Defibrillator-Proof, Prepositioned 12-Lead ECG Sensor for Rapid Tactical Triage and Monitoring

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Abstract

- QHeart® Sensor F is a prepositioned, preconnected, adjustable 12-lead ECG sensor that makes 12-lead ECG efficient, accurate with lower risk for contamination
- QHeart® Sensor F is
  - Defibrillator-proof
  - One-size fits all
  - Supports Right and Posterior placements
  - Converts to 3-lead monitor in seconds
  - Wearable for 24 hours
  - Connects to ALL ECG machines, Zoll, Stryker and bedside monitors
- Designed for field use, triage, medical evacuation and transport

Introduction

- In high-intensity combat and emergency medical environments, the speed and accuracy of cardiac diagnostics are often hindered by the complexity of traditional 12-lead ECG electrode placement.
- We present the QHeart® Sensor F, a single-piece, prepositioned electrode system designed to provide medical-grade diagnostics and a seamless transition to continuous monitoring in contested or resource-limited settings.

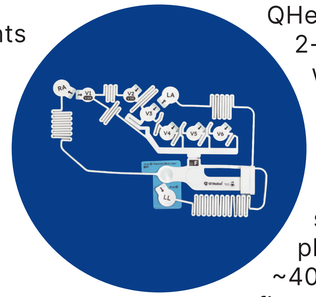
Capability Description

QHeart® Sensor F addresses 3 critical military medical capabilities:

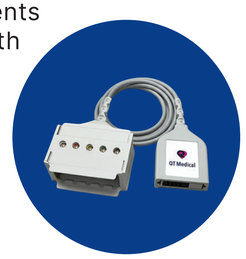
- Rapid Tactical Triage: Prepositioned electrodes eliminate placement guesswork, allowing for the fastest possible diagnostic 12-lead ECG in high-stress settings.
- Advanced STEMI Detection: Built-in capability for right-sided (V3R, V4R) and posterior (V7-V9) lead placement, maximizing detection of complex infarcts.
- Continuous Monitoring: The hardware allows a seamless transition from a 12-lead diagnostic test to 3-lead monitoring in just five seconds, to any cardiac monitor, without re-leading the patient.

Methods/Approach

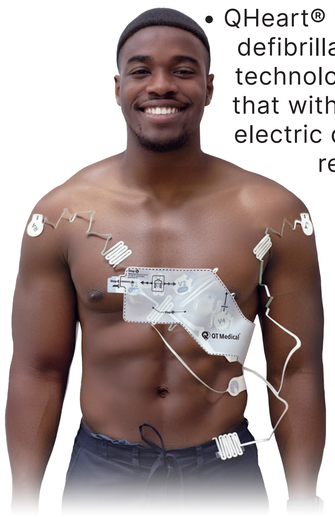
QHeart® Sensor F is made of silver printed circuit technology with pre-positioned and pre-connected ECG Ag/AgCl sensors and premium hydrogel for optimal conduction and signal quality. It is a single-piece, fully adjustable sensor that is both preconnected and prepositioned.



QHeart® Sensor F is made of 2-layer design: bottom layer with all the sensors pre-positioned with extra room for adjustment, top layer as a template to hold the pre-positioned sensors in place for easy placement. Its design allows ~40% of patients to fit perfectly with zero adjustment (ready for immediate ECG recording). For remaining patients, by removing the top layer, each individual sensors can be adjusted based on patient's size and chest configuration to achieve an optimal and precise fit.



- QHeart® Sensor F ensures AHA-standard placement across diverse patient populatuons, with various body sizes and shapes.



- QHeart® Sensor F is defibrillator-proof, a technological breakthrough that withstand high-voltage electric discharge during resuscitations.
- QHeart® Sensor F features wide-range compatibility with existing military and civilian hardware, including GE, Philips, Baxter, Zoll, Stryker ECG and monitors.

Results

The QHeart® design is based on original QHeart® sensors which has been validated through use by hundreds of thousands of patients. Defibrillator testing was conducted in labs with each sensor withstood a high-voltage discharges per IEC 60601-2-25 (e.g., 360 J / 5 kV). Technical testing confirms the device can convert from 12-lead to 3-lead monitoring in 5 seconds, significantly reducing workload and the risk of lead-placement errors during patient handoffs. V1 can be moved to V4R and V2 can be moved to V3R for right-sided placement. When V3 is adjusted to V6 position, V4 can be moved to V7, V5 to V8 and V6 to V9, to support posterior leads placement.

Applicability to Medical Roles of Care

QHeart® Sensor F is highly applicable across the continuum of care, from Role 1 (Point of Injury/TCCC) to Role 3 (Combat Support Hospitals). Its ability to remain on the patient during defibrillation and transition to monitoring makes it an ideal tool for Prolonged Casualty Care and MedEvac transitions.

Impact to the Warfighter/Significance

By reducing the time required for accurate diagnostics and eliminating the need for re-leading during monitoring transitions, QHeart® Sensor F minimizes "hands-on" time.
Its defibrillator-proof nature ensures that life-saving interventions can proceed without equipment failure, ultimately improving survival rates for casualties with cardiovascular complications following combat trauma. Its design for prolonged wearing allows continuous monitoring.

Developmental Status

QHeart® Sensor F is a fully developed hardware solution, incorporating FDA-cleared technology and standardized AHA placement protocols. It is currently available for integration into military medical workflows. Comparative analysis demonstrates that QHeart® Sensor F is superior in efficiency and placement accuracy compared to other integrated systems.

Conclusion

- QHeart® Sensor F is fully developed with modern technology and premium materials to support efficient and accurate 12-lead ECG placement and immediate conversion to 3-lead ECG monitoring.
- QHeart® Sensor F is designed for prolonged wearing and monitoring
- QHeart® Sensor F is tested extensively for defibrillator-proof and advanced (right and posterior) placement
- QHeart® Sensor F converter cable connects all ECG systems and monitors