NEST-ED

Technical Modules

February 2021

Newborn Essential Solutions and Technologies-Education (NEST-ED) Technical Modules provide educational support for each of the technologies included in the NEST360° bundle for newborn care. These materials are intended to strengthen locally developed neonatal and technical trainings in pre-and in-service settings and are not intended to be comprehensive technical guidelines or device-specific manuals.

FACILITATING THE CLINICAL USE AND TECHNICAL REPAIR OF TECHNOLOGIES FOR NEWBORN CARE IN LOW-RESOURCE SETTINGS

DISCLAIMER

Newborn Essential Solutions and Technologies-Education
Technical Modules: Glucometer

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PREFACE

This series has been designed with the intent of supporting the clinical use and technical repair of technologies in newborn care units.

Newborn Essential Solutions and Technologies-Education (**NEST-ED**) Technical Modules provide educational support for each of the technologies included in the NEST360º bundle for newborn care. These materials are intended to strengthen locally developed neonatal and technical trainings in pre- and in-service settings. Of note, these materials are not intended to be comprehensive technical guidelines or to replace the use of device-specific user and service manuals or textbooks. They are to be used to facilitate the implementation of comprehensive newborn care, including bubble CPAP, in a resource limited setting.

The NEST-ED Technical Modules were developed through a combination of international standard review, international expert feedback, and multinational NEST360º expert consensus opinion. NEST-ED Modules form the backbone of all lectures, power points, job aids, and other supportive education materials supplied by NEST360º.

ABBREVIATIONS

bCPAP	Bubble continuous positive airway pressure
BMET	Biomedical Equipment Technician
dL	Decilitre
ESD	Electrostatic Discharge
FiO_2	Increased Fractional Concentration of Oxygen
Fr	French size
HAI	Hospital acquired infections
HCWs	Healthcare workers
KMC	Kangaroo mother care
LBW	Low birth weight
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
mm Hg	Millimeters of mercury
NEST-ED	Newborn Essential Solutions & Technologies-Education
NEST360°	Newborn Essential Solutions & Technologies
nm	Nanometer
O_2	Oxygen
OGT	Orogastric tube
PCB	Printed Circuit Board
ppm	Parts per million
ROP	Retinopathy of Prematurity
PSA	Pressure Swing Adsorption
PSU	Power Supply Unit
ROP	Retinopathy of Prematurity
SpO_2	Peripheral blood oxygen saturation
UPS	Uninterruptible power supply
WASH	Water, sanitation and hygiene

NOMENCLATURE

Allen keys	Hex keys
bCPAP prongs	bCPAP patient interface
Christmas tree adapter	Barbed oxygen fitting, nipple and nut adapter
Control PCB	Main PCB
Cot	Bassinet, infant crib
Flat head screwdriver	Slot head screwdriver
Flow splitter	Oxygen splitter, flow meter stand
Glucometer	Glucose meter
Hospital Acquired Infection	Iatrogenic infection, nosocomial infection
Multimeter	Digital multimeter, Avometer
Nasal prongs	Oxygen catheter, oxygen cannula, oxygen prongs
Positive Pressure	Positive end expiratory pressure, positive airway pressure
Radiant warmer	Resuscitaire, resuscitation table
Star screwdriver	Torx screwdriver
Suction pump	Suction machine

Introduction

The NEST-ED Technical Modules have been prepared to help technical staff and students understand the basics of when and how to use equipment essential to newborn care. More importantly, the Technical Modules support staff in troubleshooting common issues, as well as prepare staff to repair equipment when it breaks down or malfunctions. Modules may be used by teaching institutions, to supplement current newborn care curricula, or by hospitals, clinical departments and individuals to update their knowledge and to better facilitate the effective and safe use of newborn care equipment. Modules should be used alongside device user and service manuals to provide additional context as needed.

Whilst reading this series, navigate to the **Table of Contents** by clicking the NEST360° logo that appears at the bottom right corner of each page: NEST360°

Every module has a similar structure with sections and subsections. The sections have similar headings and subheadings to make it easy for the user to navigate them. However, words may have different meanings for the various cadres of staff reading them and so to reduce misinterpretation, the heading titles are explained below.

The NEST-ED Technical Modules are intended as a flexible resource that hospitals and partners can adapt to their specific needs. The Technical Modules consist of generic content that can be applied to any model within a device category, coupled with model specific device images that can be exchanged for alternative images depending on the devices available at your facility. Individuals who are interested in gaining access to the editable NEST-ED Technical Modules should contact the **NEST Training Materials Coordinator** (Anniina Lockwood, al90@rice.edu) or the **NEST Biomedical Tech Training Director** (Sara Liaghati-Mobarhan, slmobarhan@rice.edu).

CLINICAL PROBLEM

This section provides useful information on the clinical application of a device that would bear relevance to the biomedical team, not only to aid in their troubleshooting, but also for user training.

ASSESSMENT

This section explains how the device works, and what kinds of patients it is useful for. This section also includes comprehensive diagrams of internal and external views of the devices, including consumables that may be used with the device. This section also contains detailed descriptions of key device components (including alarms) and includes a diagram of typical device flow (including components and how they interact with each other, electrical current and fluid movement through the device if relevant).

MANAGEMENT

This section focuses on **clinical** management and provides step by step directions on how to set the device up for a patient, followed by instructions on starting the patient on the device and monitoring a patient whilst on the device. This section also describes how to remove the equipment from the patient when it is no longer needed. Although a biomedical engineer or a technician will not be responsible for providing care, understanding these steps will be useful in training and when assessing the device.

INFECTION PREVENTION

This section lays out the basic infection prevention measures that should always be taken when handling equipment, followed by directions for disinfecting the equipment both during and after use. This section also describes the crucial Infection Prevention and Control steps that are particularly relevant to biomedical engineers and technicians.

COMPLICATIONS

This section explains some of the common but serious clinical complications that relate to and can arise from the use of the equipment (e.g., complications that will be seen or directly apply to the patient). Biomedical engineers' and technicians' understanding of potential complications for the patient is crucial to ensure patient safety. This section also describes common device complications (e.g., complications that will be seen or directly apply to the device).

CARE & MAINTENANCE

This section describes where to place equipment for use, how to safely handle devices and their consumables, whether calibration is recommended, and how to decommission the equipment. Biomedical engineers and technicians are responsible for second-line care and maintenance to ensure the equipment lasts to their potential lifetime; as such, this section also lists the necessary daily, weekly, monthly and annual preventive maintenance steps required to keep the device in good working condition. First-line care and maintenance is the responsibility of the user and is described in the **NEST-ED Clinical Modules**.

TROUBLESHOOTING & REPAIR

This section describes steps that should be taken when a device malfunctions and first-line troubleshooting efforts have failed to address the issue. This section describes tools and spare parts that might be required to prepare for repairs and to troubleshoot failures, and provides a list of components commonly provided with the device to ensure that all components return to the ward post-repair. Finally, this section also explains steps for testing, repairing, and replacing specific parts of the device.

REFERENCES & ALERTS

References & alert boxes are included within each module to provide clarity on areas where recommendations are governed by published standards, evidence, and/or expert opinion. This is included for the dual purpose of facilitating (1) feedback and continuous improvement of NEST-ED Technical Modules and (2) implementer review of content for incorporation in local trainings.

? ALERT 0.0 Subject

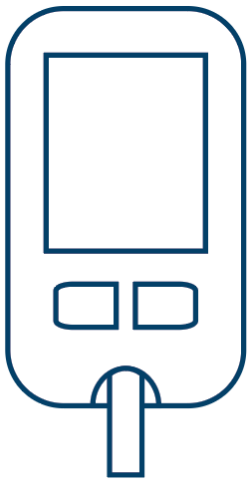
QUERY ALERT BOXES appear where there may be controversy or disagreement. In these cases, alert boxes provide background to the recommendations that are made in the body of the document. Relevant documents are cited and brief explanation of reasoning for current module content provided.

! ALERT 0.0

RECOMMENDATION ALERT BOXES appear where there are recommendations based largely on expert opinion or consensus, or to emphasize an important element of care. Relevant documents are cited and brief explanation of reasoning for current module content provided.

Point-of-Care Diagnostics

Glucometer



1 Clinical Problem

Blood glucose measurement using a glucometer is necessary in clinical assessment and management of patients in all hospital settings. In newborn care units, glucometers are used during routine assessment for all infants on admission.

Glucometers should also be used during continuing management for all sick or at-risk patients. Hypoglycaemia or low blood glucose may present symptomatically (as jitteriness, irritability, lethargy, seizures, etc.) or asymptomatically.[1] It is important to identify hypoglycaemia as it may lead to permanent harm.

2 Assessment

Hypoglycaemia occurs in 10% of healthy neonates and directly contributes to both morbidity and mortality.2,3 It is the most common medical emergency to occur in neonatal patients.

Glucometers **(2.1)** provide a rapid measurement of approximate whole blood glucose level to guide treatment for patients with mild to severe hypo- or hyperglycaemia.[1] Where available, point of care tests should be confirmed by laboratory analysis when hypo- or hyperglycaemia is persistent, recurrent, or there is concern about accuracy of the point of care device.

2.1 Glucometers.

2.2 Glucometer test strips.

There are multiple types of glucometers, including portable and benchtop. **(2.1)** Glucometer test strips are specific to model. **(2.2)** Most guidelines suggest that glucose levels in all neonatal patients should not fall below **2.5 mmol/L** (45 mg/dL). **(Alert 2.1)**

Alert 2.1

As many glucometers are designed to monitor hyperglycaemia in diabetic adults and children, not all glucometers are able to accurately measure hypoglycaemia in neonatal patients.[4,5] Accuracy at the lower ranges of glucose to assess hypoglycaemia is the priority of monitoring in newborn patients. To appropriately assess neonatal hypoglycaemia, glucometers used in neonatal wards should be accurate within ± 3.6 mg/dL at 54mg/dL. The **NEST360° Qualified Technologies for Newborn Care in Low-Resource Settings** & **Newborn Technology Landscape** technical documents outline commercially available and in-development glucometers appropriate for use in neonatal care.

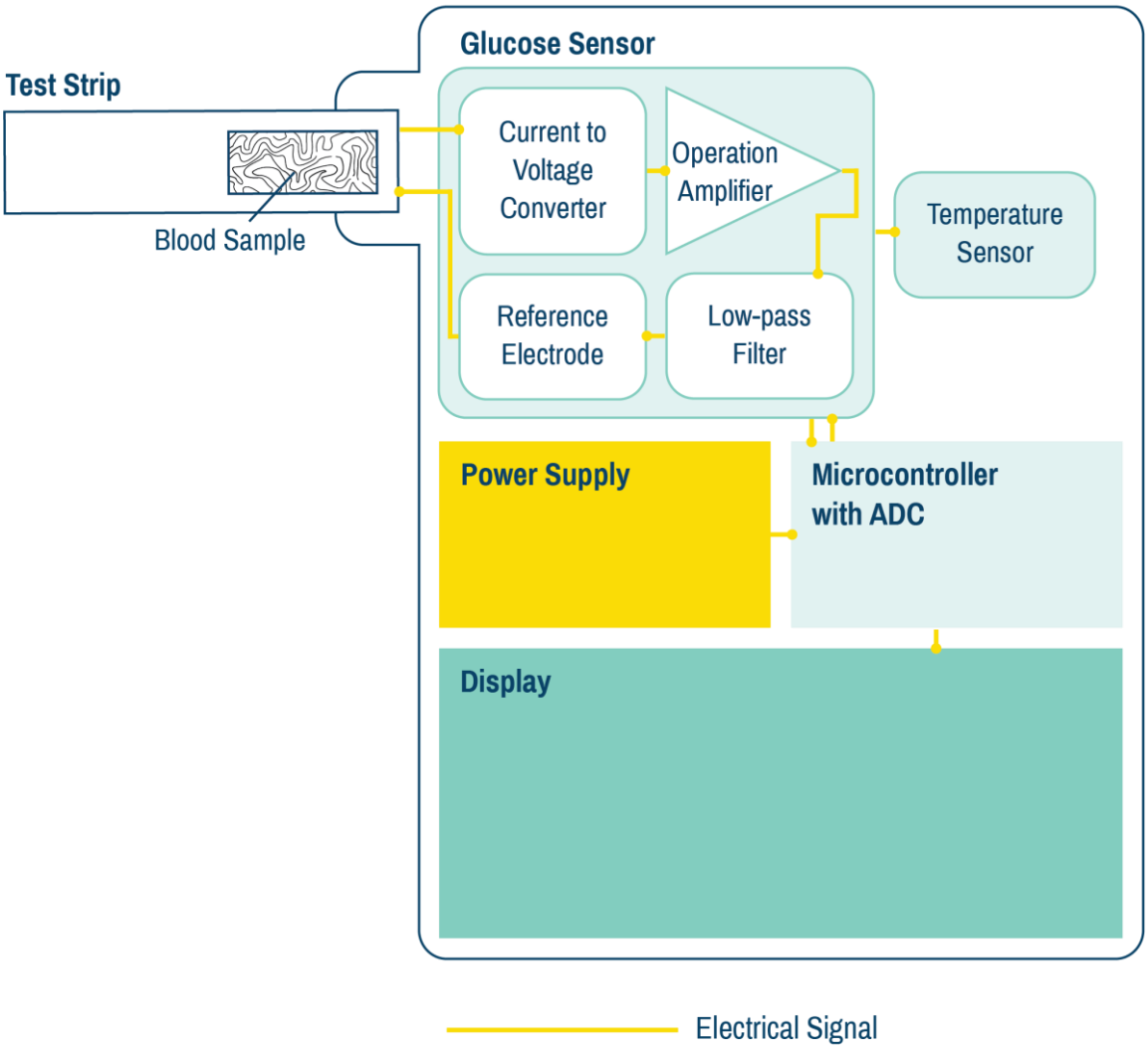
Glucose test strips that change colour according to a visual scale are also available for measuring glucose levels. **These are not recommended due to their poor accuracy and subjective nature of measurement.**

HOW IT WORKS

Glucometers use **test strips** with a glucose oxidase electrode. Glucose in the blood reacts with glucose oxidase on the strip, generating a current which is then measured and analysed to determine an estimated blood glucose level. Standard external and internal device components are annotated below in **Figure 2.3**. Components should be similar regardless of model. However, specific locations, visual setup and component type may vary by brand and device model. Refer to service and user manuals if model in use is different from the displayed version.

2.3 Glucometer main components.

TYPICAL DEVICE FLOW



MAIN COMPONENTS

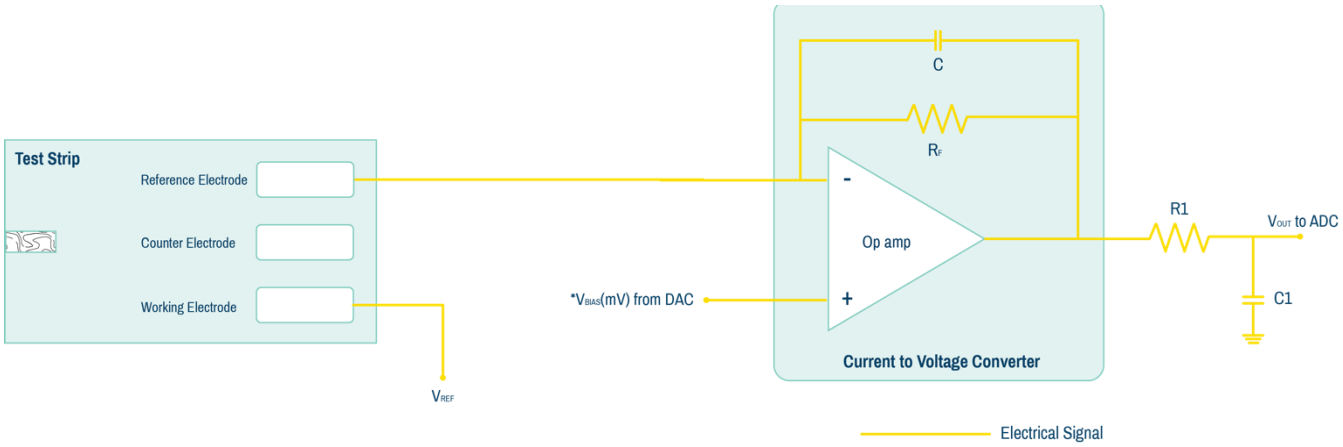
The following device components should be similar regardless of model. However, specific locations, visual setup and component type may vary by brand and device model. Refer to model service and user manuals if different from the displayed model for more device-specific information.

LCD / display screen

The LCD or display screen is on the front of the device and represents the main control and display area for the device.

Glucometer strip

A typical test strip has three main terminals or electrodes; the working electrode, reference electrode and counter electrode. **(2.4)** Glucose oxidase chemical reactions take place and produce electrons at the working electrode which is directly connected to a current-to-voltage converter. The counter electrode supplies current to the working electrode.



2.4 A typical test strip circuit.

Control PCB

The control PCB ranges from basic to extensive by glucometer model, but typically contains connections to the LCD, control panel and strip port and processes signals from the glucometer strip to the display.

Battery

The rechargeable or disposable battery powers the LCD and measurement functionality without the need for mains power.

Strip ejector

In some models, a strip ejector is present that aids in the ejection of the glucometer strip without requiring the user to physically touch the strip. This provides additional infection protection for the user and patient from the blood on the used strip.

3 Management

Management covers how to use the glucometer, including set up for a patient, patient commencement, care whilst using the device and concluding the assessment of the patient. These instructions are helpful for a biomedical engineer or technician both in user training and in assessing the appropriate functionality of the device.

SETTING UP FOR A PATIENT

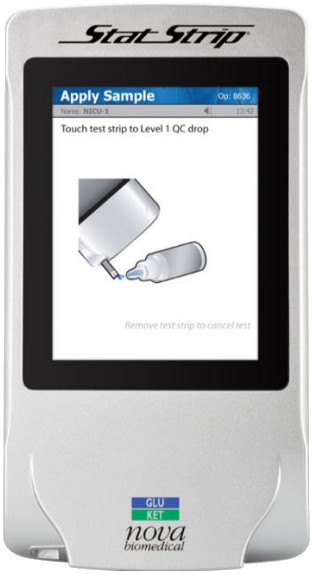
1. Collect: **(3.1)**
   - Glucometer
   - Glucometer strips
   - Control solutions
2. Turn on the glucometer. This may be completed by pressing the power button of the glucometer or inserting a glucometer strip into the glucometer strip port.

3.1 Collect glucometer, test strip & control solutions.

3.2 Insert strip.

3. Fully insert a test strip into the meter. **(3.2)** The strip should click into place.
4. A **Quality Control** test should be conducted daily. If this has not been completed, perform a test using the control solutions provided with the glucometer **(3.3)**, or a solution of known glucose content. The solution should be placed on the strip as with a normal sample. **(3.4)** The results should appear within seconds as a **Pass**. **(3.5)**

3.3 Collect control solutions.



3.4 Allow the strip to absorb a drop of the control solution.

3.5 The control solution should test as a **Pass**.

PREPARING A PATIENT

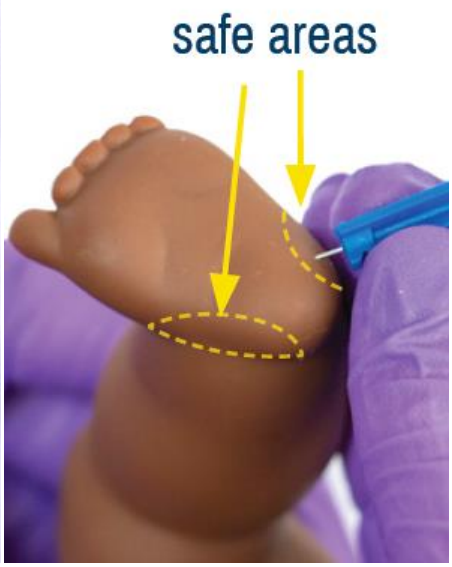
1 Clinical or nursing staff should take neonatal glucometer readings from the skin on the outer edge of the patient's heel. The site should be cleaned using cotton wool soaked in alcohol and allowed to dry before samples are taken. **(3.6) Blood glucose samples should never be taken from the finger of a neonate. Areas of skin with low blood flow, swelling, inflammation or infection should be avoided.**

3.6 Clean outer edge of the patient's heel using cotton/gauze soaked in alcohol.

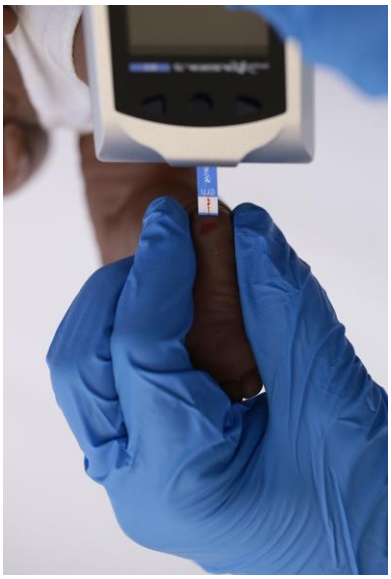
ASSESSING A PATIENT

1. Collect: **(3.7)**
    - Glucometer
    - Glucometer strips
    - Gloves
    - Alcohol swab
    - Lancet
    - Cotton wool
2. Insert glucometer strip into glucometer and ensure it is turned on.
3. Using the lancet, clinical or nursing staff should prick the disinfected outer edge of the heel. **(3.8)** A blood drop should form. If this does not occur, the heel may be massaged to generate the blood drop.
4. Clinical or nursing staff should wipe the first drop from the patient's skin and an additional blood drop generated. Clinical or nursing staff can then collect the second blood drop on the tip of the glucometer strip. **(3.9)** The glucometer should automatically absorb the blood drop.

3.7 Collect assessment materials.

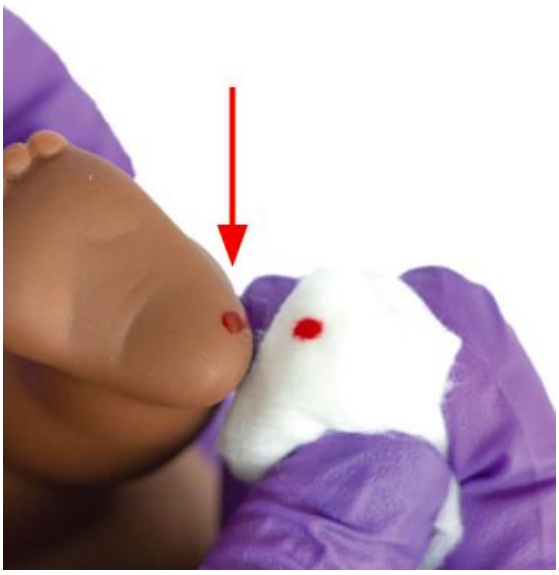


3.8 Prick disinfected outer edge of heel using lancet.



3.9 Collect blood drop on glucometer strip.

5. Using a dry cotton swab, clinical or nursing staff should apply pressure to the heel to stop the bleeding. **(3.10)**
6. Blood glucose level will be displayed as a number on the glucometer screen. **(3.11)** Clinical or nursing staff should read and record the glucose levels. They should then compare the measurement with the clinical condition of the patient and repeat the test if necessary.



3.10 Apply pressure to stop bleeding.

3.11 Read & record glucose levels.

7 Staff should compare glucose levels to normal standards[6] and take interventions according to clinical guidelines. **(Alert 3.1)** Whenever hypoglycaemia is found and treated, the blood glucose should be rechecked 30 minutes after intervening.

Alert 3.1 International standards for hypoglycaemia management

American Academy of Pediatrics, Pediatric Endocrine Society and WHO are all in agreement that glucose levels below 2.5 mmol/L (45 mg/dL) signify hypoglycaemia in newborns. However, they differ on the specific actions that should be taken and how aggressively to manage glucose levels below 45 mg/dL (2.5 mmol/L). For a full discussion of management of hypoglycaemia in newborns, these documents should be referenced and local practices put into place by clinical and nursing staff.[7–9]

CONCLUDING ASSESSMENT

Remove the glucose strip from the glucometer and dispose of strip in hazardous waste container. Dispose of the used lancet in sharps container. Remove gloves, dispose in hazardous waste container, and wash hands.

4 Infection Prevention

Routine and adequate cleaning of medical devices is critical to prevent hospital-acquired infections in newborn care units.

CLINICAL INFECTION PREVENTION

1. Clean hands with soap and water or alcohol before and after assessing a patient using a glucometer or handling any materials that will be used on a patient (e.g., a lancet). **Gloves should be worn throughout the process of taking a blood glucose measurement and disposed of immediately after concluding the measurement.**
2. Always thoroughly clean the patient's skin before taking a measurement using a glucometer. Inadequate cleaning of the skin may result in an infection. Taking a sample from a site with a skin infection also poses the risk of infection dissemination.
3. Ensure that all patient-related consumables are new before use. Materials used in blood glucose measurements **should never be reused**.
4. All patient-related consumables should be stored in a clean, dry location. Glucometer measurement strips should be stored in an airtight container and according to hospital policy.
5. Follow universal precautions of handling sharps.

DISINFECTION AFTER USE

1. Remove the glucose strip from the glucometer and dispose of strip in hazardous waste container. Dispose of used lancet in sharps container. Remove gloves, dispose in hazardous waste container, and wash hands.
2. Wipe down the glucometer with 70% alcohol. **(4.1)** Be careful not to submerge or drip alcohol onto the glucometer, particularly in its glucometer strip reading slot. **(Alert 4.1)**

4.1 Wipe down the glucometer with 70% alcohol.

BMET INFECTION PREVENTION

1. Any piece of equipment used in providing patient care must be handled carefully, as it may be contaminated and have the potential to spread infection.
2. Clean and disinfect glucometer housing and components whilst wearing PPE as appropriate (e.g., rubber gloves, apron, face protection) **before any repairs or maintenance are made. (Alert 4.1)**
3. Avoid any contact between used piece of equipment and skin, mucosa or clothing.
4. Post-maintenance, decontaminate all tools and surfaces used with 70% alcohol or according to manufacturer guidelines. Do not use equipment until it has fully dried following decontamination.

? Alert 4.1 Disinfecting Equipment

Disinfection of equipment should always comply with manufacturer guidelines. WHO recommends 0.5% dilution of chlorine (0.5% or > 100ppm available sodium hypochlorite) as the standard disinfectant for materials and surfaces contaminated by blood or body fluids.[10] For metal and rubber surfaces, which may be corroded by chlorine, 70% alcohol is also commonly utilised for low level disinfection.

Other appropriate low-level disinfectants include quaternary ammonium, improved hydrogen peroxide and Iodophor germicidal detergent.[11] Phenolic germicidal detergent is also identified but should not be used in neonatal wards since affordable, effective alternatives are available; and, there are concerns it may cause hyperbilirubinemia and/or neurotoxicity in neonates.[12]

See dedicated NEST360° module on Infection Prevention and Control for further details on risks, benefits and utilisation of chemical disinfectants. For comprehensive guidance on infection prevention and control we recommend utilising Reference Manual for Health Care Facilities with Limited Resources Infection Prevention and Control (Caston-Gaa & Ruparelia, 2018).

5 Complications

Equipment in newborn care units are highly specialised. Without proper knowledge and skills, this equipment can be potentially dangerous for the infants, families and care providers.

CLINICAL COMPLICATIONS

- **Bruising:** inappropriate / repeated attempts to collect blood for glucose testing may result in bruising.
- **Bleeding:** if pressure is not applied post blood collection bleeding may persist for a short period of time. Continued bleeding may indicate an underlying bleeding disorder.
- **Artery, nerve or bone damage:** the back or the inner part of the heel should not be used for blood collection. This may cause artery, nerve, or bone damage.
- **Pain:** the lancet prick can cause pain; appropriate soothing measures should be employed.
- **Infection:** rarely infection may occur at the site if infection precautions are not adequate.

DEVICE COMPLICATIONS

- **Falsely high readings:** dextrose gel or substances on the skin can affect readings. If you record a very high reading in a patient who is otherwise showing symptoms of hypoglycaemia, consider recleaning the patient's skin and retaking the measurement.
- **Expired glucose strips:** outdated or improperly stored glucose strips can produce inaccurate readings. Make sure the lid is kept tightly on the strip container as humidity damages the strips. When possible, unexpired glucometer strips should be used.

6 Care & Maintenance

Biomedical engineers and technicians are responsible for second-line care and maintenance to ensure equipment lasts to its potential lifetime.

POWER SOURCE

A glucometer is powered by replaceable or rechargeable **(6.1)** batteries. If using a rechargeable device, users should regularly charge the glucometer when not in use to ensure power in the event of a power outage.

WARD LOCATION

The glucometer and associated glucometer testing strips should be stored in a clean, dry and secure area. As glucometers are fairly small, care should be taken to ensure that they remain on the ward and accessible for use when required. If the glucometer has a docking or charging station, it should be kept on the dock or charging station when not in use. **(6.2)**

6.1 Low battery warning.

6.2 Glucometer on its charging port.

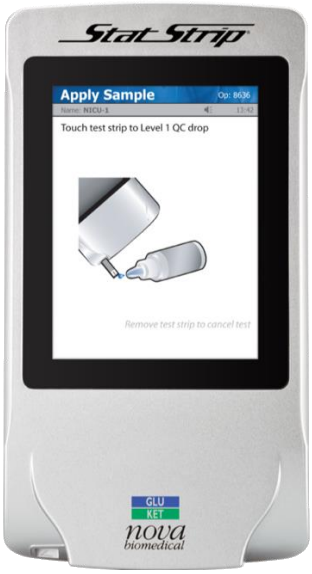
DEVICE CALIBRATION

Quality Control assessments are recommended for most glucometers on a regular basis. This may range from daily to biweekly or monthly. Manufacturer recommendations should be followed to advise frequency.

A **Quality Control** test using the control solutions provided with the glucometer **(6.3)** may be used to check the glucometer. Most glucometers with this functionality will have a specific Quality Control testing mode that should be navigated to within the device menu. The solution should be placed on the strip as with a normal sample. **(6.4)** The results should appear within seconds as a **Pass**. **(6.5)** If the device does not pass the **Quality Control** test, contact the manufacturer to recommend steps to repair, calibrate or replace as needed.

If control solutions are not available, a solution of known glucose content may also be used to check the glucometer. This can be performed as a normal patient test; assessors should compare the resulting reading with the known glucose content of the sample. If the device shows results inconsistent with the known glucose content, contact the manufacturer to recommend steps to repair, calibrate or replace as needed.

6.3 Collect control solutions.



6.4 Allow the strip to absorb a drop of the control solution.

6.5 The control solution should test as a **Pass**.

DECOMMISSIONING

Assuming appropriate use and consistent maintenance, a glucometer may last from 6 months to 3 years, depending on the model. In most instances, glucometer failures are irreparable and decommissioning and replacement is required. If the LCD or control PCB is still in good condition, these parts may be repurposed for other devices. Typically, the control PCB should only be repurposed for devices of the same manufacturer and model, although components from the circuit board may be desoldered and repurposed independently. **(Alert 7.2)**

PREVENTIVE MAINTENANCE

After Each Use

- [ ] Turn off the glucometer. Use gauze and 70% alcohol or diluted chlorine to thoroughly wipe the LCD, control solution bottles and housing of the glucometer. Dispose of used strips appropriately.

  See **Glucometer: Disinfection After Use** and **Alert 4.1** for more information.

- [ ] Visually inspect glucometer components.

Weekly

- [ ] Visually assess the glucometer strip port for fluid or physical damage.
- [ ] Inspect the condition of the glucometer battery, including its charge level and physical integrity.
- [ ] Document cumulative hours used (if available) and preventive maintenance actions taken.

Monthly

- [ ] Perform **Weekly** preventive maintenance steps.
- [ ] Conduct a **Quality Contr**ol test using the control solutions provided with the glucometer, or a solution of known glucose content, with the nursing or clinical staff. Place this solution on the strip as with a normal sample.
- [ ] Document cumulative hours used (if available) and preventive maintenance actions taken.

Quarterly

- [ ] Perform **Monthly** preventive maintenance steps.
- [ ] Document cumulative hours used (if available) and preventive maintenance actions taken.

Annually

- [ ] Perform **Quarterly** preventive maintenance steps.
- [ ] Confirm supply of spare glucometer batteries, glucometer strips & control solutions are adequate to support estimated replacement for next year.
- [ ] Document cumulative hours used (if available) and preventive maintenance actions taken.

7 Troubleshooting & Repair

Biomedical engineers and technicians are responsible for providing rapid maintenance, troubleshooting and repair support for users.

PREPARE FOR REPAIR

ACCESSIBLE TOOLS	SPARE PARTS	DEVICE CHECKLIST
Digital multimeter Phillips, star & flat head screw drivers Allen keys Needle nose pliers Forceps Gauze Alcohol	LCD Batteries	☐ Glucometer ☐ Glucometer charging port (if applicable) ☐ Glucometer strips ☐ Quality control solutions

TROUBLESHOOTING FAILURES

The glucometer is not turning on.

Probable Cause: Discharged batteries

Components to Check: Battery level (if rechargeable) or voltage and physical condition

The glucometer is giving results incompatible with patient condition.

Probable Cause: Expired or incorrect strips

Components to Check: Glucostrips expiry date and brand
Firmware edition & condition
Control PCB electrical & physical integrity

The glucometer is not providing a reading.

Probable Cause: Damaged circuit board or glucostrip entry port

Components to Check: Control PCB electrical & physical integrity
Glucostrip entry port physical integrity

Discoloured or black spots obstruct view of the display.

Probable Cause: Damaged LCD

Components to Check: LCD physical integrity

REPAIR & REPLACE

Where technically possible and not likely to obstruct clinical care, repairs may be made within the newborn care ward. Use discretion to determine if this is appropriate or if the device should be removed to the biomedical workshop for more testing or repair.

Testing & replacing the batteries

The glucometer battery is responsible for powering all display measurement and alarm functions. If the glucometer is not turning on, the batteries should be visually assessed for rust or other physical damage. **(7.1)** Depending on the severity of the damage, rust or other build-up present on the battery terminals can be gently scraped off with very fine sandpaper.

Both the voltage across the battery terminals and the continuity of the wires from the battery to the control board should be tested and the battery or wires replaced if necessary. Specifications for battery voltage should be available in the manufacturer's service manual.

7.1 Battery build-up. Remove build-up using fine sandpaper.

Testing & replacing the glucometer strips

Outdated or improperly stored glucose strips can produce inaccurate readings. The lid should be kept tightly on the strip container as humidity damages the strips. When possible, unexpired glucometer strips should be used. If the strips may have been contaminated, perform a **Quality Control** test to assess their stability.

Testing & replacing control PCB and associated components

In most cases, if one element of the control PCB has malfunctioned, the entire control PCB should be replaced. Visually assess the PCB for burnt or damaged components. Internal wiring continuity leading from the power supply to the control PCB may also be assessed for replacement. **(Alert 7.1)**

! Alert 7.1

Printed Circuit Boards (PCBs) contain components that are sensitive to electrostatic discharge (ESD) and can damage the board if not handled properly. As when handling any ESD-sensitive PCB, observe standard ESD safety procedures.

Testing & repairing the glucostrip entry port

The glucometer strip entry port may be damaged from liquid or fluid spill into the entry port. Visually inspect the port for debris build-up. If build-up is present, use a pair of forceps wrapped in alcohol-soaked gauze to **gently** clean the glucometer strip entry port.

Testing & replacing the LCD

The LCD is typically damaged due to incorrect use, particularly when the user pushes with too much force on the screen. If the damaged areas do not hinder viewing or use of the display, the glucometer may be used. However, if the damaged areas prevent easy use, the LCD may be replaced. Contact the manufacturer to request a replacement part specific to the glucometer model.

? Alert 7.2 Repurposing Parts

In some cases, parts on the unit may be replaced with a repurposed or recycled part from another piece of equipment being used for parts. **Repurposed parts should be considered with caution and guidance from the manufacturer to ensure specifications of the repurposed part is compatible with the equipment.** This includes spare parts and accessories that may not be compatible with multiple systems (e.g., circuit boards, glucometer strips).

8 References

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