Screening for CCHD:
Equipment for Screening

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Annamarie Saarinen

CCHD Interest Call
July 13, 2012
Screening Basics
## Screening Basics

### Supplies You Will Need

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pulse Oximeters</strong></td>
<td>• At least one pulse oximeter to be used for screening</td>
</tr>
<tr>
<td></td>
<td>• One pulse oximeter for back-up</td>
</tr>
<tr>
<td><strong>Infant Disposable or Reusable Pulse Ox Sensors</strong></td>
<td>• If using disposable sensors, one disposable sensor for every infant screened</td>
</tr>
<tr>
<td></td>
<td>• If using reusable sensors, one reusable sensor for each pulse oximeter. Also consider additional reusable sensors for back-up</td>
</tr>
<tr>
<td></td>
<td>– Disinfecting agent recommended by pulse oximetry equipment manufacturer</td>
</tr>
<tr>
<td><strong>Rolling Cart for Supplies</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Data Collection Forms</strong></td>
<td>• One for every infant screened</td>
</tr>
<tr>
<td><strong>Dedicated individual to perform screening</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Red Heart-Shaped Stickers</strong></td>
<td>• One red heart-shaped sticker for every infant who has been screened</td>
</tr>
<tr>
<td><strong>Blankets for warming the infant and blocking extraneous light</strong></td>
<td></td>
</tr>
<tr>
<td><strong>A parent for comforting infant</strong></td>
<td></td>
</tr>
</tbody>
</table>
Screening Basics

1. Pair screening with other standard-of-care newborn screening performed following 24 hours of age (prior to DC).

2. Movement, shivering and crying may affect the accuracy of the pulse ox reading. Ensure that the infant is calm and warm during the reading. Swaddle the infant and encourage family involvement to promote comfort while obtaining the reading. If possible conduct screening while the infant is awake.

3. Nail polish dyes and substances with dark pigmentation (such as dried blood) can affect the pulse ox reading. Assure that the skin is clean and dry before placing the sensor on the infant. Skin color and jaundice do not affect the pulse ox reading.
Screening Basics

4. Wrap the sensor around the thinnest part of the outer aspect of hand/foot or around the great toe/thumb.

5. Place the light emitter on the top of the foot/hand/digit, with the photodetector directly opposite on the fleshy portion of the foot/hand/digit.

6. If using reusable sensors, use disposable wrap to secure sensor to the infant.

**CAUTION**

Never use your hand or tape to secure sensor to site.

Do not use adult clips on infant patients
Screening Basics

Right Hand

Foot
Screening Basics

Application with Disposable Sensor

Application with Reusable Sensor

Star to the Sky

Raise the (Red) Bar

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Children's National Medical Center
Considerations for conventional oximeters:

- Heart rate displayed and correlates with what is expected for an infant (100-160 BPM)

- Ensure that pleth wave (arterial pulse) is stable, indicating perfusion to the site being monitored and with no motion artifact

Troubleshooting: Motion, Sensor placement
Consider the following if using Signal Extraction Technology:
- Motion is not a limiting factor, therefore do not depend on pleth wave

Peripheral Perfusion Index (PPI) – An assessment of the pulse strength at the monitoring site and can range from 0.02 (weak pulse strength) -20 (strong pulse strength). Most newborns should have a PPI of >1.0.

- Troubleshooting: Sensor Placement (opposite and min space between probes), Clean sensor, Ambient Light, CCHD?
**Is Your Reading Accurate?**

- **Signal Identification and Quality Indicator (Signal IQ)**
  An indicator of the system’s confidence level in the strength of the arterial pulse and oximetry measurements

- Troubleshooting: Sensor placement, Interruption in blood flow to site - BP cuff? , Legs Crossed?, Diaper Change?
9. If using disposable probes, dispose of used probe. If using reusable probes, dispose of disposable wrap and clean reusable probe with alcohol pad.

10. Document readings and proceed per nursery protocol.

If you are using disposable pulse ox sensors, use a new, clean sensor for each infant. If you are using reusable pulse ox sensors, clean the sensor with recommended disinfectant solution between each infant. Dirty sensors can decrease the accuracy of your reading and can transmit infection. A disposable wrap should be used to secure the sensor to the site.
Equipment Overview
Equipment Overview: Covidien (Nellcor)

## Equipment Overview: Covidien (Nellcor)

### Nellcor™ Sensor Accuracy Chart in Neonates

<table>
<thead>
<tr>
<th>Model</th>
<th>70%-100% SpO₂ Range</th>
<th>LoSat 60%-80% SpO₂ Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXN*</td>
<td>±2</td>
<td>±3</td>
</tr>
<tr>
<td>MAXI</td>
<td>±2</td>
<td>±3</td>
</tr>
<tr>
<td>SC-NEO**</td>
<td>±2</td>
<td></td>
</tr>
<tr>
<td>SC-PR**</td>
<td>±2</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>±3.5</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>±2.5</td>
<td></td>
</tr>
<tr>
<td>OXI-A/N</td>
<td>±4</td>
<td></td>
</tr>
<tr>
<td>OXI-P/I</td>
<td>±3</td>
<td></td>
</tr>
<tr>
<td>D-YS</td>
<td>±4</td>
<td></td>
</tr>
</tbody>
</table>

### Single-Patient-Use Sensors
- **Adhesive SpO₂ Sensors**: Comfortable, form-fitting sensors; suitable for long-term monitoring.
  - Neonatal/Adult: <3 kg or >40 kg
  - Infant: 3-20 kg

### Reusable Sensors
  - Neonatal/Adult with Wraps
  - Pediatric/Infant with Wraps
  - Adult/Neonatal <3 kg or >40 kg
  - Pediatric/Infant 3-40 kg
## Equipment Overview: Masimo

### Rad 7

<table>
<thead>
<tr>
<th>MEASUREMENT RANGE</th>
<th>SpO₂</th>
<th>SpMet</th>
<th>SpCO</th>
<th>SpHb</th>
<th>SpCC</th>
<th>Pulse Rate</th>
<th>Perfusion Index</th>
<th>RRa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 - 100%</td>
<td>0 - 90.0%</td>
<td>0 - 60.0%</td>
<td>0 - 25 g/dL</td>
<td>0 - 35 ml of O₂/dL of blood</td>
<td>25 - 240 bpm</td>
<td>0.02 - 20%</td>
<td>4 - 70 breaths per minute</td>
</tr>
</tbody>
</table>

### Rad 5

<table>
<thead>
<tr>
<th>PERFORMANCE MEASUREMENT RANGE</th>
<th>SpO₂</th>
<th>Pulse Rate</th>
<th>Perfusion</th>
<th>No Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 - 100%</td>
<td>25 - 240 (bpm)</td>
<td>0.02% - 20%</td>
<td>70% to 100%</td>
</tr>
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</table>

### OXYGEN SATURATION ACCURACY (K₅₉pliant)

- **Saturation**
  - No Motion: Adults/Infants/Pediatrics ±3%
  - Saturation: 70 - 100%

- **No Motion**
  - Adults/Infants/Pediatrics ±2%
  - Neonates ±3%

- **Motion**
  - Adults/Infants/Pediatrics ±3%
  - Neonates ±3%

- **Low Perfusion**
  - Adults, Pediatrics ±2 digits
  - Neonates ±3 digits

Adhesive Sensors: Neonates < 3 kg = Neo sensor

Foot Application:

• Apply the sensor to either foot using the thinnest part of the foot – this is the lateral aspect

• The detector can be on either the sole of the foot or the top of the foot

• Ensure the emitter and detector are aligned.

• Wrap the tape around the foot.

Hand Application:

• Apply the sensor to the right hand using the thinnest part of the palm – this is the lateral aspect

• The detector should be on the fleshy part of the hand, this may be the back of the hand – dorsal aspect

• Ensure the emitter and detector are aligned.

• Wrap the tape around the hand.
LNCS Inf Infant Sensor

Great Toe Application

Thumb Application

Great Toe or Thumb Application
Patient Weighing 3 - 10 kg
Multisite YI with Foam Wrap: Neonates > 1 kg

Foot Application

Hand Application
Applications of YI Wraps

Clean Shield® Multisite Wrap

Standard Wrap

Foam Wrap

<table>
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<tr>
<th>Body Weight</th>
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<th>Standard Wrap</th>
<th>Foam Wrap</th>
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<tbody>
<tr>
<td>1 kg ~ 3 kg</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>3 kg ~ 10 kg</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>10 kg ~ 30 kg</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
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# Equipment Overview: Masimo Pricing

**Estimates Only**

## Oximeters:
- Rad 5 (handheld) - $500
- Rad 7 (stand alone) - $1700

## Sensors:

### Adhesive Sensors:
- Neonates < 3 kg, ($10-$12 each sensor), sold in boxes of 20
- Infants 3-10kg, ($10-$12 each sensor), sold in boxes of 20

### Reusable Sensor:
- Multisite YI, ($116-$175), 1 sensor
  
  Warranty for 6 months

### Wraps for YI; one used for each newborn screened:
- Foam Wrap ($1.50 per wrap) sold in packs of 12
- Clean Shield Wrap ($1.77-$1.92 per wrap) sold in boxes of 100
- Standard Wrap ($0.72-$0.78 per wrap) sold in boxes of 100
PalmSat® 2500 Series: Product Highlights

- **Reliable:** Proven Nonin Technology
  - 2% root-mean-square accuracy
  - Regulatory clearance for neonates, infant, pediatric and adult patients
  - Claims for accuracy under conditions of motion and low perfusion

- **Versatile:** Broad assortment of sensors available

- **Pulse rate monitoring range of 18-300 bpm**

- **Durable:** Backed by industry leading 3-year warranty & tested to assure performance in challenging conditions, such as drops & liquid ingress. Granted US Army/Air Force Aeromedical Certification.

- **Dependable Long Battery life:** 80 hours with 4AA alkaline batteries or 40 hours with Nonin rechargeable battery pack

- **Made in the U.S.A.**
NONIN Single-use-sensors
6000 Cloth and 7000 Micro foam

- 2 material choices
  - Cloth
  - Micro-foam
  - Pressure-sensitive adhesive
- Latex free
- Sensors for neonates, infants, pediatric and adult sizes
- Accuracy of +/- 2 in motion and low perfusion
7000 Flexi-Form III sensor
single-patient-use

- **Maximum comfort** – The cushioned, adhesive micro-foam material allows for maximum patient comfort during extended monitoring.
- **Optimal fit** – New, smoother backing for a comfortable fit.
FDA Discussion
<table>
<thead>
<tr>
<th>Company</th>
<th>Contact Name</th>
<th>Email</th>
<th>Phone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covidien</td>
<td>Nicole Malcolmson</td>
<td><a href="mailto:Nicole.malcolmson@covidien.com">Nicole.malcolmson@covidien.com</a></td>
<td>877-968-CCHD</td>
<td><a href="http://solutions.covidien.com/CCHD">http://solutions.covidien.com/CCHD</a></td>
</tr>
<tr>
<td>Masimo</td>
<td></td>
<td></td>
<td>877-968-(2243)</td>
<td><a href="mailto:cchdinfo@masimo.com">cchdinfo@masimo.com</a></td>
</tr>
<tr>
<td>Nonin</td>
<td>Frank Tappen</td>
<td><a href="mailto:Frank.tappen@nonin.com">Frank.tappen@nonin.com</a></td>
<td></td>
<td><a href="http://www.nonin.com">http://www.nonin.com</a></td>
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</tbody>
</table>
The Nellcor N-65 portable pulse oximeter with OxiMax technology offers accurate and reliable performance in monitoring conditions of low perfusion and signal interference.

- Compatible with complete line of Nellcor sensors
- Audible and visible alarms
- Bright blue, backlit display is easy to see, night or day
- Long battery life: 19 or 40 hours depending on battery type

Covidien embedded OxiMax technology in its most popular hand-held oximeter to create the Nellcor N-65 portable pulse oximeter. This hand-held oximeter is effective for a broad range of patients and stands up to difficult monitoring conditions, such as low perfusion and signal interference that can hamper other hand-holds. Compatibility with the innovative Nellcor™ sensors, including the SpO₂ forehead sensor and the nonadhesive sensor, further expands the versatility of the Nellcor N-65 pulse oximeter with OxiMax technology.

The small and lightweight Nellcor N-65 portable pulse oximeter is convenient for continuous monitoring or spot checks in physician offices or clinics, EMS/transport or in acute care settings. Its ergonomic shape and simple keypad make it easy to handle and operate. Wherever you need accurate, reliable SpO₂ measurements, count on the Nellcor N-65 portable pulse oximeter to meet the challenge.
NELLCOR™ SENSORS—A SMART CHOICE

The extensive family of single-patient use, reusable and specialty Nellcor sensors from Covidien lets you make the best choice for each patient. For example, the Nellcor™ SpO₂ forehead sensor is a more effective monitoring option than finger sensors during low perfusion because the forehead is not prone to vasoconstriction.2,3 The SpO₂ forehead sensor also offers an alternative when the hands are not accessible. Nellcor™ nonadhesive sensors, which fit securely without adhesives, are a smart choice for patients with fragile skin, such as geriatric or burn patients.4,5

PATIENT ASSESSMENT

As patients move to other areas of care, clinicians can view the alarm data from Nellcor™ stand-alone and multiparameter monitors to quickly assess the frequency and severity of desaturation events.

FEATURES AND SPECIFICATIONS

DESCRIPTION

The Nellcor™ N-65 portable pulse oximeter with OxiMax™ technology is intended for noninvasive continuous or spot check measurement of functional oxygen saturation of arterial hemoglobin (SpO₂). It can be used with adult, pediatric and neonatal patients, and is compatible with the complete line of Nellcor sensors. The monitor comes with four AA-size alkaline batteries.

PERFORMANCE

<table>
<thead>
<tr>
<th>Display Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO₂: 0%–100%</td>
</tr>
<tr>
<td>Pulse rate: 20–250 bpm</td>
</tr>
</tbody>
</table>

Accuracy

| Saturation (% SpO₂ ± 1 SD): |
| Low perfusion: 70% to 100% ± 2 digits |
| Pulse rate: Low perfusion: 20 to 250 bpm ± 3 digits |

POWER

Requirements

6 volts supplied by four AA-size batteries

Battery Life

- Alkaline: 19 hours (typical)
- Lithium: 40 hours (typical)

ENVIRONMENTAL

Storage/Shipping Temperature

-4°F to 158°F (-20°C to 70°C)

Operating Temperature

41°F to 104°F (5°C to 40°C)

Operating Altitude

-1,254 ft to 9,882 ft (-382 m to 3,012 m)

Relative Humidity

15% to 95% noncondensing

PHYSICAL CHARACTERISTICS

| Size |
| 2.8 x 6.2 x 1.4 (inches) |
| (7.3 cm x 15.8 cm x 3.5 cm) |

Weight (with batteries)

0.65 lb (0.29 kg)

Standards

- EN60601-1-2: 2001 (CISPR 11, Class B)
- EN60601-1: 1990 (A1+A2)
- UL 60601-1, CAN/CSA C22.2 No. 601.1 (Class: Internally Powered, Type BF)
- EN60601-1-8
- EN865

Displays

Oxygen saturation, pulse rate, vertical bar graph

Indicators

- Pulse amplitude, pulse search, low battery, alarm silence, interference, data in sensor, sensor disconnect, print

Optional Accessories

- Protective boot (three color options)
- Moisture-resistant jacket
- Carrying case
- Citizen portable infrared printer

References

1. FDA 510(k).
FOR PATIENT CARE ANYWHERE
The Nellcor N-85 hand-held monitor is convenient for spot checks and continuous monitoring in a variety of settings, including EMS/ED, transport, critical care, operating room, sleep lab and for procedural sedation.

MICROSTREAM®* CAPNOGRAPHY TEAMS UP WITH NELLCOR™ PULSE OXIMETRY WITH OXIMAX™ TECHNOLOGY

The Nellcor N-85 hand-held capnograph/pulse oximeter with OxiMax technology combines two highly advanced technologies in a convenient, portable device. Microstream™ capnography helps ensure accurate end-tidal CO₂ measurements and crisp waveforms, giving you a clear picture of your patient’s respiratory status.¹ The extensive selection of Microstream breath-sampling accessories allows you to monitor intubated and nonintubated patients—including those receiving supplemental oxygen.

• **Nellcor Oximetry Advantage.** The Nellcor N-85 monitor delivers exceptional pulse oximetry performance even during low perfusion and signal interference.² Nellcor™ specialty sensors—including the forehead SpO₂ sensor and nonadhesive SpO₂ sensors—expand your patient care options.
**THE HAND-HELD CHOICE**

Nellcor™ N-85 monitor with OxiMax™ technology: EtCO₂ and SpO₂ (capnography/pulse oximetry) EtCO₂ (capnography only)

- AC and battery operation
- User-adjustable alarms
- Data output/printing
- Four-language menu

**FEATURES AND SPECIFICATIONS**

### MICROSTREAM®** CAPNOGRAPHY

The Nellcor N-85 hand-held monitor with OxiMax technology provides full-featured capnography with crisp waveform display and trend data.

- For mechanically ventilated and nonintubated patients.
- Low sample flow rate of 50 mL/min allows monitoring on the widest range of patients, from neonates to adults.²
- Reliable CO₂ monitoring, even in high humidity environments.²
- Innovative optical bench enhances stable, accurate measurements from a small sample.²
- Wide selection of CO₂ sampling accessories available.

**Nellcor™ Pulse Oximetry**

Equipped with Nellcor pulse oximetry advanced digital signal processing technology, the Nellcor N-85 hand-held monitor with OxiMax technology stands up to difficult monitoring conditions, offering reliable SpO₂ and pulse rate measurements.

- Accurate monitoring even with weak pulse signals.²
- A hand-held monitoring alternative for use with the family of Nellcor sensors.
- Provides graphical trends and plethysmographic waveform.
- Interfaces with the Nellcor™ OxiNet III remote monitoring system.
A GENTLE ALTERNATIVE FOR SENSITIVE SKIN

When patients with fragile skin require pulse oximetry monitoring, choosing an appropriate sensor can be a challenge. Adhesive sensors can cause skin trauma, and reusable sensors have drawbacks for long-term monitoring. Nellcor offers a convenient solution. The new nonadhesive sensor is made of a soft, pliable, low-profile foam material that gives it “stiction” to help keep the sensor in place without adhesives. The sensor easily fastens with a small Velcro® tab. Nellcor nonadhesive sensors are ideal for patients with special skin needs. When your patients have compromised skin integrity, try the sensor with the soft touch.

CHOOSING THE RIGHT SENSOR CAN BE A CHALLENGE

Reusables are not always the answer.

Adhesive sensors can be a problem for certain patient groups with challenging skin conditions, but reusable sensors have limitations as well:

- For short-term monitoring; sensor site must be changed frequently. Prolonged use at the same sensor site can cause pressure necrosis.¹
- Less secure fit, especially with active patients.
- Typically less accurate than adhesive sensors.
- Nonsterile; increased risk of cross contamination.

NONADHESIVE SENSOR

DESIGNED FOR OXIMAX POWER

As part of the Nellcor™ Pulse Oximetry System, Nonadhesive Sensors work exclusively with Nellcor Pulse Oximeters and other manufacturers’ monitoring systems equipped with OxiMax technology. The unique OxiMax platform enables Nellcor to create innovative sensor designs that help improve patient care.
SOLVE THE SENSOR DILEMMA WITH NELLCOR™ NONADHESIVE SENSORS

Nonadhesive Sensors offer a convenient new option.

- Designed for long-term monitoring.
- Comfortable, secure, “second-skin” fit keeps sensor in place to promote reliable readings.
- High degree of accuracy, comparable to adhesive digit sensors.
- Sterile, single patient use; offers infection control advantages.
- Works with OxiMax technology to ensure optimal monitoring performance, even when challenged with patient motion and weak pulses.

ORDERING INFORMATION

The single-patient-use Nonadhesive SC-A Sensor is indicated for patients weighing over 40 kg. Two other Nonadhesive Sensors are available for neonates and preterm infants. Nonadhesive Sensors come in cases of 24.

Model: SC-A
Weight range: >40 kg

Model: SC-NEO
Weight range: 1.5 to 5 kg

Model: SC-PR
Weight range: <1.5 kg

BRIGHTER OPTICS FOR BETTER PERFORMANCE

Nellcor™ Nonadhesive Sensors are designed with high-efficiency LEDs that enhance the sensor’s ability to acquire a pulsatile signal, even with thicker or darkly pigmented skin, or weak pulses. You can count on reliable pulse oximetry readings in the toughest monitoring situations.
Tools and Technology to Start Your CCHD Screening Program
Objectives

> What is Motion-Tolerant?
> Pulse oximetry system
> Monitors: Bedside, Handheld
> Confidence Indicators: Signal IQ, Perfusion Index
> Sensors: Adhesive, Reusable
What is Motion-Tolerant?

- **Physiologic Signal**
- **Algorithmic Analysis**
- **Output Data**

Conventional Pulse Oximetry

**R/IR (Conventional Pulse Oximetry)**

**Digitized, Filtered & Normalized**

- **R/IR Adaptive Filter**
- **DST** Adaptive Filter
- **FST** Adaptive Filter
- **SST** Adaptive Filter
- **MST** Adaptive Filter

**Confidence Based Arbitrator**

**Post Processor**

*Conventional Pulse Oximetry 66%*

*Digitized, Filtered & Normalized SpO2% 97%*

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Pulse Oximetry System
2012 Radical-7 LCD Display

- SpO₂ Display
- Alarm Limits Display
- PR Display
- Battery Status Indicator
- Perfusion Index Display
- Pulse Waveform Display
- Menu Access
- Signal IQ Display

- %SpO₂: 82
- PR bpm: 114
- PI: 0.6
Confidence Indicator: Signal IQ

- Displayed as horizontal bar with vertical spikes
- Vertical spikes coincide with the pulsation at the measuring site
- Height of spike indicates confidence

Low Signal Quality

Good Signal Quality

Reducing Signal Quality

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Confidence Indicator: Signal IQ

- Plethysmographic waveform is clean and strong.
- Confidence indicated by high level in Signal IQ—Note height of ‘spike’.

- Plethysmographic waveform is corrupted.
- Height of ‘spikes’ decreasing—confidence in resulting measurement diminishing.
Confidence Indicator: Perfusion Index (PI)

> What is PI?
  - Assessment of the pulse strength at the monitoring site
  - Numerical value between 0.02% and 20.0%
  - Lower values indicate lower perfusion
  - Measurement is influenced primarily by the amount of blood at the monitoring site

> If Perfusion Index (PI) < 0.70 in at least one limb, consider referring infant for further medical evaluation.

> Adding Perfusion Index to neonatal examination and saturation screening may increase sensitivity to some types of CCHD though may result in an increase in false positives

Rad-5 Display

- % SpO₂
- Perfusion Index Indicator
- Signal IQ™ Indicator
- Pulse Rate BPM
Sensors for CCHD Screening

Adhesive, Disposable, Single-Use

Reusable
Adhesive Sensors: Neonates < 3 kg = Neo sensor

Foot Application:
- Apply the sensor to either foot using the thinnest part of the foot – this is the lateral aspect
- The detector can be on either the sole of the foot or the top of the foot
- Ensure the emitter and detector are aligned.
- Wrap the tape around the foot.

Hand Application:
- Apply the sensor to the right hand using the thinnest part of the palm – this is the lateral aspect
- The detector should be on the fleshy part of the hand, this may be the back of the hand – dorsal aspect
- Ensure the emitter and detector are aligned.
- Wrap the tape around the hand.
LNCS Inf Infant Sensor

Great Toe Application

Thumb Application

Great Toe or Thumb Application
Patient Weighing 3 - 10 kg
Multisite YI with Foam Wrap: Neonates > 1 kg

Foot Application

Hand Application
Applications of YI Wraps

Clean Shield® Multisite Wrap

Standard Wrap

Foam Wrap

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Thank you
PalmSat® 2500 Series: Product Highlights

- Audible & visual alarms (2500A)
- Bright LED display of SpO2 & Pulse Rate
- Easy 2 button operation (On/Off & Advance)
- Tri-color signal quality indicator
- Blinking Alarm Silence indicator
- Low Battery indicator
- Recharger/Base (optional)
- Rugged rubberized case with IPX2 liquid Ingress protection. Small & lightweight 7.5 oz.
PalmSat® 2500 Series: Product Highlights

- **Reliable**: Proven Nonin Technology
  - 2% root-mean-square accuracy
  - Regulatory clearance for neonates, infant, pediatric and adult patients
  - Claims for accuracy under conditions of motion and low perfusion

- **Versatile**: Broad assortment of sensors available

- **Pulse rate monitoring range of 18-300 bpm**

- **Durable**: Backed by industry leading 3-year warranty & tested to assure performance in challenging conditions, such as drops & liquid ingress. Granted US Army/Air Force Aeromedical Certification.

- **Dependable Long Battery life**: 80 hours with 4AA alkaline batteries or 40 hours with Nonin rechargeable battery pack

- **Made in the U.S.A.**
NONIN Single-use-sensors
6000 Cloth and 7000 Micro foam

- 2 material choices
  - Cloth
  - Micro-foam
  - Pressure-sensitive adhesive
- Latex free
- Sensors for neonates, infants, pediatric and adult sizes
- Accuracy of +/- 2 in motion and low perfusion
6000C cloth sensor single-patient-use

- **Maximum comfort** – The flexible, adhesive cloth material offers maximum comfort while the premium adhesive allows for multiple sensor site changes.
- **Easier placement and adherence** – The flexible material allows for easier sensor placement and adherence to the patient, especially for hard to fit patients such as infants and neonates. Better adherence means less risk of slipping off the finger, toe or foot— ensuring uninterrupted readings by keeping the sensor in place.
- **More tear-resistant material** – Allows for easier repositioning.
7000 Flexi-Form III sensor
single-patient-use

- **Maximum comfort** – The cushioned, adhesive micro-foam material allows for maximum patient comfort during extended monitoring.
- **Optimal fit** – New, smoother backing for a comfortable fit.
NONIN MEDICAL

❖ Further information can be found at www.nonin.com

❖ Inquiries can be directed to:

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Considerations

Equipment: pulse oximeter and related accessories (probe of appropriate size)--the oximeter should have been validated by the manufacturer by a comparison of its values (and consequently its calibration curve) with directly measured oxyhemoglobin saturation.

Personnel: Pulse oximetry is a relatively easy procedure to perform. However, if the procedure is not properly performed or if it is performed by persons who are not cognizant of device limitations or applications, spurious results can lead to inappropriate intervention.

After agreement has been initially established between SaO2 and SpO2, the frequency of SpO2 monitoring (ie, continuous vs 'spot check') depends on the clinical status of the patient, the indications for performing the procedure and recommended guidelines. For example, continuous SpO2 monitoring may be indicated throughout a bronchoscopy for detecting episodes of desaturation, whereas a spot check may suffice for evaluating the efficacy of continued oxygen therapy in a stable postoperative patient. However, it must be emphasized that direct measurement of SaO2 is necessary whenever the SpO2 does not confirm or verify suspicions concerning the patient's clinical state.

If the device probe is intended for multiple patient use, the probe should be cleaned between patient applications according to manufacturer recommendations.

The external portion of the monitor should be cleaned according to manufacturer's recommendations whenever the device remains in a patient's room for prolonged periods, when soiled, or when it has come in contact with potentially transmissible organisms.

The precision of pulse oximeters is within ± 2% to ± 3% when the SaO2 is 90% or more; the precision is thus ± 4% to ± 6% if a 95% confidence interval (± 2 SD) is desired. For example, if the SpO2 is 94%, then the true SaO2 may be as low as 88% or as high as 100% for 95% of the measurements. This translates into a wide range of PaO2 values. Adequate arterial oxygenation will result if a target SpO2 of 92% or more is achieved in white patients and 95% or more in black patients.

Pulse oximetry may fail to record accurately the true SaO2 during severe or rapidly produced desaturation and during physiologic extremes (e.g., hypotension, hypothermia, unstable hemodynamic factors and agitation). More information is required concerning the prevalence of signal failure with the regular use of pulse oximetry and the effect this has on nursing and medical care (e.g., Does frequent signal failure lead to greater demands on nurses to reposition the probe and to frequent, annoying alarms?).