

# Wearable Technology-Does It Fit Your Injured Worker

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# Objectives

- Identify what constitutes rehab technology and identify the appropriateness for the wearable technology environment.
- Recognize wearable tech recommendations and how they affect the injured worker's level of function.
- Understand the wearable tech product lines focusing on maximizing the injured workers independence.
- Identify levels of diagnosis to the wear tech equipment recommendations by addressing that the injured worker may have secondary diagnosis or education deficient that may impede the outcomes.

# Wearable Technology



# Wearable Technology Definition

- **Wearable technology** (also called wearable gadgets) is a category of technology devices that can be worn by a consumer and often include tracking information related to health and fitness. Other wearable tech gadgets include devices that have small motion sensors to take photos and sync with your mobile devices.
- **Wearable technology** is related to both ubiquitous computing and the history and development of wearable computers. Wearables make technology pervasive by interweaving it into daily life. Through the history and development of wearable computing, pioneers have attempted to enhance or extend the functionality of clothing, or to create wearables as accessories that provide users with surveillance.



# Old School Wearable Technology

## The first wearable devices

- The first real global wearable technology focused on communication and fitness.
- Wearables make technology pervasive by interweaving it into daily life.



# History of Wearable Technology

## A BRIEF HISTORY OF WEARABLE TECHNOLOGY

### INNOVATIONS



**1976**  
**FLISAR LA QUATRE WRECH**  
First wristwatch company to launch a watch with a wristband.



**1984**  
**LAUNDRY WATCH**  
One of the first digital watches to be used for monitoring laundry cycles.



**1993**  
**Apple Newton PDA**  
One of the first handheld computers to be used for personal information.



**1996**  
**First BlackBerry Launched**  
First mobile phone with a full QWERTY keyboard.



**1997**  
**Sony Walkman**  
First portable music player with a wristband.



**1997**  
**Digital Hearing Aid**  
First digital hearing aid with a wristband.



**2000**  
**First Bluetooth Tracker Shipped**



**2001**  
**Apple iPod**



**2002**  
**VICTORIN L-series**  
The world's first fully digital wristwatch.



**2004**  
**Motorola RAZR**  
The world's first flip phone with a camera.



**2004**  
**DuPro Camera**  
The world's first camera watch.



**2006**  
**Apple iPod Kit**  
The world's first iPod with a wristband.



**2007**  
**Apple iPhone**



**2008**  
**Fitbit**  
The world's first fitness tracker with a wristband.



**2008**  
**Seaborn Up**



**2008**  
**NIXA HURTSAND**



**2007**  
**BeFit Watch**  
The world's first fitness watch with a wristband.



**2014**  
**Nissan Nismo SmartWatch**  
The world's first smartwatch with a wristband.



**2015**  
**Mi 1, Smart**



**2015**  
**Google Glass**  
The world's first smartwatch with a wristband.



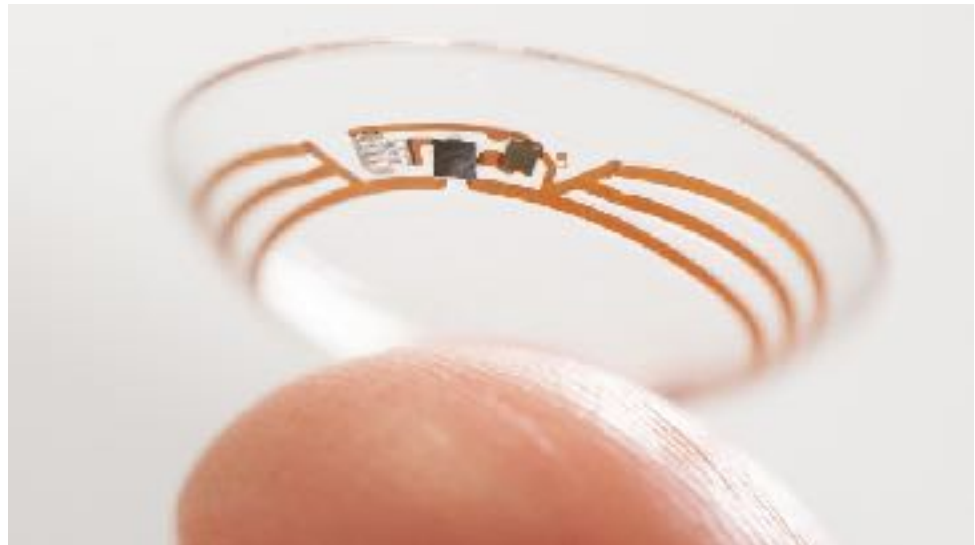
**2015**  
**Samsung Galaxy Gear**  
The world's first smartwatch with a wristband.



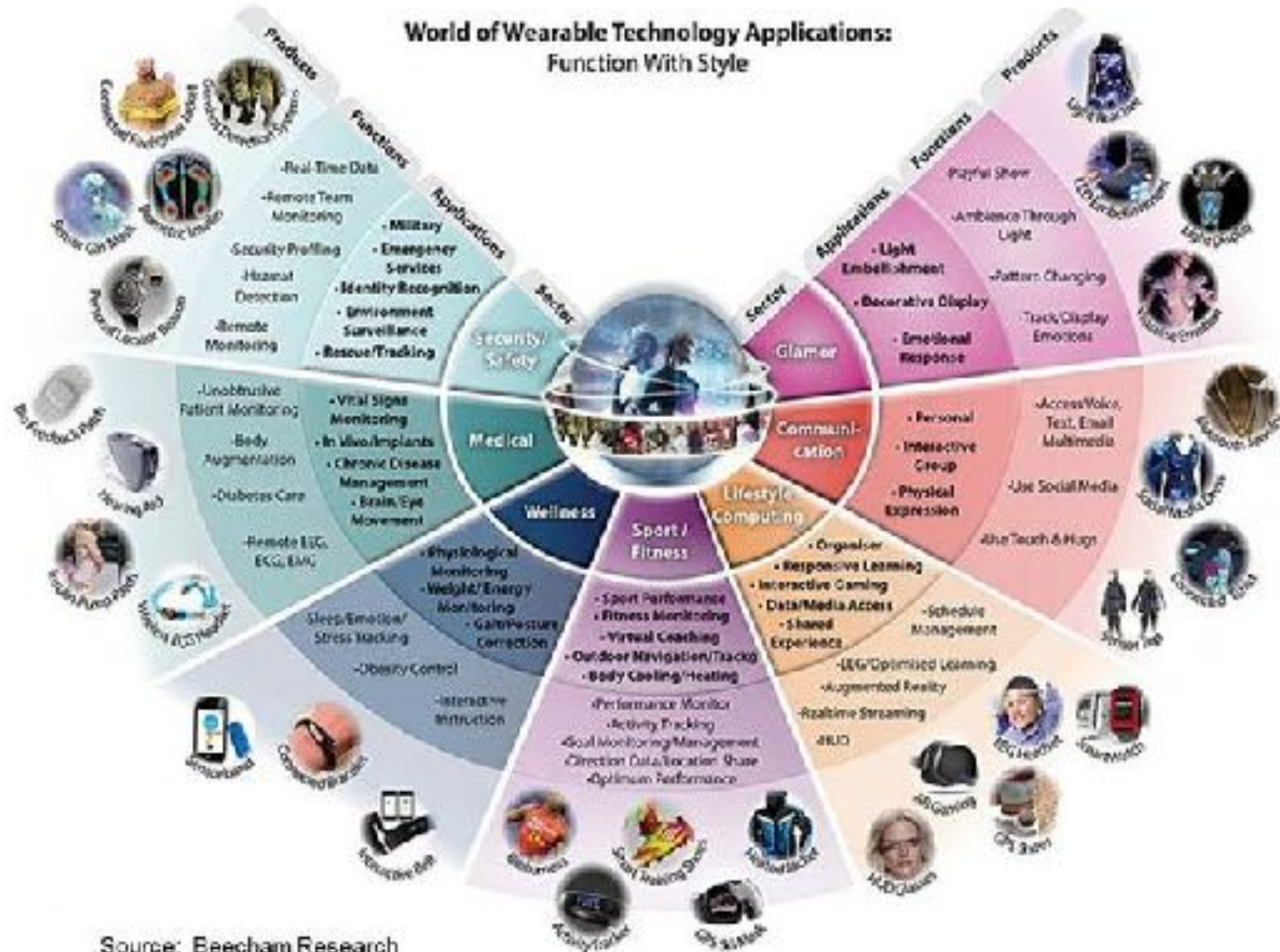
# Wearable Projections

**Wearable technology** is already large. As the wearable electronics business powers from \$20 billion in 2015 to almost \$70 billion in 2025, the dominant sector will remain the healthcare sector which merges medical, fitness and wellness.

- Communications
- Business Connectivity
- Technology Sector
- Security
- Fashion
- Lifestyle



# Wearable Technology Sectors



Source: Beecham Research



# Industry Sectors



# The Smartphone



STEPS, CALORIES, DISTANCE



AUTOMATIC SLEEP MONITORING



DAILY PHOTO FOOD JOURNAL

# Wearable Technology Scenarios

## Complex

- Quadriplegic/Paraplegics
- TBI/ ABI
- Amputations

## Bariatric

- Health Monitoring
- Weight Loss
- Activity Compliance

## Geriatrics

- Communication
- Aging Claimants
- Technology

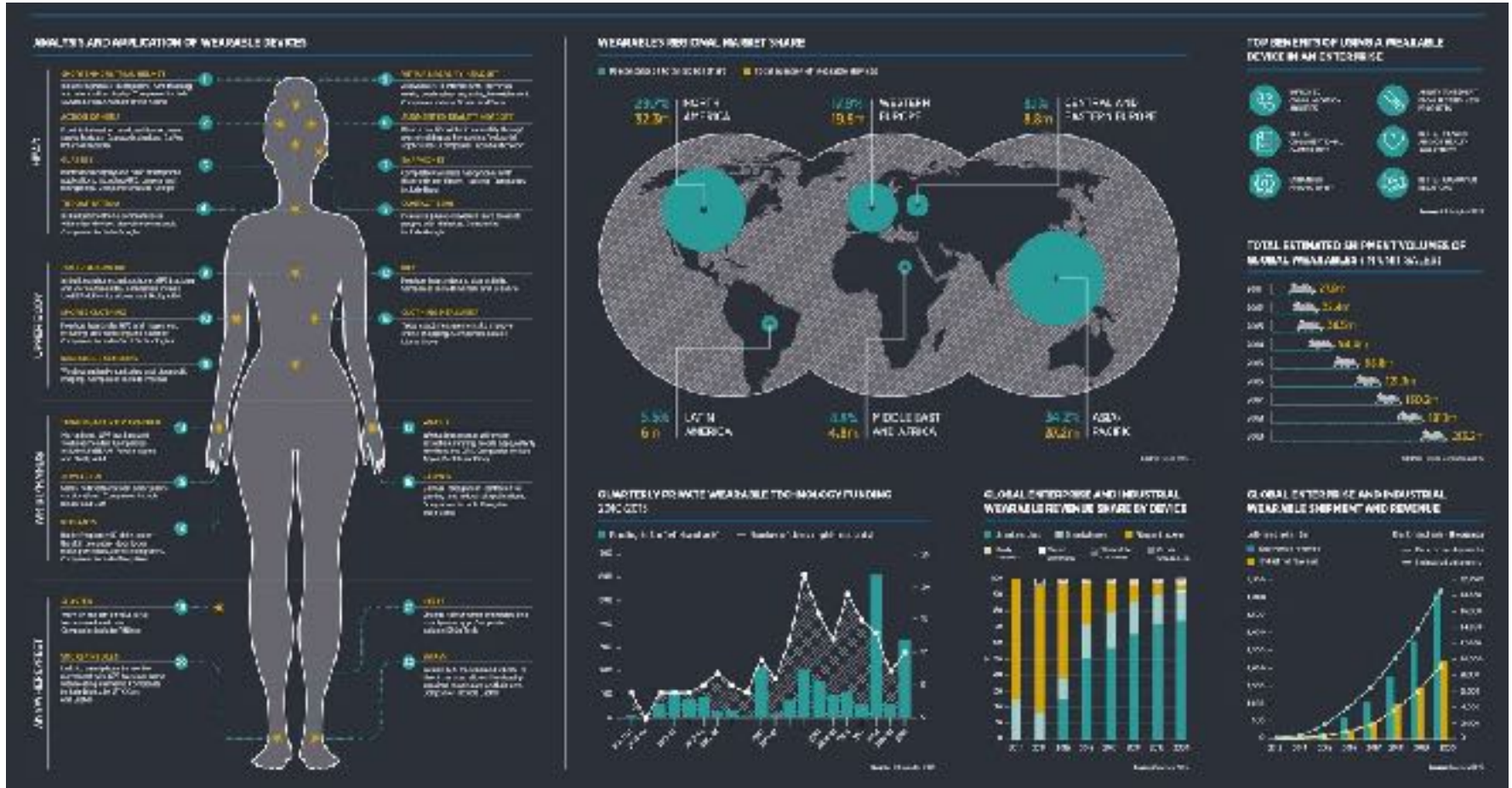
## Short Term

- Activity Technology
- Compliance
- Limitations

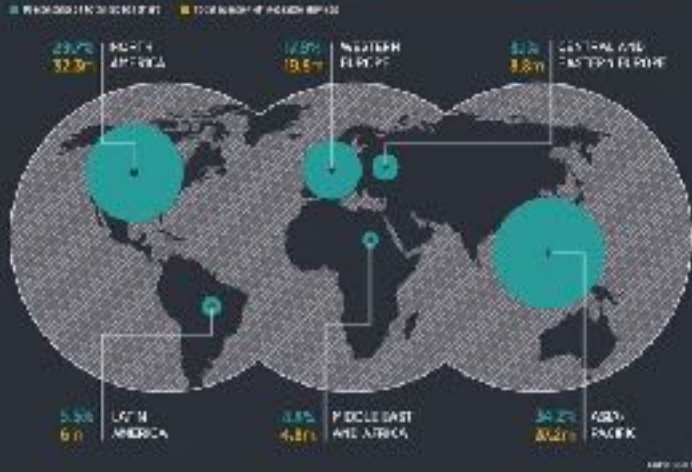
# Complex Wearable Technology Products

- Advanced Rehab Power
  - Power chairs
  - Driving control
  - Power standing chairs
- Augmentative Communication
  - Smart phones
  - iPads/Tablet
  - Applications
- Connectivity
  - Infra-red
  - Wi-Fi
    - Home
    - Community
  - Bluetooth 4.0
- New Robotic Devices
- Exoskeletons
- Ergonomics
- GPS
- Computers
- Environmental Controls
- Telehealth
  - Telerehab
  - Telepresence
  - Telecare
- Access to Devices/Mounting
  - Wheelchair
  - Beds
  - Desk
  - Backpacks

# Growing Trends in Wearables



## WEARABLES REGIONAL MARKET SHARE



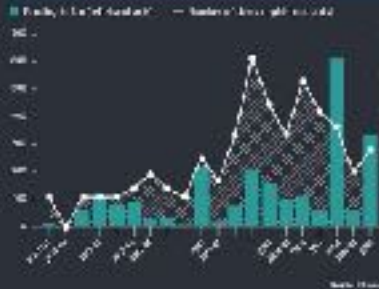
## TOP BENEFITS OF USING A WEARABLE DEVICE IN AN ENTERPRISE



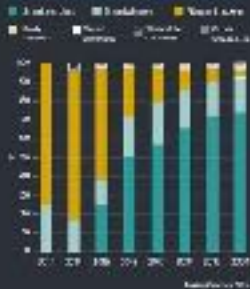
## TOTAL ESTIMATED SHIPMENT VOLUME OF WEARABLES FROM 2014 TO 2021



## DIAGNOSTICALLY PROMPT WEARABLE TECHNOLOGY FUNDING 2010-2021



## GLOBAL ENTERPRISE AND INDUSTRIAL WEARABLES REVENUE SHARE BY DEVICE



## GLOBAL ENTERPRISE AND INDUSTRIAL WEARABLES SHIPMENT AND REVENUE



# Lifestyle Considerations



# Augmentative Applications

- Applications
  - Visual tools
  - Speaking devices
  - Text to speech
  - Hundreds of applications
  - Inexpensive
- Quality of life
- Increase cognitive skills
- Increase level of independence
- Map and directions
- Ease of use



# Wearable Technology Concerns

- Education Levels
- Limited Range of Motion
- Access to Environment
- Under Selling
- Over Selling
- Caretaker
- Quality of Life
- Service Provider Cost
- Data Privacy
- Data Quality
- Transfers
- Home Modifications
- Transportation
- Equipment Storage
- Cognitive Ability
- Medical Necessity
- Environment
- Functional Independence
- Product Quality
- Data Storage



# Activity Trackers

But for people using a wearable healthcare device:



71%  
use it  
every  
day



44%  
feel more  
in control  
of their  
health



76%  
are interested  
in sharing  
their data  
with doctors  
to help  
treatments

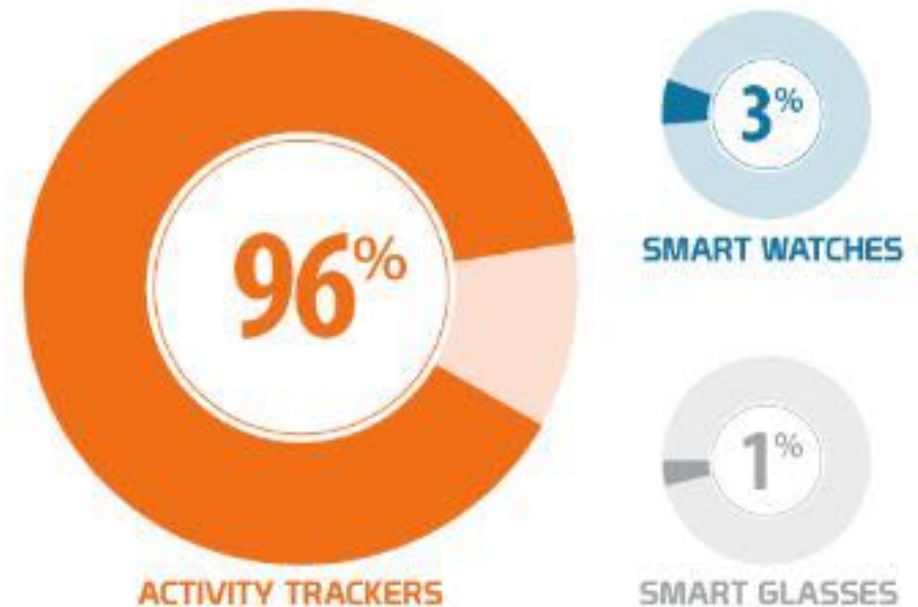


70%  
are interested in  
sharing their data  
with their  
insurance  
company to  
reduce premiums



# Activity Bracelets

- Wellness
- Prevention
- Risks
- Compliance
- Post Injury
- Post Surgery
- Data Collection
- Quality of Life
- Recovery Tied to PT Program



PORTION OF THE CONNECTED WEARABLE MARKET EACH CATEGORY HAS IN 2013

# Wearable Activity Monitors





- Activity Tracking
- Weight Loss
- Compliance Monitoring
- Ergonomic Prevention
- Health Prevention



# Wearable Communication Devices

## Smart Watch



 <p><b>Messages</b></p> <p>Apple Watch lets you get a heads-up for new messages without having to reach for your iPhone. You can also read and reply to messages directly from your watch. To read and reply to messages, simply tap the message card on the watch face. To reply, tap the reply button on the message card.</p> <p><a href="#">Watch the 'Messages' tutorial video.</a></p>	 <p><b>Phone</b></p> <p>Apple Watch lets you answer or decline incoming calls without having to reach for your iPhone. You can also make outgoing calls directly from your watch. To answer or decline an incoming call, tap the call button on the notification card. To make an outgoing call, tap the call button on the watch face.</p> <p><a href="#">Watch the 'Phone' tutorial video.</a></p>	 <p><b>Email</b></p> <p>Apple Watch lets you get a heads-up for new emails without having to reach for your iPhone. You can also read and reply to emails directly from your watch. To read and reply to emails, simply tap the email card on the watch face. To reply, tap the reply button on the email card.</p> <p><a href="#">Watch the 'Email' tutorial video.</a></p>
 <p><b>Calendar</b></p> <p>Apple Watch lets you get a heads-up for new calendar events without having to reach for your iPhone. You can also view and interact with calendar events directly from your watch. To view and interact with calendar events, simply tap the calendar card on the watch face.</p> <p><a href="#">Watch the 'Calendar' tutorial video.</a></p>	 <p><b>Activity</b></p> <p>Apple Watch lets you track your daily activity and receive reminders to move more. You can also view and interact with activity data directly from your watch. To view and interact with activity data, simply tap the activity card on the watch face.</p> <p><a href="#">Watch the 'Activity' tutorial video.</a></p>	 <p><b>App Store</b></p> <p>Apple Watch lets you get a heads-up for new apps and updates without having to reach for your iPhone. You can also view and interact with app information directly from your watch. To view and interact with app information, simply tap the app card on the watch face.</p> <p><a href="#">Watch the 'App Store' tutorial video.</a></p>



**Notifications**  
Be alerted with a tap, then instantly respond in a variety of ways.



**Siri**  
Use Siri to make calls, send messages, and check your calendar, just ask.

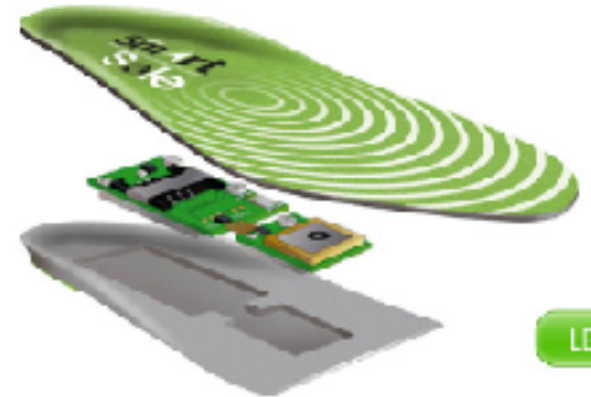
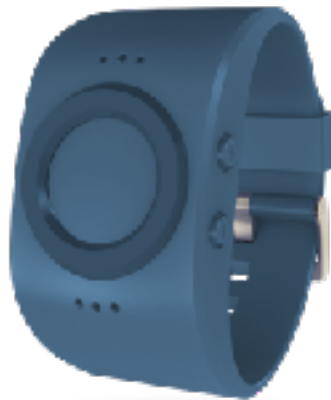


**Apple Pay**  
The easy, safe, and private way to pay for purchases.

# Location Trackers

- **GPS**

- Activity Tracking
- Location Position
- Safety Environments



# Wearable Health Monitors

## 9Solutions gTag Companion

The 9Solutions gTag Companion provides active elderly people and recovering patients a secure living in their familiar home environment.

The 9Solutions gTag Companion gives security and a piece of mind to relatives and friends. In case of an emergency, help can be provided regardless of time and place, also in situations when their loved ones are not able to call for help. Automatic alarms can be generated e.g. when the user is leaving the home in the night-time or does not return within the defined time frame.

### Features:

- Comfortable, waterproof, hygienic and easy to use indoor and outdoor locating wrist tag
- Built on Bluetooth® Low Energy and GPS, GSM/3G technology
- Two programmable buttons and a LED



# Wearable Communication Devices

## Growing demand for personal safety technology through 2020



Source: Ericsson ConsumerLab, Wearable Technology and the Internet of Things, 2016  
 Base: Smartphone users across Brazil, China, South Korea, UK and the US

# Wearable Communication Devices

- **Personal Safety. Peace of Mind.**
- Occlly™ is a wearable personal safety device specifically designed to be a visual deterrent. It can be worn on the body or clipped to an accessory. Occlly is armed with a panic button, four cameras that record around you, sirens, a microphone, LED lighting, wireless capabilities, and a number of automatic alarm sensors.
- When Occlly alarms, it sirens and illuminates alerting people in the immediate area, while continuing to record audio and images. All relevant information including images recorded before and during the alarm are sent in real-time to our 24-hour emergency response center. During the alarm, Occlly's trained staff assesses the emergency situation by reviewing the images and live audio recordings. At the same time, our staff contacts and provides assistance to the customer, and dispatches local authorities to the emergency location.
- Occlly is a personal bodycam with an enhanced panic alarm system.





# Wearable Communication Devices

## wearsafe® Safety as a Service Features

Wearsafe is a **Safety-as-a-Service** that can be activated using the **Wearsafe Tag**, our own discreet, wearable device.

Wearsafe can also be activated using technology consumers already own so they can instantly call for help using wearable devices that fit their active lifestyle.

Wearsafe is the most advanced personal safety service available today because it provides more accurate context for emergency situations than any other technology on the market.



# Benefits of GPS Technology



## Independence, but protected by a virtual safety zone

You can't always be there for them, but you can keep an eye on them, and give them the gift of independence, by setting a virtual safety zone. Then you can rest at ease knowing that if they do wander you'll receive a text message or email alert to your phone so you know they're on the move, and you can see where they're going.



## Map their whereabouts on your mobile phone

Loc8tor GPS lets you see a map of your friend or relative's movements on any computer connected to the internet – laptop, tablet or smartphone – and it works when you're abroad too.



## Accurate to within 16 feet (5m) and unlimited range

Pinpoint your loved one's location using the same technology used to guide cars and other vehicles. Loc8tor GPS uses satellites to keep track of their movements and the GSM cellphone network to report their location to your phone, tablet or laptop.



## SOS Call for help

Ideal for letting a family member or carer know that they are in need of assistance, the Loc8tor GPS has a panic button, which sends an alert via SMS or email when pressed, and can alert up to 4 different people at the same time.

# Wearable Health Monitors

## LegSys

- Quantitative gait analysis in 5 minutes or less
- Wireless wearable system that is portable and easy to use
- Quickly analyze gait without the restraints of a gait laboratory, such as limited walking space
- Proprietary technology validated using state-of-the-art camera-based motion capture
- Automatically generated reports demonstrate patient progress toward measurable goals



# Wearable Health Monitors

## ViSafe

- myViSafe™ is comprised of an application for use on a phone or tablet. Four mini sensors and a desktop dashboard allow you to access and analyse your workplace assessment data. The sensors can be worn on the back and shoulder capturing real-time movement in the workplace.
- myViSafe is the ideal manual handling training platform - employees can see their own movement profile and understand how safely they are moving. The personalised data and the interaction with the wearable technology engages employees like never before.
- More powerful than any classroom manual handling training program, myViSafe brings training to life and empowers employees to take responsibility for their own personal safety.



# Wearable Communication Devices

## Google Glass



# Wearable Safety Devices

## Inflatable Helmet



# Wearable Safety Devices

## Sun Protection



### UVA+B SunFriend® Sun Monitor Instructions:

**Turn ON each day to start daily UV/Sun accumulation.**

**Select your Skin Sensitivity** by holding down the **Set Sens** button. 1 is for the lightest, and/or most sensitive skin and 11 is for the darkest, and/or least sensitive skin. **Start with lower numbers 1-4.** As you become familiar with your own sensitivity, adjust the number accordingly. *Hint: If you experience reddening of the skin after all 11 LEDs have lit up, set your SunFriend® Skin Sensitivity to a lower number the next time you use it.*

**Wear SunFriend face-up on your wrist throughout the day.** Make sure the face is unobscured by clothing. Push the **Check UVA+B** button from time to time to see how your sun exposure is accumulating. When all eleven of your LEDs light up and are flashing, you have had your UV/Sun exposure for the day.

**When finishing, turn OFF.** It is time to apply sunscreen and/or sun block clothing, or to go indoors. Turning SunFriend off also resets it for a new daily exposure. Hold the on/off button for at least 2 seconds, until the lights power down.



# Wearable Safety Devices

## Smart One

The **Smart One** monitors the baby's sleeping position, temperature and movement. The wearable device has wireless connectivity with smart phones allowing the user to view the baby's activity data on their phones. There is an App on the smart phone that will alert the user of any sleeping changes for the baby.





# Wearable Health Monitors

The **SurroSense Rx** system is comprised of pressure-sensing inserts worn inside of your shoes. When dangerous time and pressure thresholds are detected, you're notified via smartwatch. The system also tracks and stores data to give you ongoing insight into what's happening underfoot.



Foot ulcers can occur as a result of loss of protective sensation and coordination of muscle groups in the foot. Diabetic foot lesions are responsible for more hospitalizations than any other complication of diabetes.

# Wearable Health Monitors

## Smart Socks Aim to Avert Amputations

- More than 400 million people around the world have diabetes; about 40 percent of them are unable to feel pain in their feet. That means even tiny wounds or blisters can grow larger and become infected, increasing the risk of foot amputations.
- Siren Socks The socks are made with fabric embedded with commercially available sensors that detect changes in foot temperature—a sign that the appendage is fighting infection. If the temperature rises four degrees or more, the user receives a notification via app that indicates which foot is injured and where. It encourages the wearer to consult a doctor if the problem persists for more than 24 hours.
- Ma believes the socks are just the beginning. The sensor-enabled fabric, she says, could be deployed for innovations such as pressure-sensing sheets or moisture-sensing undergarments. “We’ve been approached by nurses and doctors with their ideas,” she says.



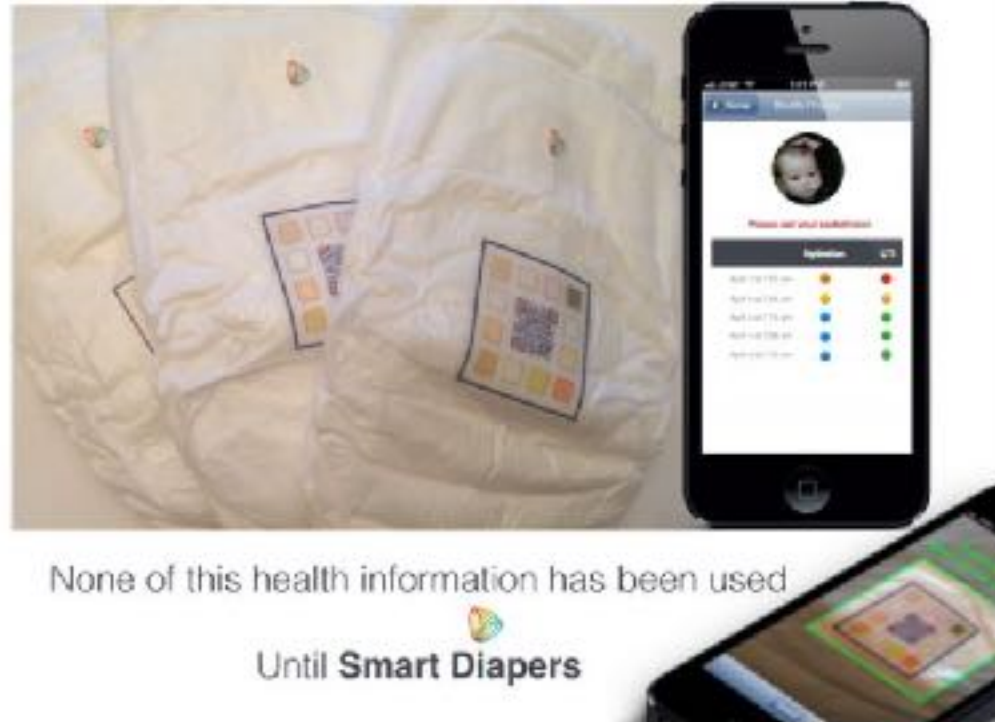
# Wearable Health Monitors

**Smart Diapers** work with an app to keep track of your child's health

Smart Diapers are not meant to report a daily number, but, rather, only speak up in those rare cases when you should contact your physician for follow-up testing.

The data tracked in the first version of Smart Diapers can reveal signs of:

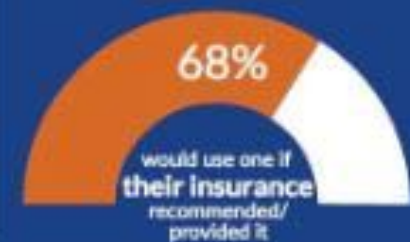
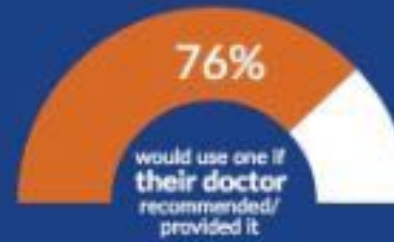
- **Urinary Tract Infection**
- **Prolonged dehydration**
- **Developing kidney problems**



# Postural Devices



What will sway consumers to use wearables for tracking their health or fitness?



# Wearable Health Monitors

## Lumo Lift

- **Get Posture Coaching.**  
Get vibrational reminders for your posture. Option to customize your posture coaching experience through the Lumo Lift App.
- **Set Custom Goals.**  
Set custom daily posture and activity goals to fit your lifestyle.
- **Track your posture and activity.**  
View your posture hours, steps you've taken, distance travelled and calories burned instantly through the home screen of the Lumo Lift App.
- **Track your progress.**  
Gain valuable insights into your daily and hourly progress for both posture and your activity.



# Wearable Health Monitors

## LifeVest

Life Vest wearable defibrillator is worn by patients at risk for sudden cardiac arrest (SCA), providing protection during their changing condition and while permanent SCA risk has not been established.

The LifeVest allows a patient's physician time to assess their long-term arrhythmic risk and make appropriate plans.

The LifeVest is lightweight and easy to wear, allowing patients to return to their common activities of daily living, while having the peace of mind that they are protected from SCA.

The LifeVest continuously monitors the patient's heart and, if a life-threatening heart rhythm is detected, the device delivers a treatment shock to restore normal heart rhythm.



# Wearable Health Monitors

## ViSi Mobile System

ViSi Mobile System, a platform for comprehensive vital signs monitoring that is designed to keep clinicians connected to their patients, whether in or out of bed, or while in transport.

With ViSi Mobile keeping a watchful eye, physicians and nurses have immediate access to vital patient parameters so they can intervene earlier and respond more rapidly - to prevent adverse events and to improve patient safety.

Featuring comfortable body-worn sensors that allow for freedom of movement, the system enables highly accurate, continuous monitoring of all vital signs.

The ViSi Mobile System is able to continuously measure and display all vital signs (ECG, Heart/Pulse Rate, SpO2, Blood Pressure (cuff-based and now also cuffless on a beat-to-beat basis), Respiration Rate, Skin Temperature) with monitoring accuracy and resolution typically found in ICUs.



# Wearable Health Monitors

## Muse

The brain sensing headband is a brain fitness tool that **measures brain signals** much like a heart rate monitor senses your heartbeat. Muse's 7 finely calibrated sensors - 2 on the forehead, 2 behind the ears plus 3 reference sensors - detect and measure the activity of your brain.





# Wearable Health Monitors

## Powerful Relief, Yet Comfortable

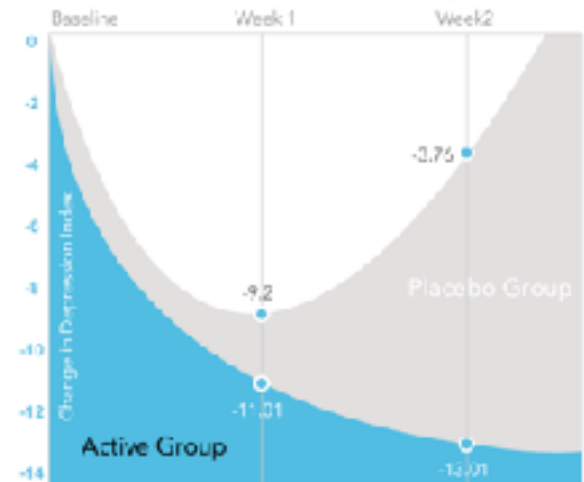
The Fisher Wallace Stimulator® is a portable medical device that comfortably stimulates brain regions responsible for healthy mood and sleep. The device is cleared by the FDA and approved for sale over-the-counter in Europe for the treatment of depression, anxiety and insomnia.



## Medical-Grade Technology

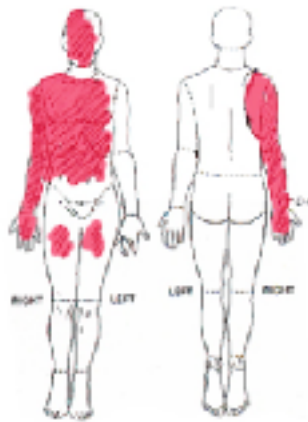
The Fisher Wallace Stimulator® is cleared by the FDA to treat depression, anxiety and insomnia. Used for 20 minutes, once or twice a day, the device works by stimulating the brain to produce serotonin and melatonin while lowering cortisol. The device is comfortable to use and reduces symptoms for the majority of patients within two-to-four weeks of daily use.

Change in Beck Depression Index  
Treatment of Bipolar II Depression  
Clinical Trial Conducted at Mount Sinai Hospital

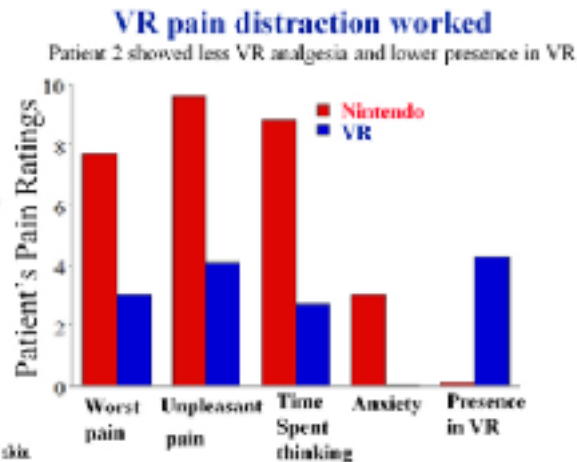


# Wearable Virtual Reality

- Therapy Applications
  - Pain management
  - Motor Learning
  - Balance Training
  - Gait Training
  - Mirror Therapy



Burned area of patient 2, match the unburned skin was harvested for autologous skin graft.



# Wearable Prosthetics

## i-limb hand

### Product Features

- Instant access to 36 grip options and gestures on-the-go.
- Fully automatically rotating thumb.
- my i-limb™ mobile app for a variety of smartphone devices.
- Confidence and accurate reliable control in every day tasks.

### Benefits

- Individually motorised digits offers maximum dexterity and precision.
- Moves like a natural hand
- The i-limb™ ultra revolution enables the user to carry out a wide variety of tasks.
- Multiple control options include muscle signals, mobile Apps & grip chips™.

### Selection Criteria

The i-limb™ ultra revolution is appropriate for patients with a full hand absence who are looking for optimum functionality. A range of full hand solutions with a variety of wrist options are available. Further information is available on [www.touchbionics.com](http://www.touchbionics.com)

### Aesthetics

- Variety of prosthetic cover solutions including 20 colour options, Touch Screen Technology and i-limb™ skin match customised cover.



# Wearable Robotics

## JACO

- Draws power from chair (25w)
- Any controller
- Removable (move to table or stand)
- Weather-proof



# Innovation: TeleRehab

**Tele-rehabilitation** (or e-rehabilitation) is the delivery of rehabilitation services over telecommunication networks and the internet. Most types of services fall into two categories: clinical assessment (the patient's functional abilities in his or her environment), and clinical therapy.

- Improving adherence to prescribed at-home therapy
- Clinical oversight with data collection
- Creates a strong continuum of care model
- Reduced overall costs due to delayed recovery
- Cost effective solution to augment outpatient physical therapy
- Remote access from anywhere, reducing additional lost time from work



## By The Numbers: Tele-Rehabilitation Impact

**2.5x**

More Home Exercise Plans (HEP) than without tele-rehabilitation program yielding improved adherence.

**77%**

Increase in patient adherence yielding faster recovery periods.

**26days**

Average number of days reduced from in outpatient physical therapy alone yielding lower overall costs to employer.

# Innovation: TelePresence

- Claim Benefits
- Cost vs. Functionality
- Cognitive Ability
- Limitations
- Accessibility
- Privacy



# Exoskeletons

- Wellness
- Prevention
- Compliance
- Post Injury
- Quality of Life
- Lifestyle
- Independence
- Functionality
- Environment

**82%**  
OF USERS BELIEVE  
WEARABLE TECH HAS  
**ENHANCED**  
THEIR LIVES



# Exoskeletons

## Indego® by Parker Hannifin

- **Patient Requirements**

- **Height Range:** 5'1" – 6'3"
- **Maximum Weight:** 250 lbs
- **Maximum Hip Width:** 16.6"
- **Femur Length:** 14" – 18.5"
- **Level of Injury:** C5 or lower
- **Spasticity Score:** Modified Ashworth score 3 or lower
- **Strength:** Sufficient upper body and balance





# Exoskeleton Talking Points

Below bullet points are areas of focus to bring this amazing high tech wearable technology product into workers compensation. These are critical areas to ensure that the expected outcomes are met for the injured worker and ultimately the employer.

- **Exoskeletons to Injury**
  - a. Paraplegic
  - b. Quadriplegic
  - c. Acquired Brain Injury
  - d. Bariatric
- **Assessment Process**
  - a. Safety and Accessibility
  - b. Claimant Capabilities
  - c. Measurements
  - d. Demonstrations Value
- **Criteria Requirements for injured**
  - a. Clinical Justifications
  - b. Single Function Devices
  - c. Claimant size
  - d. Claimant Injury Level
  - e. HCPC Codes

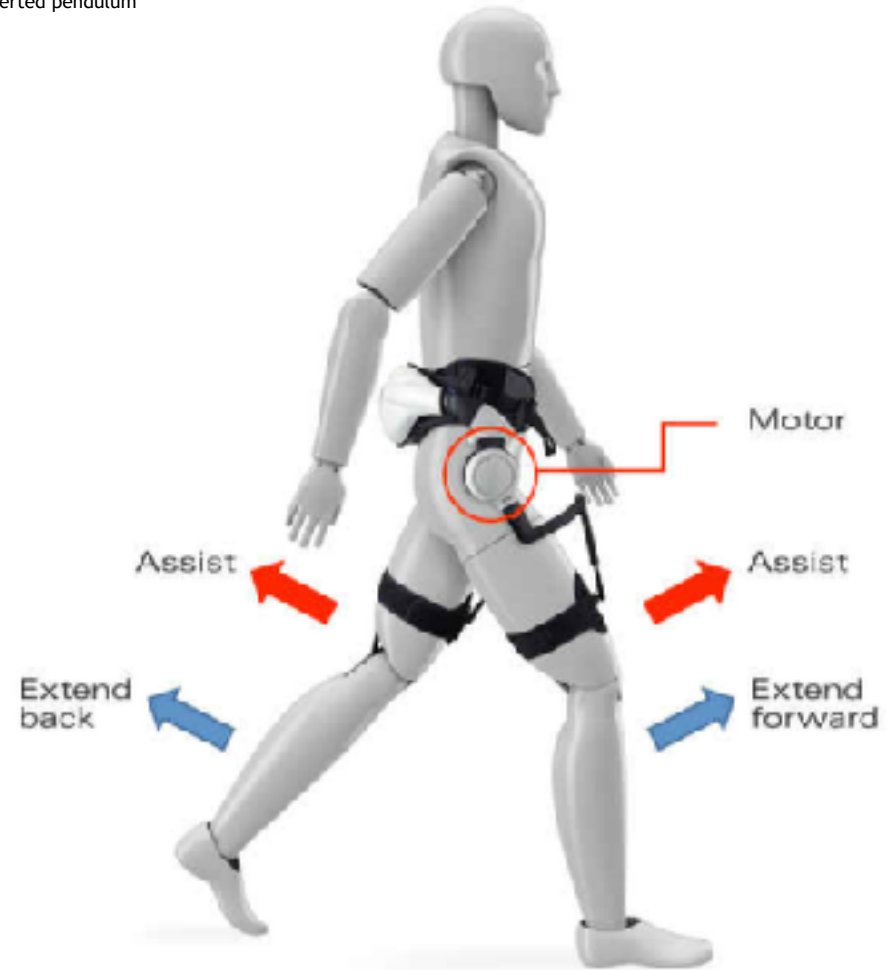


- **Risk and Claim Strategies**
  - a. Falls
  - b. Wounds
  - c. Medical Cost Projections
  - d. Reserve Setting
  - e. Structured Settlement total medical spend on claim
  - f. Life Care Plans
- **Exoskeletons**
  - a. Types
  - b. Industry Cost
  - c. Functional capabilities
  - d. Facility awareness
- **Mobility**
  - a. Current Equipment
  - b. Home Modifications
  - c. Transportation of Device

# Exoskeletons

## Honda Walking Assist

The Walking Assist Device features a function to influence the user to achieve efficient walking based on the inverted pendulum model, which is a theory of bipedal walking, and is designed as a device to be used in the training of walking.



# The Future

## Where do we go from here?



**MC10 Biostamp**

Smart sensing sticker worn like a temporary face tattoo.

Can sense how our bodies work: data from the heart, the brain, muscles, body temperature - even hydration levels.

Will launch in 2014



Entirely new form factors for electronics

# Thank you.

**Zack Craft**

**ATS,ATP,CRTS,CAPS,CEAC,RTS**

VP National Product Leader DME-Complex Care

Rehab Engineer

[zack\\_craft@onecallcm.com](mailto:zack_craft@onecallcm.com) | 1.800.848.1989

