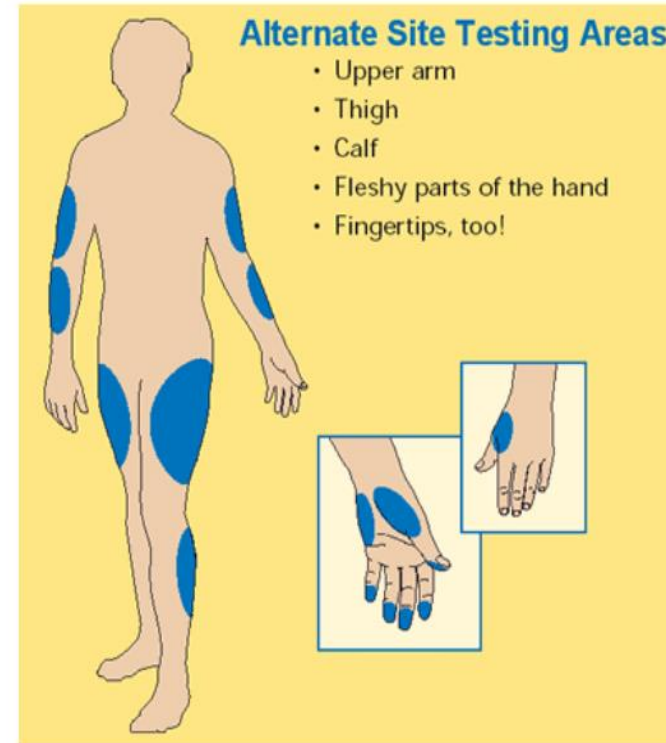


Alternate Site Testing of Blood Glucose

Alternate site refers to testing blood glucose on parts of the body other than the fingertip

Alternate sites:

- Forearm
- Upper arm
- Base of the thumb
- Thigh
- Calf



<http://diabetesdigest.com/glucose-monitoring-alternate-site/>

Alternate Site Testing of Blood Glucose (Limitation)

Alternate site testing may not be as accurate as fingerstick testing, particularly when blood glucose levels are changing rapidly.

- **Lag time** in the flow of blood to sites other than the hands, such as the forearm and thigh. Although the lag time is short, it can cause blood test results to be less accurate when blood glucose levels are changing rapidly .



Whole blood sampling is obtained

Alternate Site Testing of Blood Glucose (FDA's general advice)

Use alternate sites when blood glucose levels are steady:

- Before meals/food intake
- 2 hours after meals/food intake

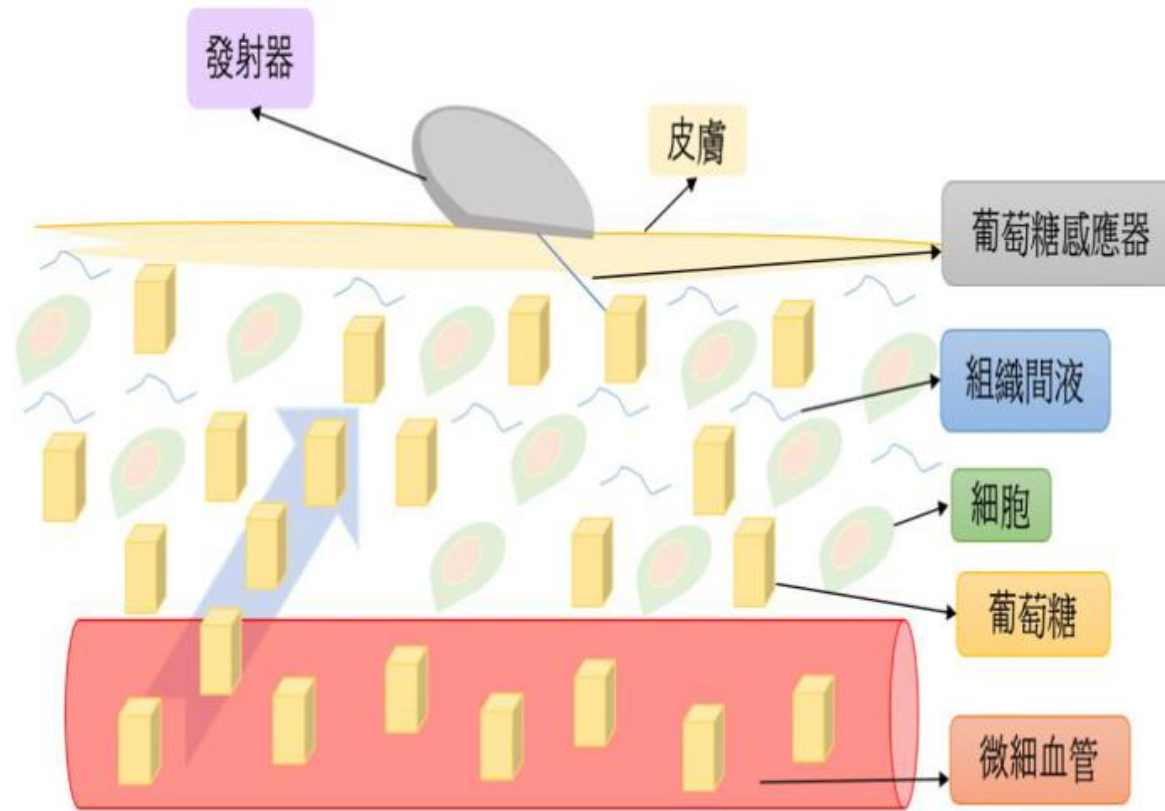
Do not use alternate sites to check blood glucose under these conditions when blood glucose levels are changing rapidly:

- suspect the blood glucose is low
- after exercising vigorously
- during an illness

Not all the BGAs are compatible with alternate site testing. Please consult diabetes nurses or endocrinologists should alternate site for glucose testing is required for hospitalized patients

Continuous Glucose Monitoring System

CGM
- measure the
glucose level
within
interstitial fluid



➤ Physiological lag time between sensor glucose up to **15 min**

Common Continuous Glucose Monitoring System

Abbott Freestyle Libre	Dexcom G7 (real-time)	Medtronic Guardian 4 (real-time)
		

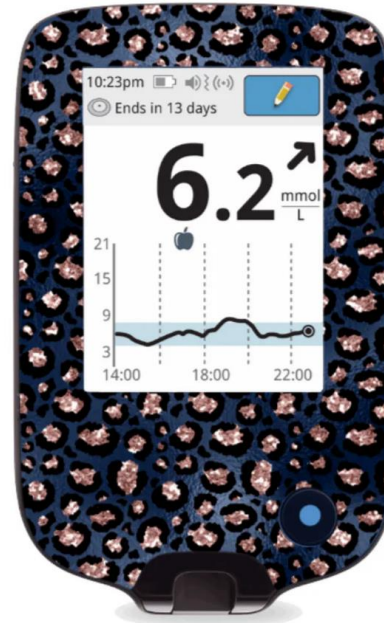
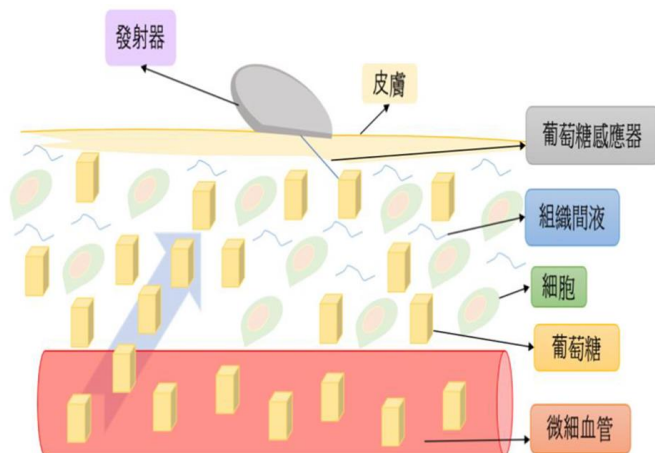
transmitter link to the sensor

Last for 14 days	Last for 10 days	Last for 7 days
◆ ~\$599 (sensor) ◆ ~ \$550 (reader) or ◆ Data is transmitted to smart phone / reader	◆ ~\$620 (Sensor) ◆ Data is transmitted to smart phone / montior	◆ ~\$585 to \$780 (Sensor) + cost of transmitter ◆ Data is transmitted to smart phone / reader

Abbott Freestyle Libre Arrow Trend

血糖箭咀可預測未來15分鐘的血糖

- ↑ 急速上升, 超過1.5mmol/L 度
- ↗ 輕微上升約 1.0 至1.5mmol/L
- 變化少於1.0 mmol/L
- ↘ 輕微下降約 1.0 至1.5mmol/L
- ↓ 急速下降, 超過1.5mmol/L 度



DMEC performs spot paired test at DM nurse clinic
- if arrow displays →



Recommendations for Continuation of Home CGMs After Hospitalization (1)

Should the CGMs could be kept

- if the patient is alert and can self manage the BS monitoring
 - data from **CGMs could be supplement** to capillary blood glucose (CBG) to guide DM Mx but could not replace CBG testing in wards
 - nurses / patient could **use trend arrows to prevent extreme BS excursions** (hypo- or hyperglycaemia) and to determine if confirmatory BG test with meter is required
 - aware of **interferences / factors** affecting the accuracy of sensor data
 - Document sensor **“on & off day ”** and provide finger prick for calibration if necessary

Recommendations for Continuation of Home CGMs After Hospitalization (2)

The CGM should be removed if the patient is

- **not smart** and couldn't self manage especially remove the sensor when it is due
- requiring surgery, procedure, radiation therapy, or diagnostic imaging
- having significant oedema / poor tissue perfusion / treated with vasoactive agents (such as adrenaline / dopamine) may affect the accuracy

notify relative if removed is needed, **save the whole sensor piece and return** to the patient

Summary of International Guidelines on the Use of CGM in the Hospital

Special situations and cautions

- Interference affecting the accuracy of sensor glucose (Hydroxyurea, Acetaminophen , Ascorbic acid)
- Radiology - remove when having CT, radiotherapy, MRI
- Situations with rapidly changing glucose levels and fluid/electrolyte shifts (hyper- or hypoglycaemia)
- Patients with poor tissue perfusion (BP <100 mmHg, hyper- or hypo-thermia, volume depletion) or using vasoactive agents (adrenaline / dopamine)
- Individual capable to use the device safely and independently
- Always confirmed with POC - therapy should be adjusted and hypoglycemia (BG <3.9 mmol/l) should be confirmed with hospital-calibrated glucose meters
- With proper institutional protocols – not yet A/V in HA

1. Zelada, H., Perez-Guzman, M. C., Chernavsky, D. R., & Galindo, R. J. (2023). Continuous glucose monitoring for inpatient diabetes management: an update on current evidence and practice. *Endocrine Connections*, 12(10).
2. Care, D. (2024). 16. Diabetes Care in the Hospital: Standards of Care in Diabetes—. *Diabetes Care*, 47(1), S295-S306.

Teaching materials

Point-of-Care Testing Policy in NTEC
Department of Chemical Pathology, Prince of Wales Hospital, Shatin, New Territories, Hong Kong.

Blood Glucose

1. BGA Operator Certification Workflow
2. Teaching Materials & Video

All training materials

3. Protocols / Internal QC Record / Audit Form

Link nurse nomination form

NTEC Point-of-Care Glucose Testing – Connected Glucometer
Access Right Application Form

4. Quiz (at NTEC iLearn)
5. NTEC POCT External Quality Programme
6. Problem Shooting

iChemPath – POCT

Chem Path Training Videos

			
NTEC POCT Blood Glucose Analyzer (BGA) Refresher Training for BGA Link Nurses / Operators (12:57 min) Resolution(High)	EQAP Introduction and Data Interpretation (8:33 min) Resolution(High)	How to Report EQAP Result Online (2:56 min) Resolution(High)	
Pending			
			
Abbott iSTAT Alinity (1:44 min) Resolution (High)	RapidPoint 405 (9:26 min) Resolution (High)	Abbott iSTAT 1 (1:44 min) Resolution(High)	
			
RightSign Urine Pregnancy Test (4:45 min) Resolution(High)	Hemocue Hb 201+/201DM (22:38 min) Resolution(High)	Nova StatStrip Glucometer (4:41 min) Resolution(High)	Contour Plus Glucometer (11:27 min) Resolution (High)
			
Sampling Procedure for Faecal Occult Blood Test (In-patients) (1:51 min) Resolution(High)	Sampling Procedure for Faecal Occult Blood Test (Out-patients) (1:31 min) Resolution(High)	大便隱血測試的採樣程序 (院內病人) (1:51 min) 解析度(高)	大便隱血測試的採樣程序 (門診病人) (1:31 min) 解析度(高)

Take home message

- Proper **storage** of blood glucose strips :tightly capped / intact foil wrap
- Note the **expiry** / use before date of all opened **control solutions/ strips**
- All actively-in-use BGAs: perform internal QC **daily**.
- Non- active BGAs: **right before** patients' blood glucose test
- **hand hygiene** and change of gloves between patients for each testing / during taking strips out from the vials to minimize the contamination of glucose test strips
- **effective meter cleaning**
- Correct **skill** of blood sampling for CBG measurement
- Always observe **patient's clinical picture** whether matched with the POCT BS findings
- Caution on the **limitations of BGAs** – check plasma glucose for double confirm if necessary
- Caution if **alternate site / continuous glucose monitoring** is used for in-patients

On-site QC skill assessment

BGA link nurse

- select the meter used the in the parent ward
- pair up ➡ either hi- or lo level of QC
- Registered after completion of the QC test
- Perform evaluation

Teaching staff

- Complete MCQ (Nova StatStrip & Contour Plus Elite)
- pair up ➡ performs either hi- or lo level of QC for NOV



NTEC iLearn



Module B (Nurses)



Module D (Care-related Support Workers
(e.g. PCA, EA))

Module B (Nurses)

These training materials are for browsing only. [No assessment can be done.]

If you need to conduct the assessment after the browsing of the materials,
please login via the "[individual portal](#)" in the iLearn cover page.

POCT BGA Operator Quiz

PASSED

Newly appointed East Cluster
POCT Operators are Testing
i-Learn Homepage

[Print Certificate](#)

[Back](#)

