

Esperto Medical, Inc.

Category:

Best Startup

Company Name:

Esperto Medical, Inc.

Turnover and/or Funding:

Summary

Esperto is a clinical-stage medical device startup developing next-generation wearable cardiovascular diagnostics that enable hospital-based and remote patient monitoring with unprecedented ease and accuracy. Cardiovascular pathologies cost more than \$250B and claim more than 700,000 lives in the U.S. each year [1,2]. Controlling blood pressure (BP) is the first-line defense in reducing cardiovascular risk factors and mortality, yet more than three-quarters of American adults with hypertension have inadequately controlled BP [3]. Wearable devices hold great promise for empowering patients to take control of their hypertension, yet the current crop of wearable BP monitoring tools pose major concerns around accuracy [4]. Esperto's first product offering is a cuffless, noninvasive, and calibration-free vital sign monitor that directly measures BP, pulse rate, respiration rate, and temperature and other metrics continuously via our proprietary, patented resonance sonomanometry (RSM) technique [5]. Since RSM measures BP directly, it avoids the accuracy issues that plague inference-based approaches, like photoplethysmography, that depend on calibration. Esperto is currently conducting pilot studies of its prototype RSM monitor in a diverse cohort of human subjects. Pivotal studies and FDA de novo filing are scheduled for 2026.

Funding

Series A (December 2024). Esperto closed an oversubscribed \$10M Series A investment round in 2024 co-led by Bold Capital Partners and Catalyst Health Ventures. Wavemaker Three-sixty Health, Free Flow Ventures, Fund@Caltech and Maverick Ventures also participated. The investment will fund the remaining technology development and pilot clinical studies of the Esperto Armband, the company's first commercial product. The deal is notable for its strong syndicate in a competitive segment (patient monitoring) at a time when the medical device investment landscape remains challenging. Esperto anticipates raising a Series B in late 2025 to complete pivotal studies, FDA marketing authorization, and commercialization. A Prix Galien

Award would be instrumental in increasing the visibility of Esperto Medical with potential follow-on investors.

Pediatric Grant (June 2025). Earlier this year Esperto received a nondilutive \$50,000 grant from the Midwest Pediatric Device Consortium, an FDA-funded accelerator for medical devices addressing unmet pediatric needs. Because children have complications from arterial catheters at a rate 10x greater than adults, this population is in dire need of better solutions. The funding will support feasibility studies to inform the prototyping of a pediatric version of Esperto's vital sign monitor.

Conditional Funding (July 2025). Esperto was recently notified by the Advanced Research Projects Agency for Health (ARPA-H) of its intention to fund Esperto's Phase I SBIR grant proposal to develop a wireless RSM-based BP monitor. We are now in the award negotiation phase. The \$600,000 grant is expected to be finalized by September 2025. Upon successful completion of Phase I, Esperto will be well positioned to secure Phase II funding in the range of \$2-3M.

Financial Runway. Esperto's current funding, not including grant funding, is projected to fund company operations through September 2026 according to the current spending plan. The ARPA-H funding would provide an additional two months of runway.

Sub-Category:

Medical Technology / Digital Health

Corporate history (creation, key milestones, main funding,...)Information on Condition / Disease and need for solution / product (prevalence, existing treatments / solutions):

Corporate History

Esperto was founded in 2018 by an ambitious multidisciplinary team from Caltech: engineer-entrepreneur Aditya Rajagopal, PhD; emergency medicine physician Alaina Brinley Rajagopal, MD, PhD; and machine learning specialist Yaser Abu-Mostafa, PhD. In 2020, Esperto raised a seed round from Maverick Ventures and hired its first staff. In 2022, it demonstrated proof-of-concept of RSM on the benchtop and then in a six subject pilot study. In 2024, the RSM method was published in the journal PNAS Nexus [5]. In late 2024, the company closed its Series A investment. The company currently has 10 full-time employees and is contemplating another 2-5 hires over the next year.

Therapeutic Area

Blood pressure (BP) is a key indicator of cardiovascular health that underlies the progression of cardiovascular disease, the number-one leading cause of death in the

U.S. Pooled data from 19 clinical trials demonstrate a reduced risk of mortality from cardiovascular disease with strict BP control [6]. Despite this, BP measurement remains unwieldy and uncomfortable for patients in both clinical and home settings and is frequently inaccurate [7]. Esperto intends to improve access and safety for BP and vital sign monitoring by providing an accurate, noninvasive, calibration-free solution that may ultimately reduce cardiovascular mortality.

Unmet Need

The most common measurement method, the conventional BP cuff, can only provide intermittent readings and has low levels of patient compliance for home monitoring. Cuff readings are also highly susceptible to improper measurement technique and white-coat effects [7]. Noninvasive continuous technologies, such as Edwards' ClearSight system, which uses the volume-clamp method, have failed to gain wide adoption due to their need for frequent calibration, poor accuracy with common pathologies, and high price point. For high-fidelity continuous BP measurement, the invasive arterial catheter remains the gold standard, but its risk profile reserves it for use in only the most critical patients. Cuffless technologies hold great promise for making BP measurement more convenient and ubiquitous; however, the vast majority of these devices estimate BP indirectly using photoplethysmography, a method with serious accuracy limitations due to its reliance on calibration to cuff measurements, black box machine learning methods, and/or patient demographics [4]. As a result, cuffless methods have faced major hurdles gaining clinical and consumer acceptance.

Thus, BP measurement that is both continuous and noninvasive remains an unrealized capability. To date, no existing or emerging technology has been capable of combining continuous, accurate BP measurement regardless of demographic differences with a portable, noninvasive form factor - a so-called \"holy grail\" of sensor technology. Esperto's first-principles based RSM approach is unique among its peers in requiring no calibration, external references, demographic inputs, or machine learning assumptions. Because RSM is based on measurable characteristics, it is not limited by age, gender, BMI, or other demographic characteristics, which have compromised the accuracy and applicability of other cuffless BP approaches. RSM also enables continuous monitoring of metrics such as pulse rate, respiration rate, arterial radius, arterial wall thickness, arterial stiffness, stroke volume, and cardiac output, further differentiating it from other cuffless monitors.

History of the development of the solution/product (Intellectual Property, preclinical and clinical datas, development collaborations):

Intellectual Property

Esperto has 18 issued patents and 30 pending patents. All have been filed through Esperto or are exclusively licensed by Esperto from the California Institute of Technology. Patents cover an ultrasound stethoscope; methodology related to resonance sonomanometry, the novel method underlying our blood pressure measurement; various approaches to resonance sonomanometry and ultrasound/audio sound measurements; an ultrasound patch; and various clinical use cases. Esperto continues to file new patents related to resonance sonomanometry and its various applications. A formal freedom to operate (FTO) analysis indicates broad FTO within the cuffless BP technology landscape.

Preclinical and Clinical Proof of Concept

We have progressively validated the resonance sonomanometry method, first assessing the physical model using arterial phantoms and subsequently with initial human feasibility studies.⁵ The physical model was constructed based on first-principles physics and the observation that arteries resonate when an appropriate external acoustic stimulus is applied. After developing the physical model, we custom-designed an early prototype device (Proto-2) for validation of the method on carotid arteries. In initial human feasibility study in six subjects on the carotid artery compared to brachial BP cuffs, we found that RSM was in fact accurate (DBP mean difference -2.1 ± 8.4 ; $p=0.54$) and capable of determining pressure through the cardiac cycle in real-time in multiple human arteries (Fig. 1, Document Upload). Finally, we completed a feasibility study in 60 test subjects of varying age, race, ethnicity, gender, BMI, and comorbidities to ensure that the Esperto Method is applicable to a diverse cohort of human subjects (61.7% M, 36.7%F, 48.3% H/Lx, 30%A, 15%W, 5%B) in comparison to arterial catheters. The study demonstrated that our method is broadly applicable to various outpatient pathologies (HTN, diabetes mellitus, cardiac abnormalities, hyperlipidemia, body mass index [BMI]>30) and that the shape of the arterial waveform matched that of the arterial catheter. Variance in the data is likely related to human error from the handheld early prototype form factor, where operator fatigue led to imprecise probe placement and poor radius measurement due to imaging of arteries in longitudinal views (chords). Additional sensitivity analysis demonstrated that the method is quite sensitive to radius measurement and, thus, radius would be more effectively measured in cross-section. Our latest prototype, Proto-3, is designed to resolve this error with the autonomous artery finding and parameter extraction algorithms (Figs. 2-3). Current research is focused on improving the design of the device for ease of use and initial clinical validation with new, exciting features like automatic artery detection and tracking.

Development Collaborations

Esperto has partnered with San Francisco-based product design consultancy Whipsaw, widely recognized as one of the leading industrial design firms globally, to design the commercial form factor of the Esperto Armband. Product concept illustrations are included in the Document Upload section.

Why this drug or device is innovative, the broad implications for future research, and/or how it will improve the human condition:

Technological Innovation

Esperto is developing the first cuffless blood pressure measurement technology capable of measuring blood pressure directly (without calibration, demographic inputs, or machine learning estimations), greatly reducing the sources of error that have caused the medical establishment to lose faith in competitive cuffless approaches. Resonance sonomanometry is based in LaPlace's law, which relates wall tension and diameter to pressure. RSM leverages ultrasound imaging to extract key parameters for the physical model (vessel diameter, thickness) in combination with audio-frequency sound to induce arterial resonance (measuring arterial tension). Because all necessary components of the model are directly observable and result in absolute (not relative) pressure on a millisecond basis, blood pressure can be determined without calibration, on any artery visible to ultrasound.

Improving the Human Condition

By enabling more accurate, convenient, and safe vital sign monitoring and cardiovascular diagnostics, RSM will have a positive diagnostic impact on anyone with a blood pressure. Esperto devices will 1) directly improve the patient experience by eliminating the pain and complications of arterial catheters and discomfort of squeezing cuffs; 2) advance the state of the art in continuous blood pressure monitoring by introducing a new technical approach with the potential to be more accurate, reliable, and convenient than alternatives; and 3) improve patient and population health by enabling predictive metrics of disease that allow patients to seek care proactively and thereby prevent later disease. The market opportunity for Esperto's solutions is more than \$20 billion, spanning critical care (\$4B+), remote patient monitoring (\$6B+), and consumer (\$10B+) markets.

Implications for Future Research

Ubiquitous continuous BP monitoring as enabled by Esperto would provide a wealth of data for early detection of disease, especially for those with common disorders such as hypertension, prevalent in approximately 46% of U.S. adults. Pathologies that could be detected early, tracked longitudinally, or prevented by continuous BP monitoring include hypertension, stroke, myocardial infarction (MI), thrombosis (pulmonary embolism, deep vein thrombosis), preeclampsia/eclampsia, hypertrophic obstructive cardiomyopathy, and syncope. Esperto devices could be placed in Emergency Departments or Intensive Care Units and remain on the patient for the duration of their hospital stay, providing a wealth of data that could then be mined to develop predictive metrics for diseases like stroke and MI and also lead to better fluid and medication management. In outpatient settings, Esperto devices could be applied when a patient is

prescribed a new antihypertensive, e.g., allowing continuous BP monitoring throughout the next few days to weeks to determine if the BP is stable and managed appropriately. Esperto devices could help with fall prevention in geriatric patients, sounding alarms when an individual demonstrates pre-hypotension, hypotension, or wavering gait as an indication to sit down before syncope occurs. Finally, the wealth of data contained in continuous BP waveforms collected from healthy and sick patients, patients in and out of hospitals, both mobile and sedated, will enable development of predictive metrics that will ultimately help prevent pathologies like thrombosis, stroke, and MI.

Please provide appropriate references (PubMed, Abstract, Website):

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