Patient monitoring on General Wards

Gert van Rheenen
Patient Monitoring, PCMS
Maart 2017
Health continuum of care

Philips is best positioned to provide the combination of a broad span of measurements and analytics along the Health Continuum.
Waar kent u ons van?

IntelliVue Platform
  Human Interface
  Uitwisselbaarheid

Upgrade mogelijkheden
  Software Maintenance Agreement

Flexibiliteit
  Schaalbaarheid
  Modulariteit

Networked to IntelliVue Information Center
PIIC iX

IntelliVue wireless networks
(Smart-hopping and 802.11)

Modules

IntelliVue XDS Clinical Workstation

Rack
Messaging | **Ready where you are**

We are dedicated to creating the future of healthcare and saving lives

*Philips Healthcare guiding statement*

Philips
Innovation and you

Integrated Patient Care
Value across the continuum of care

IVD enabled POC solutions

**Minicare**
Ready where you are

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**Hospital**

Minicare I-20
Minicare M-xxx
Minicare C-70

**Home**

Minicare H-2000

**GP**

Minicare xxx
Why do we worry about general care?

40% of unanticipated deaths in a hospital occur in the general ward.

70% of cardiac patients show signs of deterioration 24 to 48 hours before a cardiac arrest.

80% of patients who have cardiac arrest do not survive to discharge.

Subtle signs of deterioration are present 6 to 8 hours before a critical event.

Over worked Staff, Sicker Patients, and Complex Workflows often lead to missed deteriorations.
The concept of EWS
National Early Warning Score (NEWS)

<table>
<thead>
<tr>
<th>Physiological Parameters</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Respiratory rate (bpm)</td>
<td>≤8</td>
<td>9-11</td>
<td>12-20</td>
<td>≥21-24</td>
<td>≥25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B  O₂ Saturations (%)</td>
<td>≤91</td>
<td>92-93</td>
<td>94-95</td>
<td>≥96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C  Any supplemental Oxygen</td>
<td>Yes</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C  Systolic BP (mmHg)</td>
<td>≤90</td>
<td>91-100</td>
<td>101-110</td>
<td>111-219</td>
<td>≥220</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C  Pulse (bpm)</td>
<td>≤40</td>
<td>41-50</td>
<td>51-90</td>
<td>91-110</td>
<td>111-130</td>
<td>≥131</td>
<td></td>
</tr>
<tr>
<td>D  AVPU score</td>
<td></td>
<td>Alert</td>
<td></td>
<td></td>
<td>VPU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E  Temperature (°C)</td>
<td>≤35.0</td>
<td>35.1-36.0</td>
<td>36.1-38.0</td>
<td>38.1-39.0</td>
<td>≥39.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Concern about a patient should lead to escalation, regardless of the score.

* [http://www.ihi.org/resources/Pages/ImprovementStories/EarlyWarningSystemsScorecardsThatSaveLives.aspx](http://www.ihi.org/resources/Pages/ImprovementStories/EarlyWarningSystemsScorecardsThatSaveLives.aspx)
### Escalation protocol - NEWS

#### NEWS GRADED RESPONSE STRATEGY

<table>
<thead>
<tr>
<th>NEWS SCORE</th>
<th>FREQUENCY OF MONITORING</th>
<th>CLINICAL RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>minimum 12 hourly</td>
<td>-</td>
</tr>
<tr>
<td>LOW Total: 1 - 4</td>
<td>minimum 4 hourly</td>
<td>-</td>
</tr>
<tr>
<td>MEDIUM Total 5 or more or 3 in one parameter</td>
<td>Increase frequency to a minimum of 2 hourly</td>
<td>-</td>
</tr>
<tr>
<td>HIGH Total 7 or more</td>
<td>Increase frequency to a minimum of 1 hourly</td>
<td>-</td>
</tr>
</tbody>
</table>

**Pain Score**

- 0 None 0
- 1 Mild Pain 1
- 2 Moderate Pain 2
- 3 Severe Pain 3

**SBARR Tool**

- S Situation
- B Background
- A Assessment
- R Recommendation
- R Readback

**Outreach Team Contact**

- LGI: Bleep 80 1450
  Ext 28179
- SJUH: Bleep 80 6425
  Bexley Wing: Bleep 80 5781
  Ext 67637 / 66367

NEWS is a tool and may not always reflect the severity of a patient's condition.

http://rrapid.leeds.ac.uk/ebook/assets/images/charts/NEWS_scoring_small.jpg
IntelliVue Guardian Solution
IntelliVue Cableless Measurements

Cableless SpO2 pod

Cableless NBP pod

NEW – Cableless Respiration pod
Patient monitoring with EWS

Patient data

Traditional

Cable less

Analytical Engine

Eskalation

EMR

Philips confidential
Philips Wearable Biosensor
Comprehensive patient data from a single biosensor

Automatically and continuously measures
• Heart Rate (HR)
• Respiratory Rate (RR)
• Body posture
• Detects falls
Reliable and convenient

- Medical grade
- Self-adhesive
- Single-patient use
- Wireless
- Worn discreetly on the chest
- Lasts for average patient stay (3-4 days)
- Encrypted data; HIPAA-compliant
- Temporary memory storage of 10+ hours
- Uses silicone or hydrocolloid adhesive
Philips wearable biosensor

Single-patient use sensor, lasts for average length of stay (4 days)

- ECG electrodes: detect heart rate
- Thermistor: detects skin temp.
- Accelerometer: detects motion
- Temporary memory storage: 10 hrs. or more
- All data is encrypted: HIPAA compliant
- Battery life: 4 days (w/o ECG)
- On button activation
- Bluetooth Low Energy Radio

Choice of adhesives:

- Gentle Grade: silicone adhesive
  - low activity, perspiration, and humidity levels

- Active Grade: hydrocolloid adhesive
  - moderate to high activity, moderate perspiration and humidity levels, single use
Integrates with IntelliVue Guardian Solution to deliver a powerful Philips solution.
Wearable, Wireless Monitoring with IGS

1 Meet Mary
• A protocol recommends more vigilant monitoring

2 Easy connection
• Mary’s nurse, Nancy places a biosensor on her
• Sensor is quickly associated with Mary and Nancy receives a connection confirmation

3 Efficient spot checks
• Automatic Input from sensor is sent to spot checks
• Mary’s vitals are automatically and frequently monitored while Nancy leaves with the spot check monitor to continue making her rounds

4 Notifications throughout the hospital
• Rapid Response Team (RRT) receives a notification if Mary’s condition is deteriorating or that she fell
• RRT is able to appropriately respond and triage this patient in time to avoid further deterioration

5 Early intervention
• RRT intervenes at an early stage, stabilizes Mary and avoids further deterioration and a re-admission back to the ICU
From wireless sensors to contactless sensing

Challenges of contact sensors

- Obtrusiveness of contact sensors
  - Intervene with normal activity
  - Require user’s efforts and cooperation
  - Not robust to motion
  - Not always suitable for long term monitoring

Solution

Contactless monitoring of vital body signs, activity and measurement context using camera-based sensing
Vital signs camera

Status

– Motion robust measurement of heart rate (even during fitness exercise)
– Monitoring of breathing signal under any illumination conditions
– Estimation of body posture and full body actigraphy

Advantages

– Re-use of cost efficient and widely available camera HW
– Monitoring of multiple persons simultaneously
– Acquisition of several vital signs and context information by a single sensor
– Easy to use, no cooperation from subject is required
Demo: Respiration rate & heart rate

Breathing Rate

Heart Rate

Breathing Signal

Heartbeat Signal

Experimental research system
Demo: Heart rate
A powerful offering for the IntelliVue Guardian Solution (IGS)

Helps caregivers identify early signs of patient deterioration and detects falls to drive early intervention

Philips wearable biosensors automatically and frequently monitor HR, RR, temp, posture, and falls

Analyzes the combined trend of the measurements received from the sensor over a configurable period of time

If deterioration is verified, a notification is automatically sent to the responsible caregiver per the hospital’s policy
Combined biosensor benefits and IntelliVue Guardian Solution

**Clinical**
Manage higher acuity patients in need of more frequent monitoring

**Financial**
Reduce associated costly adverse events, complications, unplanned transfers back to the ICU, and longer lengths of stay

**Operational**
Drive workflow efficiencies, enhance medical documentation process, and better utilize limited staff resources

**Emotional**
Provide freedom of mobility, comfort and convenience for patients, and peace of mind for caregivers
References for IntelliVueGuardian Solution
Bangor Hospital, UK

Technology to reduce cognitive load: Results from the VITAL II study

Patient deteriorates and is transferred

General Ward
- 24% SAE
- 86% Cardiac Arrest
- 8% Mortality

ICU
- 20% ICU Admission
- 30% APACHE II sickness level of patient
- 47% ICU Mortality

N = 2139 Patients Pre-Phase and 2263 in Intervention Phase (two year total)
Dr. Bartos discussed her journey in selection, deployment and use of the Guardian System.

Since Guardian Go-Live, there have been “ZERO” code in two years of usage.
AU Health, Georgia, USA

Topic: Improving outcome in the deteriorating patient

- Kevin C. Dellsperger, MD, PhD, VP and Chief Medical Officer

- Implementation of Guardian and a new process to identify deterioration successfully reduced predictable codes by 89%
St. Elizabeth Hospital, Lincoln, NE, USA

Topic: In the beginning a struggle... Now a victory with MEWS

- Nancy Extrom, MSN, CCRN, CSC, Critical Care Educator described the journey with MEWS

- St. Elizabeth reduced ICU bounce back by 37%
IntelliVue Guardian Solution At Celebration Health

A 92% improvement in notification time was demonstrated between the recognition

Conclusions

The authors conclude that the implementation of this system has proven beneficial in identifying clinical deterioration in patients earlier and more consistently than previously observed. Feedback from clinical staff demonstrated that the integrated system with Admission Data Transfer and Electronic Medical Record capability has improved consistent use of the RRT and documentation of vital signs.

uniform process of RRT activation.