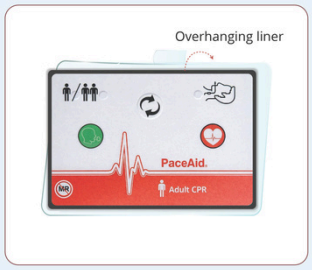
Engineering a Medical-Grade Smart Label for Real-Time CPR Guidance

Production-Ready Design, Printed Circuitry

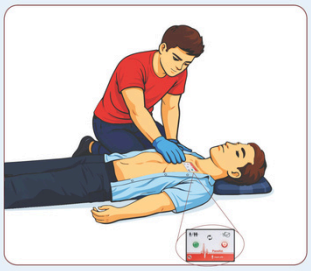
AT A GLANCE

In high-stress medical emergencies, even well-trained responders can struggle to maintain proper CPR timing and rhythm. Performing compressions too fast or too slow can significantly reduce survival outcomes. PaceAid was created to solve this problem by providing real-time, visual CPR guidance that keeps responders aligned with American Heart Association guidelines. This case study highlights how Butler Technologies partnered with PaceAid to transform an early concept into a scalable, medical-grade device using print technology and expert material selection.

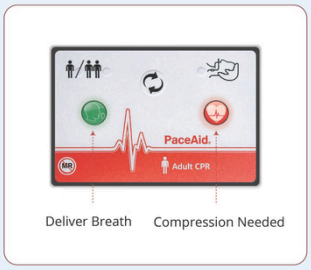
HOW TO USE PACEAID



Locate and peel the adhesive layer. Device will automatically activate.



Place on victim's upper chest, shoulder, arm, or any area within rescuer's direct line of sight.



Follow the LED indicators for visual CPR guidance.

Begin CPR and improve the quality of the life you save.

PROBLEM

The founder of PaceAid, a practicing clinician, identified a critical gap during real-world resuscitation efforts: responders lacked a simple, dedicated tool to guide CPR timing and rhythm without distraction. Existing tools often measured performance after the fact or added cognitive load during already chaotic situations.
When PaceAid first came to Butler Technologies, the concept existed only as a basic sketch with generic artwork and a patent drawing outlining core functionality. The idea resembled a "smart label," but final dimensions, materials, artwork, and manufacturability were undefined.

Key challenges included:

- Designing a device that automatically powered on when the adhesive liner was removed
- Preventing bodily fluids from entering sensitive electronics
- Ensuring the device could safely remain on a patient during AED shock without electrical conduction
- Creating a solution flexible enough to conform to the human body while housing batteries and circuitry
- Developing a cost-effective design that could scale into multiple product variants

PaceAid needed a manufacturing partner with deep medical device experience, strong quality and regulatory awareness, and the engineering expertise to transform a life-saving idea into a reliable, production-ready product.

SOLUTION

Butler Technologies partnered closely with PaceAid from the earliest stages of development, collaborating through concept refinement, material selection, prototyping, and production engineering. Our team was actively engaged in solving both functional and safety-critical challenges while keeping scalability and cost efficiency in mind.

Concept-to-Production Engineering
Translated early sketches and patent drawings into a fully defined, manufacturable design. Butler's engineering team refined artwork, dimensions, circuit layout, and assembly methods to ensure production readiness.

Flexible Circuit Design
Developed a single flexible circuit design that could be used across four different PaceAid models—supporting adult and infant/pediatric CPR, one-person CPR, two-person CPR, and CPR with an advanced airway. This unified circuit reduced cost, improved lead times, and simplified scaling.

Power-On Activation Mechanism
Engineered the label to automatically activate when the adhesive release liner is removed, a critical patent-defined requirement, while maintaining a sealed construction.

Fluid Ingress Protection
Solved a major design challenge by sealing the label edges to prevent bodily fluids from entering the electronics. This was achieved through a combination of battery holder thickness optimization, foam design refinement, and a two-sided coated adhesive liner that self-seals once removed.

Material Selection & Patient Safety
Evaluated multiple foams and pressure-sensitive adhesives to balance durability, flexibility, and skin compatibility. The final materials allow short-term adhesion suitable for emergency use without being overly aggressive on the skin.

Non-Conductive Casing Design
Provided critical guidance on selecting a non-conductive casing material, allowing PaceAid to remain safely on the patient during AED shock without risk of electrical conduction—adding an extra layer of protection for both patients and responders.

Iterative Prototyping
Completed an initial prototype run, followed by a second, expanded prototype run incorporating customer feedback across all four label designs. Final production included a minor graphics refinement, resulting in a fully validated product.

ABOUT PACEAID

PaceAid is an innovative visual CPR guidance device created to support the processes of resuscitation. PaceAid provides clear, easy-to-follow visual cues to help guide bystanders, first responders, and healthcare professionals in performing CPR with greater confidence and consistency during critical moments. PaceAid is intended as a visual guidance tool to support responders when every second matters.

PaceAid

To learn more and to purchase, visit www.paceiad.com.

RESULTS

By partnering with Butler Technologies, PaceAid was able to focus on its mission—improving CPR quality and saving lives—while relying on a team of user interface and printed electronics experts to manage the complexities of design and manufacturing.

The final product has performed exceptionally well in real-world testing. During beta trials in an acute care hospital, frontline clinicians, including physicians, nurses, residents, and respiratory therapists, reported overwhelmingly positive feedback. Users highlighted PaceAid's simplicity, reliability, and effectiveness in keeping CPR within required guidelines. Several departments requested the placement of PaceAid in code carts, signaling strong confidence in its value during emergencies.

Beyond clinical settings, end users consistently describe PaceAid as a powerful confidence-building tool. Many emphasize how it reduces emotional strain, provides reassurance in chaotic moments, and helps responders act decisively when every second matters.

Today, PaceAid is ready for hospitals to not just guide CPR, but to improve the quality of the life you save.

BENEFITS

DESIGNED-FOR-PRODUCTION

Fully validated design ready for scalable manufacturing.

FLEXIBLE DESIGN

A single circuit design for four product variants.

MEDICAL-GRADE SAFETY

Non-conductive materials and sealed construction for patient protection.

WHY PACEAID CHOSE BUTLER TECHNOLOGIES

Developing a medical device for use in emergency situations requires more than manufacturing capability. It demands a partner who understands safety, usability, and real-world clinical environments.

PaceAid chose Butler Technologies for our ability to bridge engineering, materials science, and production with a deep understanding of medical device requirements. From the earliest concept discussions through final production, BTI acted as an extension of the PaceAid team by anticipating challenges, identifying risks, and designing solutions that balanced performance, safety, and scalability.

Our experience with flexible printed electronics, pressure-sensitive adhesives, and medical-grade materials allowed PaceAid to move forward with confidence, knowing their device would perform reliably in high-stakes environments. The result is not just a manufactured product, but a thoughtfully engineered solution that supports clinicians when it matters most.

> "What makes BTI a good fit for me is their reliability, cutting-edge technology, and the way they are tailored to meet the specific needs of my product with top-quality results."
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> ***-Owner of PaceAid***