MISSION: LIFELINE MINNESOTA

Colin McBain
Philips Healthcare
Emergency Care & Resuscitation
Philips Healthcare
An Industry Leader in STEMI Care
Discovery Through Treatment

- **Discovery**: Advanced life support monitor
- **Diagnosis**: Reliable 12-lead transmission and workflow
- **Treatment**: 12-lead viewing and diagnosis
- **Recovery**: Expedite Emergency Department care

Monitor: MRx
Transmit: Internet via Bluetooth connection or Wi-Fi
View: 12-lead Telemedicine Server, TraceMasterVue Cardiology Database
Transport: IntelliVue Patient Monitoring Network
Treat: Allura Xper Cath Lab, InnerCool
Monitor: IntelliVue MP20 / MP30 with ST Mapping
• FDNY (Fire Department of New York)
• Phoenix Fire Department
• Clark County Fire Las Vegas
• American Medical Response
• Tucson Fire Department
• St. Paul Fire Department
• San Diego Fire Department
• Indianapolis Fire Department
• University of Chicago Medical Center
• Vanderbilt University Medical Center
• Massachusetts General Hospital
• Cleveland Clinic
Monitor mode

Philips HeartStart MRx ALS monitor

ECG Autogain
- Data presented the way you need to see it

Large numeric measurements, waveforms, and alarms
- Enables user to quickly locate information
- Smart numerics, numerics automatically optimized to available space
- Time of day and date clock
- Event time clock

Four-wave color display
- Large color display (8.4 inch diagonal)
- See all four waves simultaneously with color-matched numeric data
- Configurable wave placement and wave color
- Easy to configure and customize, either at set up or on the fly

Concise alarm information, silenced with the touch of a button
- Selectable heart rate, SpO₂, NBP, EtCO₂ alarms
- Three-tiered alarm system: red is life-threatening arrhythmias, yellow is an alarm violation and green indicates in-operation
- Arrhythmia analysis – labels life-threatening arrhythmias
Automated test summary view

Philips HeartStart MRx ALS monitor

The Philips HeartStart MRx offers a complete on-screen summary of automated tests for the last year.

**Automated tests**

The HeartStart MRx performs hourly, daily and weekly self-tests that are reported to the ready-for-use indicator and stored in internal memory as the Automated Test Summary Report. These tests ensure that the device is functioning properly and is ready at a glance.

**Hourly**
- Batteries
- Internal power supplies
- Internal memory

**Daily – hourly test plus:**
- Internal clock battery
- Defibrillation (low energy internal discharge)
- Pacing
- ECG
- SpO₂
- EtCO₂
- NBP
- Invasive Pressure
- Temperature
- Bluetooth
- Printer
- 3-, 5-, or 12-lead ECG cable (if attached)

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**Automated Test Summary**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Test Frequency</th>
<th>Result</th>
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<tr>
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</tr>
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<td>Weekly</td>
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</table>
Trending

Philips HeartStart MRx ALS monitor

The trending feature of the Philips HeartStart MRx enables the clinician to view and print numeric trends for the current incident, provides an historical picture of the condition of the patient, and helps to determine the effect of treatment.

- Ability to view and print numeric trends for the current incident
  - Provides the clinician with an historical picture of the condition of the patient
  - Helps to determine the effect of treatment

- Trend table is visible in the lower half of the display
  - Trend data is available for up to 12 hours of monitoring
  - Trending feature is available at no charge on all devices at software revision 7.0 or later
<table>
<thead>
<tr>
<th>Feature</th>
<th>Expected benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Code view screen</strong></td>
<td>Prioritizes the most important information during a cardiac arrest</td>
</tr>
<tr>
<td>Largest ECG waveform on an ALS monitor display</td>
<td>Visibility allows clinicians to see ECG changes even from a distance</td>
</tr>
<tr>
<td>Increases the size of vitals and elapsed time clock</td>
<td>Vital information is prioritized by design</td>
</tr>
<tr>
<td>EtCO₂ waveform moves up under the primary ECG</td>
<td>Give clinicians the total picture</td>
</tr>
<tr>
<td>Alarms silenced</td>
<td>Once clinician selects the energy, the alarms are automatically silenced</td>
</tr>
</tbody>
</table>

**Running a code with the MRx**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Expected benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single energy selection for adult defibrillation</td>
<td>With SMART biphasic the first shock is the best shock; eliminates the step of changing energy levels</td>
</tr>
<tr>
<td>Rapid charge to full energy</td>
<td>Less than five second charge to full energy provides rapid defibrillation; importance of decreased hands-off to defibrillation time supported by resuscitation science; time is muscle</td>
</tr>
<tr>
<td>Capnography during a code: no need to zero out, no warming up time</td>
<td>View the capnography waveform and value in seconds, providing quick confirmation for clinician; annual calibration time</td>
</tr>
</tbody>
</table>
12-Lead ECG view

Philips HeartStart MRx ALS monitor

ONLY monitor that displays ALL 12 leads at the same time.
The benefit of seeing all leads at once offers the clinician:
• Ability to see if a lead is off
• Ability to acquire, store and transmit a clean 12-lead ECG the first time
• Ability to see ST changes in contiguous leads as they occur

12-lead interpretation and analysis
• Available on-screen: confirms paramedic’s diagnosis without waiting for a printed report
• Performed using Philips Dxl algorithm
• Critical Values alerts the clinician to any of four life-threatening conditions

STEMI Decision Support
Tools to provide clinicians with additional data to support diagnosis or treatment:
• Culprit artery
• Critical Values
• Acute Cardiac Ischemia – Time Insensitive Predictive Instrument (ACI-TIPPI)
• Thrombolytic Predictive Instrument (TPI)
Philips' commitment to the development and enhancement of state-of-the-art algorithms is clearly demonstrated through the Advanced Algorithm Research Center (AARC). A Philips-sponsored professional organization established in late 2000, the AARC is devoted to advanced research and development in all areas of ECG analysis, including diagnostic electrocardiography, arrhythmia analysis, stress testing, patient monitoring and resuscitation. The AARC's current membership base comprises key research scientists and engineers as well as experienced clinical advisors from the medical community. In addition to guiding Philips' internal R&D efforts associated with rhythm analysis and diagnostic electrocardiography, the AARC oversees extramural studies conducted by renowned cardiologists and clinicians at leading medical and academic institutions around the world.
Only Philips Takes STEMI Support to a New Level with the Advanced DXL Algorithm

Gender-Specific Diagnostic Criteria

STEMI-CA

ACI-TIPI

Critical Values
Support confident decision-making with advanced STEMI clinical decision support tools Only the Philips HeartStart MRx Monitor/Defibrillator has the advanced DXL 12-lead ECG Algorithm with Clinical Decision Support tools, which takes STEMI clinical decision support to a new level with unique capabilities that enable confident decision-making to help speed triage.

Pinpoints the STEMI-CA (Culprit Artery) most likely responsible for the acute symptoms, which can assist in directing care in the field and treatment in the Cath Lab.

Generates Critical Values for four distinct life-threatening conditions – acute MI, acute ischemia, complete heart block, and very fast heart rate – that require immediate clinical attention.

Provides enhanced Gender-Specific Diagnostic Criteria to improve recognition and interpretation of cardiac symptoms in women.

Philips also offers predictive instruments designed to help support confident decision-making. Acute Cardiac Ischemia – Time Insensitive Predictive Instrument (ACI-TIPI) uses the 12-lead ECG to provide a percentage score for predicted probability that the patient is having an Acute Ischemia. Thrombolytic Predictive Instrument (TPI) uses the 12-lead ECG to predict patient outcome with and without thrombolytic therapy.
DXL 12-lead Algorithm

**STEMI-CA**

- STEMI-CA identifies which artery is currently causing the problem:
  - Left Anterior Descending (LAD)
  - Right Coronary Artery (RCA)
  - Left Circumflex (LCx)
  - Left Main or Multi-Vessel Disease (LM/MVD)

- Why is STEMI-CA important
  - Helps medic “build a case” for preparation of the cath lab ahead of the patient.
  - Identifies the artery most likely causing the acute (recent/emergent) symptoms.
  - Identifies global ischemia when multiple obstructions exist.
  - Can direct care in the field based on the side of the heart impacted.

- DXL suggests a culprit artery only when the findings are strong, to avoid false positives
DXL 12-lead Algorithm

*Critical Values*

- Alerts the clinician to any of the following 4 life-threatening conditions.

  >>>> ACUTE MI <<<<
  >>>> ACUTE ISCHEMIA <<<<
  >>>> COMPLETE HEART BLOCK <<<<
  >>>> VERY FAST HEART RATE <<<<
DXL 12-lead Algorithm

STEMI-CA
Acute Cardiac Ischemia –
Time Insensitive Predictive Instrument (ACI-TIPI)
-- A predictive instrument that uses the 12-lead ECG to generate a 0-100% predicted probability that the patient is experiencing acute cardiac ischemia.
ACI-TIPI

*Clinical variable input*

- ACI-TIPI requires entry of chest pain status prior to 12-lead ECG acquisition
  - **Primary** if chest pain or discomfort (or equivalent left arm pain) is the main reason for the patient
  - **Secondary** if chest pain is present but is not the chief complaint.
  - **None** if the patient has no chest pain or discomfort.
- During the development of ACI-TIPI & TPI in MRx, the user interface was refined to make the data entry steps as easy and fast as possible.
**ACI-TIPI**

*Predicted probability*

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<tr>
<th>Parameter</th>
<th>Value</th>
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<td>QRSD</td>
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**090212163706a0e9**  
12-Feb-2009 16:37:41  
53 years MALE

- Sinus rhythm
- Anterior infarct, acute (LAD)

---

*ABNORMAL ECG*

**Philips Predicted Probability of Acute Ischemia 85%**

>>> Acute MI <<<

**Start NBP**  
**Exit 12-Lead**  
**New 12-Lead**  
**Print**  
**MENU**
• Only Philips has DXL
  • Enhanced gender-specific criteria
  • STEMI Culprit Artery
  • Critical Values
• Only Philips combines DXL with ACI-TIPI & TPI
  • Supports confident decision making in the field and in the ED
Transmission and The HeartStart Telemedicine System
Philips HeartStart Telemedicine

- The Telemedicine System is part of an end-to-end solution for communicating and forwarding patient data from the MRx Defibrillator in the field to a viewing and forwarding workflow station. Telemedicine System consists of software (provided by Philips) and hardware provided by the end user (server component)
Telemedicine Versions

• 12 Lead and *PCDT* Options

**The Telemedicine Server software**

The Telemedicine Server software is available in two editions. These editions vary from each other in the HeartStart MRx patient data that they store, display, and forward.

- **Telemedicine Classic 12-Lead Edition** stores, displays, and forwards 12-lead reports.
- **Telemedicine Critical Care Edition** stores, displays, and forwards 12-Lead reports, trigger events with waveforms, and vital trends.

**The Telemedicine Viewer software**

Telemedicine Viewer is an optional component, used with the Telemedicine Server. The Telemedicine Viewer is installed on a different computer from the Telemedicine Server. It allows users to interact remotely with, and perform tasks on, the patient data on the Telemedicine Server.
Who uses Telemedicine

Telemedicine is typically configured in one of the following environments:

At an EMS agency that serves multiple hospitals for a region

In this environment, the software commonly runs on one computer in a server room at the EMS agency. Telemedicine forwards 12-lead reports to receiving hospitals using fax, email, or other instances of Telemedicine that are installed at one or more hospitals. An Auto Send List can be used to notify a hospital at a number of fax or email destinations.

In a hospital that is served by multiple EMS agencies

In this environment, the software commonly runs in an IT server room with multiple copies of Telemedicine Viewer running in departments such as ED, Intensive Care Unit, Cardiology, or Radiology. Sometimes, these hospitals also forward the 12-lead reports automatically to their ECG Diagnostic Cardiology databases, such as TraceMasterVue or a GE MUSE System (GE MUSE).

In a hospital where HeartStart MRx Monitor/Defibrillators are used to monitor patients

In this environment, HeartStart MRx Monitor/Defibrillators are used in chest pain rooms, overflow areas, or as transport monitors. Telemedicine runs at a central nurses' station, allowing centralized viewing and printing of the 12-lead reports from HeartStart MRx Monitor/Defibrillators. Clinicians can also forward the 12-lead reports to the cardiology department.
How Telemedicine is used

Users in different healthcare markets use Telemedicine in different ways, based on their unique workflow and existing infrastructure. For example, an organization can use Telemedicine to do the following:

- Provide critical-care support to responders on an inbound ambulance who are transporting a patient to the emergency department (ED).

You can view periodic clinical data (12-Lead reports, trigger events with waveforms, and vital trends) while responders transport a patient to the receiving emergency department or hospital.

Prepare an Emergency Department for the arrival of a critical-care patient.

You can triage a patient who is in route to the ED, access a patient’s medical history, make decisions about where to assign a patient, or summon specialists in advance of the patient’s arrival.
Figure 4  Telemedicine Patient View

Latest EKG, CO₂, and SpO₂ Waveform Data for Patient

Latest 12-Lead ECG with Culprit Artery for Patient

Latest Vital Signs Table for Patient

Inbound Patient List

Key Event List for Patient
Current Data Transmission

Figure 3  End-to-end Bluetooth Data Transmission

[Diagram showing the flow of data transmission through various devices and connections, including Bluetooth, Internet, and other networking components.]
NEW Data Transmission Option: Wireless Link

• As part of our continuous efforts to improve the performance and reliability of the HeartStart MRx data transmission capability, you can now transmit 12-Lead ECGs, periodic clinical data, and event summaries via Wi-Fi and cellular broadband (2G or 3G)
What is Wireless Link?

A small, lightweight device that connects to the RS-232 and LAN ports in the back of the MRx and stores in the side or back carry bag pouch.

Key Features:
- Rapid WiFi and Cellular Transmission
- No pairing required
- Vitals sign transmission from the field
- Automatic switching between signals (Cell/WiFi)
- Industry standard encryption security
- Access point connectivity
- Utilizes both 2G and 3G cellular networks
- Supports AT&T and Verizon cellular data plans
- Automatic transmission retry
- Event summary batch download
- Rugged IP55 design
Wireless Link Advantages

- To ensure our customers will continue to have a reliable transmission solution
- To leverage faster transmission technology
- To reduce data transmission cost and complexity
- To increase flexibility in transmission options
- To simplify workflow and reduce opportunities for transmission failure
- To increase speed of transmitting data
- To increase cellular coverage

Figure 1  End-to-end Wireless Link 12-Lead Transmission
12-Lead/PCDT Transmission Workflow

Sending a 12-Lead

Acquire 12-Lead

Press Menu Select → Select Send → Select destination

1 2 3
Telemedicine FAQ

Q: What types of data that can be sent from HeartStart MRx
A: 12-lead reports, PCDT, or Event Summary

Q: How many locations can HeartStart Telemedicine System transmit to?
A: You can configure an Auto Send List to send 12-lead reports to as many as 20 destinations. You can also configure as many as 50 Auto Send Lists on one HeartStart Telemedicine System 4.2.

Q: What types of destinations can HeartStart Telemedicine System send to?
A: HeartStart Telemedicine can transfer incoming 12-lead reports automatically to the following destinations:
   – To a network or local printer
   – To a fax machine
   – Via email
   – To another HeartStart Telemedicine System
   – To TraceMaster/TraceMasterVue
   – To DataMed FT (GE Muse Translator)

Q: Are my transmissions secured?
A: We encrypt your Data Transmission using a 64-bit blowfish algorithm before transmission, and they are stored in the local database on our HeartStart Telemedicine encrypted as well.
MRx Monitor/Defibrillator
Leading the way in emergency care with meaningful innovations