IMPACT

Interoperable Medical Patient Autonomous Care Technologies

KEY BENEFITS

- Integration of medical devices and patient data to provide improved casualty care monitoring, management, and documentation.
- Implementation of autonomous control to augment care delivery expertise and reduce care provider workloads in pre-hospital settings.
- Optimized form factor and system design of critical care medical devices to support care in various transport and prolonged field care environments.

WHAT IS IT?

The IMPACT effort aims to address projected limitations of pre-hospital care in future conflicts with near-peer adversaries by delivering an interoperable system of critical care medical devices with enhanced documentation and integrated autonomous care capabilities.

DEVICES: The system is composed of a variety of existing and prototype medical devices, including patient vital sign monitors, infusion pumps, mechanical ventilators, and other critical care devices that communicate with a central data integrator.

AUTONOMY: Closed Loop Control algorithms for mechanical ventilation, oxygenation, and fluid reperfusion support medical providers by providing consistent high-level care management and offloading repetitive tasks.

DOCUMENTATION: The devices and algorithms within the system can be monitored and controlled through an updated version of the existing BATDOK™ interface, which augments patient care tracking and data collection.

USABILITY: The platform will be designed to be usable in multiple critical care environments, such as patient transport in C-17/C-130 aircraft and prolonged field care, through versatile medical device installation options and optimized in-flight communications capabilities.

HOW DOES IT WORK?

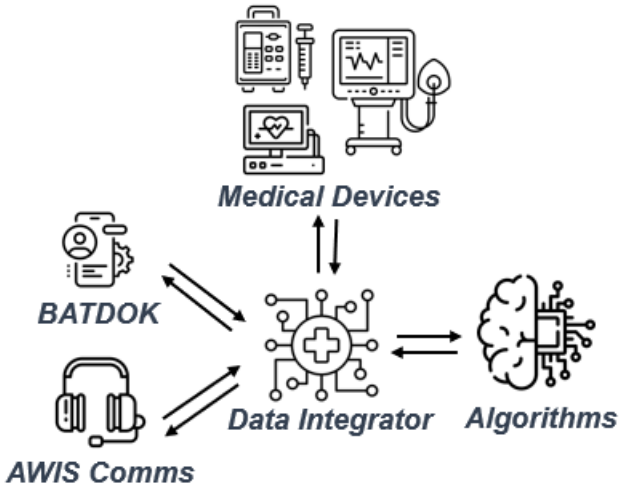
IMPACT will digitally integrate data in real time from connected medical devices and care systems into a central data repository of patient information which algorithms and care providers can use to inform care.

This effort aims to employ a common data standard and data management architecture to ensure that all patient information is seamlessly integrated in a secure and reliable manner.

Closed loop control algorithms for mechanical ventilation and fluid infusion can access real time patient vitals data through this central data store and suggest setting changes to medical devices to enhance care delivery.

Multiple critical care medical devices from different manufacturers can be digitally integrated to work within this framework. This provides flexibility to employ this system in various use cases and different technology configurations based on patient care needs and environmental limitations.

By leveraging the existing BATDOK™ documentation platform and medical devices that military care providers already use, this platform can be more easily introduced into existing workflows. Medical providers can access patient data, control therapy devices, and manage algorithms through the familiar interface.



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Continued on page 2

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WHO AND WHY?

Effective combat casualty care requires the delivery of high-level patient care, including ventilation/oxygenation support, resuscitation for hemorrhagic shock, management of severe traumatic injuries, and support of medication delivery, within the "Golden Hour" post-injury.

Existing paradigms for combat casualty care rely on air superiority, low casualty numbers, and various available patient transport platforms with dedicated, trained medical personnel to provide necessary treatment. Future projected combat with near-peer adversaries in austere environments threatens the ability to provide high level care and timely patient transport.

The key to ensuring the successful development of this multi-functional integrated system is collaboration among multiple project teams:

AFRL Software Development Cell (SDC): Utilizing the BATDOK™ platform, the SDC will lead software development to integrate medical devices and algorithms with the central architecture, update user interfaces to improve usability, and implement digital patient simulation capabilities.

AFRL Rapid Prototyping Cell (RPC): The HERMES sub-project will explore methods to orient and attach medical devices within transport platforms to streamline patient management, and the Air Wireless Intercom System (AWIS) effort aims to enhance audio headsets to improve communication for care providers during patient evacuation.

Johns Hopkins University Applied Physics Lab (APL): A technical roadmap has been finalized to outline key devices and capabilities to be included in this system to address operational gaps, and an initial concept prototype of this system is being assembled.

University of Cincinnati: In partnership with Zoll, this group has developed a closed loop control algorithm for FiO2-based oxygen delivery via ventilator. This capability is being expanded to manage additional ventilator settings.

Advanced Resuscitation in Combat Casualty Care (ARC3) Lab: This new AFRL lab at University of Maryland at Baltimore Shock Trauma Center will lead overall system concept development and prototype testing.

Image was taken during a simulated patient transport with supporting critical care. Image is property of the U.S. Air Force.

ADDITIONAL FACTS

As the first major deliverable for this effort, a technical roadmap was completed to identify emerging medical technologies, align them with key technical capability gaps, and outline a pathway for implementation within the IMPACT system to enhance patient care.

This collaborative endeavor, bringing together government, non-profit organizations, private companies, academic research centers, and hospital systems, shares a common vision: to revolutionize patient care through the strategic implementation of emerging medical technologies. The IMPACT system, designed to seamlessly integrate these advancements – including sophisticated devices and autonomous systems – holds the promise of improved outcomes and enhanced efficiency. If your organization aligns with our research aims, we encourage you to contact us to explore potential collaborations.

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