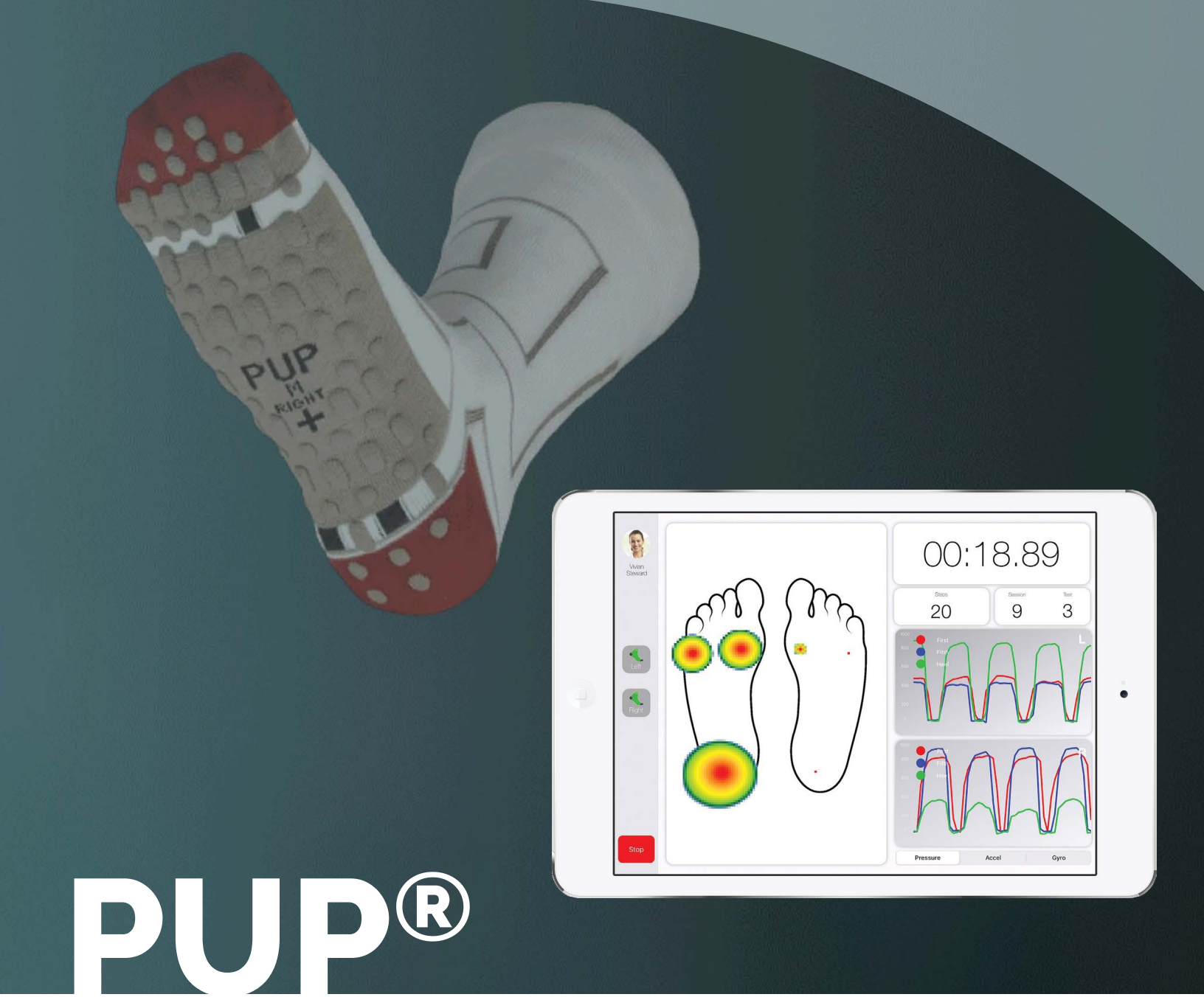

PUP®

Smart Socks

palarum

AN INNOVATIVE E-TEXTILE TECHNOLOGY SOLUTION TO PREVENT FALLS

Within acute care settings, falls persist as one of the most common and potentially devastating complications of healthcare. The **Agency for Healthcare Research and Quality** estimates that as many as 1 million hospitalized individuals fall each year, corresponding to between three and five falls per 1,000 patient days.[1]

After an initial intake fall-risk assessment, most hospital fall prevention programs rely on nurses to regularly assess and observe fall-risk patients, intervening when these patients take any actions that could lead to harm. But this process is time consuming and inefficient, as the nursing workforce dedicates more time to tasks such as filling out paperwork or tracking down supplies. Many **nurses spend less than two hours with their patients** during a typical 12 hour shift.[2]

As a result, many patients at risk for falls are left unattended for long periods of time. Some facilities employ patient sitters, but there is conflicting evidence of their effectiveness in preventing falls. Other solutions, such as bed alarms, alert nurses when a patient attempts to stand, but between **72-99% of all alarms are false,** leading to alarm fatigue and slower response times.[3]

The nursing profession needs a reliable and highly accurate solution to reduce fall rates and improve overall patient outcomes. Palarum's innovative technology, the PUP® (Patient is UP) Smart Sock, offers a new nurse-centric approach for healthcare professionals to monitor patients in real-time, drastically cutting down on the number of falls within each hospital unit.

1. Patient Safety Primer: Falls. Patient Safety Network, Agency for Healthcare Research and Equality Web site. Updated September 2019. Accessed November 2020.
2. Laura Landro. Nurses Aiming To Spend More Time With Patients. *The Journal of Advanced Practice Nursing*. Published November 2014. Accessed November 2020.
3. Kathleen Gaines BSN, RN, BA, CBC. Alarm Fatigue is Way too Real (And Scary) For Nurses. Nurse.org Web site. Published August 2019. Accessed November 2020.

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THE TECHNOLOGY BEHIND PALARUM'S PUP® SMART SOCK

The PUP® Smart Sock is a first-of-its-kind technology solution to prevent patient falls. Designed by nurses for nurses, the PUP® system prevents alarm fatigue resulting from false alarms and ensures a prompt response to each safety event.

PUP® SYSTEM COMPONENTS

The PUP® system relies on several technologies integrated together to provide continuous monitoring of fall-risk patients in real time:

PUP® Smart Socks that include three pressure sensors woven into the fabric of the sock that work through a Bluetooth transmitter affixed to the exterior of the sock

An in-room tablet that uses Bluetooth to pair with the patient's Smart Socks

A master tablet located at the nurse's station, which receives information from all in-room tablets

Palarum Smart Badge worn by each nurse on the unit

Beacons located throughout the unit that find the 3 closest nurses wearing Smart Badges

THE PUP® SYSTEM ALERT PROCESS

Upon admission, each fall-risk patient receives a pair of PUP® Smart Socks. These special Smart Socks are embedded with patented fabric sensors that are woven into the bottom of the socks. These special sensors measure any changes in movement and pressure in real time. Palarum's PUP® socks feature a small IMU (individual measuring unit), located on the exterior of the sock, that provides instant information about the patient's orientation and movement speed.

Taken together, the PUP system analyzes nine separate data points collected from the socks to validate whether or not a patient is standing or walking unassisted. If a fall-risk patient attempts to get up, the PUP Smart Sock triggers an alert on the in-room tablet. A series of electronic beacons scattered throughout the hospital unit then transmits this alert to the master tablet, located at the nurse's station.

More importantly, the intelligent alarm notification system finds the three nurses closest to the patient room via the smart badges. When a nurse responds to the alarm and enters the patient room, the system automatically deactivates all alarms for that particular incident, preventing continued unnecessary notifications to other staff members.

EARLY PUP STUDIES SHOW OUTSTANDING RESULTS

To prove its effectiveness and value, the PUP® system has already been tested in several pilot studies at four major healthcare centers. The pilot studies, which enrolled over 2,500 patients and spanned over 6,000 total patient days, showed an 80% reduction in falls when using PUP® technology when compared to the CMS average fall rate.

Other studies have examined nurse response time to alerts presented by the PUP® smart badge system compared to existing processes. With current systems, the average amount of time it takes nurses to respond to call lights ranges from **three minutes to almost 20 minutes**.[4] Two separate response-time studies using the PUP® technology took place on med-surg units at two major healthcare centers over the course of 120 days. In total, both study sites reported almost 7,000 safety events during the study period. The average nurse response time to a safety alert was one minute seven seconds, a significant reduction compared to average response times in other facilities without PUP® technology.

The PUP® system was also tested against bed alarms to help determine its accuracy. Over the course of 16 days, 18 fall-risk patients wore PUP® Smart Socks while hospitalized. Nursing staff also used bed alarms to monitor these individuals for safety events. The bed alarms triggered 80 total alerts, while the PUP® Smart Socks produced 46 alerts. After determining that 24 bed alerts were false, bed alarm accuracy was calculated at only 57%. When compared to bed alarms, the PUP® system demonstrated 99.2% accuracy.

4. Tzeng HM, Titler MG, Ronis DL, Yin CY. The contribution of staff call light response time to fall and injurious fall rates: an exploratory study in four US hospitals using archived hospital data. *BMC Health Serv Res.* 2012;12:84. Published 2012 Mar 31. doi:10.1186/1472-6963-12-84. Accessed November 2020.

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ACCURACY

HOW NURSES AND HOSPITALS BENEFIT FROM PUP® TECHNOLOGY

Initial case studies show that Palarum's PUP® Smart Sock technology effectively reduces falls among hospitalized patients. But the benefits of this solution also extend to nursing staff and healthcare systems by:

- **DECREASING COST:**
  According to the **Joint Commission Center for Transforming Healthcare**, the average cost of medical treatment for a fall with injury is over $14,000 per patient.[5] Additionally, fall prevention interventions such as **patient sitters** cost almost $40,000 per person, per year.[6] Technology solutions like PUP® Smart Socks offer significant cost savings for healthcare systems.

- **DOCUMENTING DATA:**
  The information gathered from the PUP® system integrates seamlessly with electronic medical record (EMR) systems like Epic, one of the most widely used EMR systems in the nation. Nurses may use this actionable data to compile event reports and determine ways to better ensure the safety of their patients.

- **INCREASING NURSE EFFICIENCY:**
  Instead of unit-wide alerts, the PUP® smart badge notifies the three closest staff members to a safety event. As soon as a nurse responds, the alert automatically deactivates. This prevents other nurses, including those who may not be on the unit, from receiving unnecessary alert notifications that interrupt patient care and cause alarm fatigue.

- **INCREASING PATIENT SATISFACTION:**
  In pilot studies, patients fitted with PUP® Smart Socks reported feeling comfortable wearing the technology and having greater freedom of movement. Additionally, they were less bothered by noise from false alarms and enjoyed more privacy without a sitter, which may result in higher patient satisfaction. Better HCAHPS patient satisfaction scores help hospitals maintain higher reimbursement rates from organizations like the **Centers for Medicare and Medicaid Services**. Conversely, lower HCAHPS scores directly impact a hospital's bottom line and limit the amount of funding they receive from **Medicare**.[7]

- **REDUCING FALSE ALARMS:**
  Research indicates that over 72% of hospital alarms are false, resulting in lost time and decreased productivity for nurses. Palarum's technology reports safety events with over 99% accuracy, reducing alarm interruptions and eliminating unproductive trips to patient rooms to turn off false alarms.

PALARUM'S COMMITMENT TO CUSTOMER SERVICE

Every healthcare facility utilizing the PUP® system is assigned a full-time, on-site technology coordinator from Palarum. This person provides support and assists with the growth of the program within the facility, helping educate staff about the system's functional abilities and trouble-shooting any issues that arise.

The on-site coordinator alleviates the burden nurses and hospital IT departments face when trying to fix technological issues, leaving them free to focus on other work. Palarum provides an on-site coordinator as long as the system is in use.

5. Preventing Falls. Joint Commission Center for Transforming Healthcare Web site. Accessed November 2020.
6. ZipRecruiter Web site. Accessed November 2020
7. CMS Hospital Value-Based Purchasing Program Results for Fiscal Year 2020. Centers for Medicare and Medicaid Services Web site. Published October 2019. Accessed November 2020.

LEARN MORE ABOUT PALARUM'S PUP® TECHNOLOGY

For more information about the PUP® system, including how you can schedule a demonstration, please visit our website at www.palarum.com, or contact Palarum directly at 513-228-1000 or info@palarum.com.

FCC CAUTION

Summary
This document consists of instructions on how we can change beetle modes of operation by
using nRF Connect for Mobile application.
Palarum: Beetle V3: Manual Dated: 14th February 2023
Page 14 of 15
FCC Warning
This device complies with part 15 of the FCC Rules. Operation is subject to the following two
conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause
undesired operation.
Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Specific Absorption Rate (SAR) information:
This Palarum Beetle meets the government's requirements for exposure to radio waves. The guidelines are based on standards that were developed by independent scientific organizations through periodic and thorough evaluation of scientific studies. The
standards include a substantial safety margin designed to assure the safety of all persons regardless of age or health.
FCC RF Exposure Information and Statement
The SAR limit of USA (FCC) is 1.6 W/kg averaged over one gram of tissue. Device types: Palarum Beetle (FCC ID: 2BAFT-PUPBTLV3) has also been tested against this SAR limit. The
highest SAR value reported under this standard during product certification for use worn on
the body is 0.029W/kg. This device was tested for typical body-worn operations with the back of the handset kept 0mm from the body. To maintain compliance with FCC RF exposure requirements, use accessories that maintain a 0mm separation distance between
the user's body and the back of the handset. The use of belt clips, holsters and similar accessories should not contain metallic components in its assembly. The use of accessories

that do not satisfy these requirements may not comply with FCC RF exposure requirements,
and should be avoided.
Body-worn Operation
This device was tested for typical body-worn operations. To comply with RF exposure requirements, a minimum separation distance of 0mm must be maintained between the user ’ s body and the handset, including the antenna. Third-party belt-clips, holsters, and similar accessories used by this device should not contain any metallic components. Bodyworn accessories that do not meet these requirements may not comply with RF exposure
requirements and should be avoided. Use only the supplied or an approved antenna.

PUP® Socks FAQ

Are PUP® socks reusable?
Yes, the Palarum PUP® socks can be washed and reused multiple times.

How are PUP® socks cleaned?
Palarum will work with a facility to determine the optimal cleaning procedure. We can arrange to collect used socks and perform the cleaning ourselves, or we can work with your team to establish a cleaning and QA process.

What are the available PUP® sock sizes?
Palarum provides socks in sizes ranging from small to extra-extra-large and in a variety of widths to accommodate different foot sizes and conditions.

Do PUP® socks have anti-slip tread?
Yes, the Palarum PUP® socks have an anti-slip tread on the bottom.

What happens if the PUP® socks get wet or soiled?
While there are no safety issues for the patient if the socks get wet or soiled, for their comfort, we recommend changing the socks for the patient.

SOFTWARE & OPERATING SYSTEM

What are the facility requirements?
The Palarum PUP® solution is a "wireless-based" system. A participating facility only requires access to a power outlet in each hospital room and a strong, consistent Wi-Fi signal. Additionally, Palarum would work with your IT support team to ensure all data communication is done according to your facility and HIPAA requirements.

How does the notification device work?
When the Palarum PUP® system detects a "Stand Event," an Alert Notification is displayed on the In-Room Tablet, at the Nurse's Station Tablet and on the Smart Badges of the three nurses nearest the room where the "Stand Event" occurred.

Can the PUP® system work with other notification devices?
Yes. While our recommended configuration includes the use of Smart Badges for the staff on duty, Palarum's notification system is agnostic and can be adapted to the majority of commercially available nurse call systems.

Can the PUP® system work with a hospital's EMR system?
Yes. Palarum's PUP® data capture and reporting system is agnostic and can work with most commercially available EMR solutions.

PALARUM LLC
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Lebanon, OH 45036

Palarum. The Premier Technology for Monitoring Patient Mobility
Contact Palarum today for a demonstration of PUP® technology.

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