



THE POWER OF **CONNECTED**

# Medical Device Industry Overview

E-Learning course PDF

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Honeywell Safety and Productively Solutions  
703 Rodi Road, Pittsburgh, PA 15235  
(412) 829-8145  
fax (412) 829-0972  
<http://www.vocollectvoice.com>

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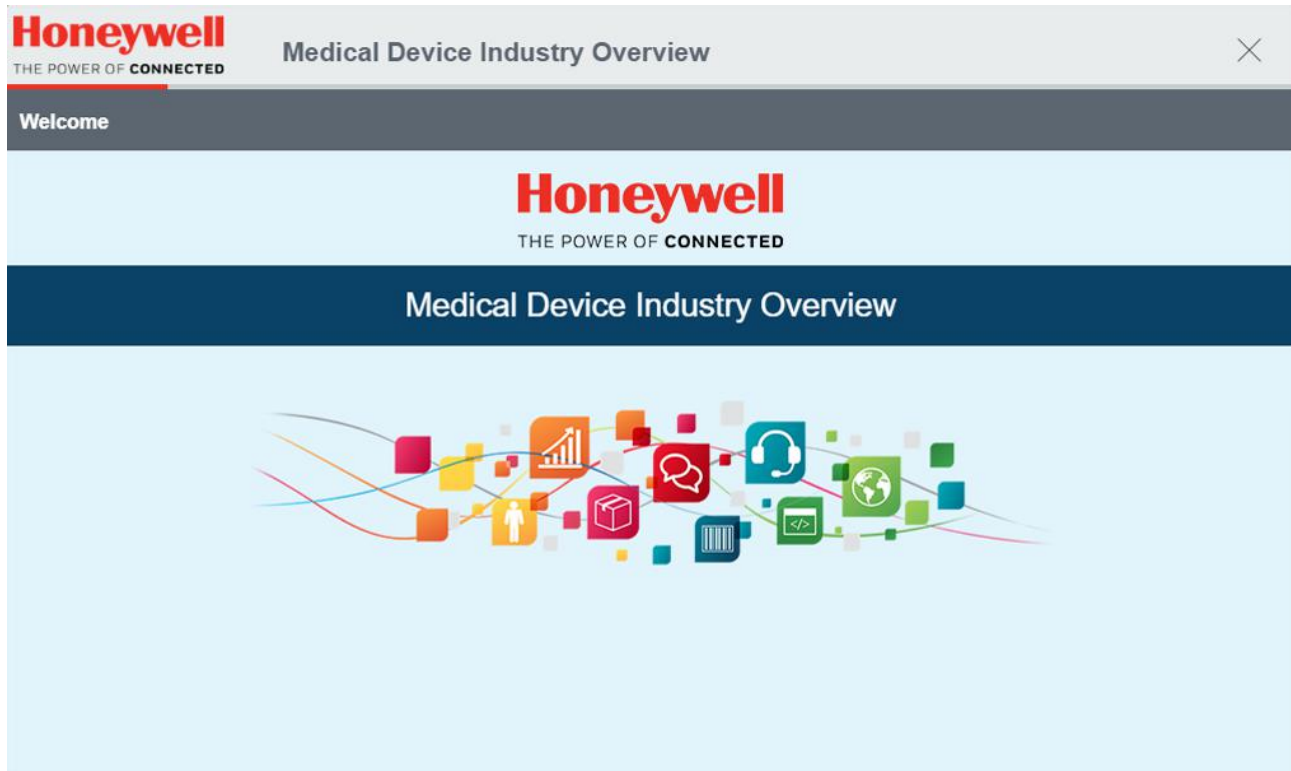
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## Introduction

### Welcome



Hello and welcome to the Medical Device Industry Overview course. This course introduces trends and technological changes that influence the medical device industry and the role of Internet of Things, or IOT in the evolution of this industry.

## Course Objective



### Medical Device Industry Overview



#### Course objectives

After completing this course, you will be able to:

- > Describe how trends/advances are relevant to sensor products
- > Identify industry shift to consumer-like behavior
- > Describe the impact of Internet of Things (IOT) on medical equipment
- > List applications relevant to Honeywell



After completing this course, you will be able to:

- Describe how medical device industry trends and technological advances are relevant to sensors,
- Identify how this is shifting to consumer-like behaviors,
- Describe the impact of Internet of Things, or IOT, on medical equipment, and
- List medical applications relevant to Honeywell 's sensor portfolio

## Medical Devices move to the home



### Medical Device Industry Overview



#### Medical devices move to the home

Select each label below to learn more.

##### 1. Hemodialysis

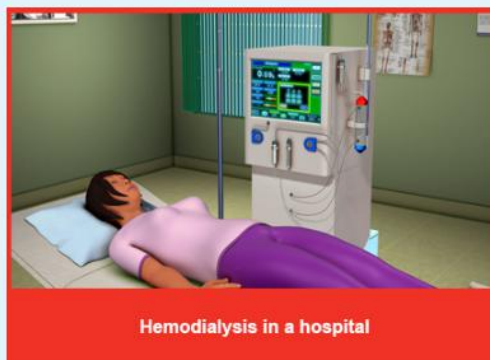
##### 2. Peritoneal dialysis

For the dialysis treatment:

Would you prefer taking it in a hospital or at home?

Would you prefer travelling to the hospital multiple times to take it?

Would you prefer the use of needles or a surgically implanted catheter?



## Hemodialysis

Treatment models that were once limited to facilities are now available in other settings, thanks to technology. As a result, medical devices are becoming more portable and accessible for everyone. For example, look at dialysis. Dialysis removes impurities from blood when a patient's kidneys are unable to perform this critical, life-sustaining function.

Would you prefer travelling to a facility multiple times every week for treatment or have treatment performed in your home?

Would you prefer needles or a surgically implanted catheter?

Today, critical, life sustaining treatments like dialysis are moving to the home environment. Rather than traveling to a hospital or clinic three to four times a week for hemodialysis, where a needle and tubing connect the patient to a machine that cleans and returns the blood to the patient, many people are now able to have dialysis performed in the comfort of their own homes. This is called peritoneal dialysis.

## Peritoneal dialysis



### Medical Device Industry Overview



#### Medical devices move to the home

Select each label below to learn more.

##### 1. Hemodialysis

##### 2. Peritoneal dialysis

Peritoneal dialysis:

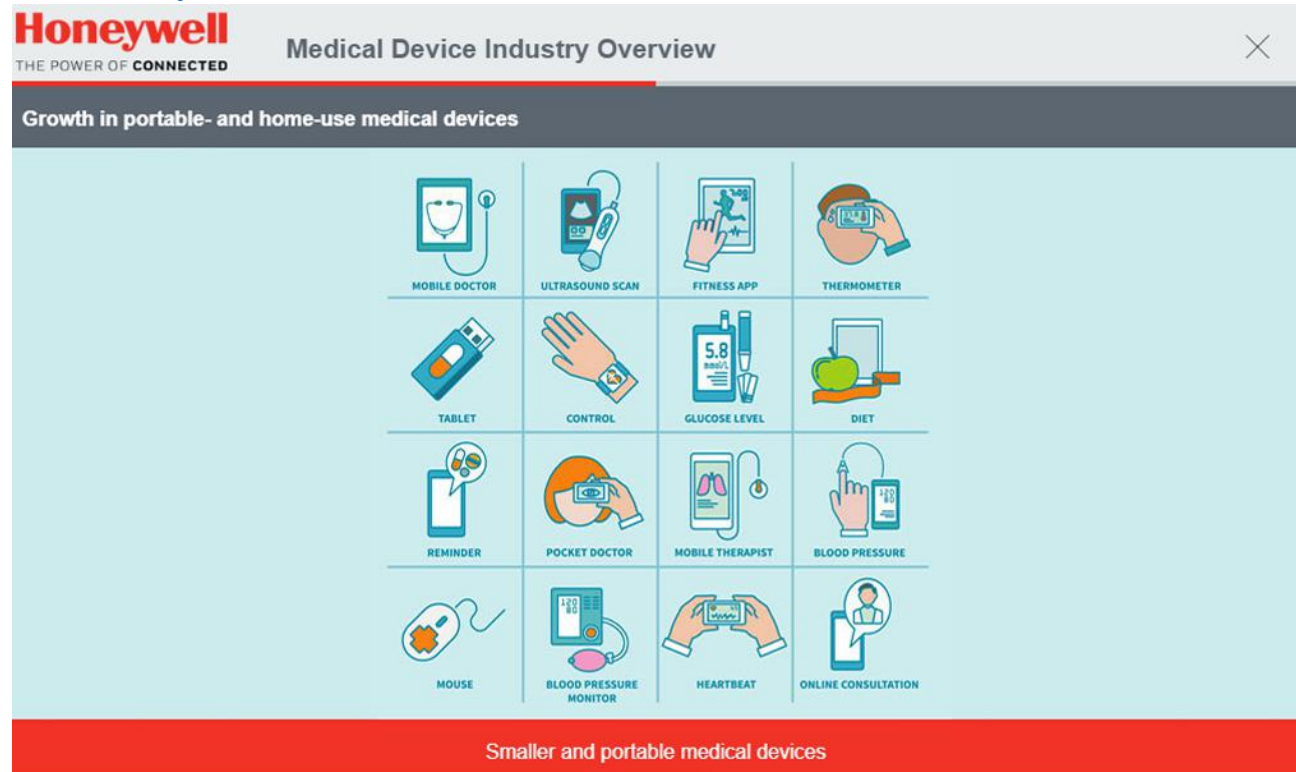
- > Blood return or removal not required
- > Self-administered, at-home treatment
- > Travel, needles, and nurse support not required



Peritoneal dialysis at home

Peritoneal dialysis doesn't require blood removal or return. The patient uses the catheter to administer fluid into the abdomen. This fluid removes impurities from the blood and then drains into a collection bag. Peritoneal dialysis eliminates the need to travel to a clinic, use needles, or obtain nurse support.

## Growth in portable- and home-use medical devices



Diagnostics, monitoring, and even treatments are moving to the home environment where possible, as it reduces healthcare costs and is more convenient for the patient.

For years, devices like glucometers, heart rate, and blood pressure monitors have been available in the home. More advanced versions of these devices transmit vital sign data from a patient's home to clinicians, enabling real-time monitoring of a patient's health.

More advanced treatment devices, like dialysis machines, sleep apnea machines, infusion pumps, and oxygen concentrators are available in the home environment.

All of these devices utilize some kind of sensor. For example, blood pressure monitors use pressure sensors. Peritoneal dialysis machines use pressure sensors and temperature sensors. Infusion pumps use force sensors.

Honeywell is poised to take advantage of increased sales volume in the sensor market from the growth in home-based medical devices.



## Internet of things- connected medical equipment



### Medical Device Industry Overview



#### Internet of things—connected medical equipment

##### Internet of Things (IOT)

- › Supports medical equipment connection to the Internet
- › Facilitates retrieval and analysis of medical data
- › Enables real-time data monitoring
- › Enhances capabilities of mobile equipment

##### Specifications:



Medical devices are becoming more connected.

The proliferation of medical devices with embedded sensors, combined with existing connectivity infrastructure, has fostered a dramatic increase in health-related applications and real-time data monitoring. This, in turn, fuels the development of additional connected devices.

Honeywell has various sensor offerings, many with industry-leading, small-size, and power-consumption features, making them ideally suited to mobile and connected devices. Let's take a look.

## Target/focus medical applications



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

Respiratory

Diagnostic/analytical equipment

Hospital hardware

Dental equipment

Surgical instruments

Patient monitoring systems

Infusion pumps



Medical devices are used in a wide span of medical applications. Honeywell offers a variety of sensors and switches focused on eight medical applications with high win rates. Note that these aren't the only areas we can sell into, but these are the focus areas. We do sell into some devices that are outside of the eight target/focus medical applications.

## Kidney dialysis machines



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

Respiratory

Diagnostic/analytical equipment

Hospital hardware

Dental equipment

Surgical instruments

Patient monitoring systems

Infusion pumps

- Replaces some kidney functions
- Removes bloodstream waste and fluid through
  - Diffusion
  - Osmosis of solutes and fluid
- Examples of medical equipment:
  - Hemodialysis machines
  - Peritoneal dialysis machines



Kidney dialysis machine

A kidney dialysis machine is used to replace some kidney functions by removing waste and fluid from the bloodstream via diffusion and osmosis of solutes and fluid across a semi-permeable dialysis membrane. Peritoneal dialysis and hemodialysis machines are examples of medical equipment in this category.

## Respiratory



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

**Respiratory**

Diagnostic/analytical equipment

Hospital hardware

Dental equipment

Surgical instruments

Patient monitoring systems

Infusion pumps

- Detect/corrects respiratory interruptions
- Examples of medical equipment:
  - Anesthesia delivery systems
  - Ventilator
  - Spirometer
  - Continuous Positive Airway Pressure (CPAP) machine



Respiratory applications

The respiratory medical application represents a set of medical equipment responsible for uninterrupted respiration, that is, inhale of oxygen and exhale of carbon dioxide from the human body. Sensors are used to detect any interruptions in the airflow to and from the body.

Some examples of medical equipment in this category include anesthesia delivery systems, ventilators, spirometers to measure lung function, and Continuous Positive Airway Pressure, or CPAP machines for sleep apnea.

## Diagnostic/analytical equipment



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

Respiratory

**Diagnostic/analytical equipment**

Hospital hardware

Dental equipment

Surgical instruments

Patient monitoring systems

Infusion pumps

- **Provide data to:**
  - Diagnose diseases
  - Facilitate decision making
  - Monitor health
- **Examples of medical equipment:**
  - Blood analyzer
  - Chemistry analyzer



Diagnostic/analytical equipment

Diagnostic and analytical equipment is used to diagnose diseases, make treatment decisions, and to monitor patients.

Some examples of medical equipment in this category include blood analyzers and chemistry analyzers.

## Hospital hardware



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

Respiratory

Diagnostic/analytical equipment

**Hospital hardware**

Dental equipment

Surgical instruments

Patient monitoring systems

Infusion pumps

- **Facilitate smooth hospital operations**
- **Examples of medical equipment:**
  - Sterilizers
  - Blood storage refrigerators
  - Autoclaves
  - Incubators
  - Hospital beds
  - Medication dispensing cabinets



Hospital hardware

Hospital hardware facilitates smooth hospital operations and patient care.

Some examples of medical equipment in this category include sterilizers, blood storage refrigerators, autoclaves, incubators, hospital beds, medication dispensing cabinets etc.

## Dental equipment



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

Respiratory

Diagnostic/analytical equipment

Hospital hardware

**Dental equipment**

Surgical instruments

Patient monitoring systems

Infusion pumps

- Facilitate smooth dental operations
- Regulate motion control and positioning
- Examples of medical equipment:
  - Dental imaging systems
  - Dental chairs
  - Pressure-operated dental instrument—drills, water sprays, and air blasters



Dental equipment

Dental equipment uses sensors for position control of dental chairs and pressure monitoring of fluid or air.

Some examples of medical equipment in this category include dental imaging systems, dental chairs, and pressure-operated dental instruments including drills, water sprays, and air blasters.



## Surgical instruments



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

Respiratory

Diagnostic/analytical equipment

Hospital hardware

Dental equipment

**Surgical instruments**

Patient monitoring systems

Infusion pumps

- **Ensure patient safety**
  - Regulate movement of air and gas
  - Maintain precise pressure and force levels
- **Examples of medical equipment:**
  - Orthopedic bone drills
  - Endoscopes



Surgical instruments

Surgical instruments use sensors to regulate the movement of air, gas, or fluids to maintain precise levels of pressure and force in surgical instruments.

Some examples of medical equipment in this category include orthopedic bone drills, endoscopes, and surgical fluid management systems.



## Patient monitoring systems



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

Respiratory

Diagnostic/analytical equipment

Hospital hardware

Dental equipment

Surgical instruments

Patient monitoring systems

Infusion pumps

- **Facilitate health monitoring**
  - Regulate airflow pressure
  - Monitor blood pressure
  - Monitor temperature
- **Examples of medical equipment:**
  - Blood pressure monitors
  - Blood glucose monitors
  - Respiratory monitors
  - Temperature monitors



Patient monitoring systems

Patient monitoring equipment is used in operating rooms, emergency rooms, intensive care units, and patients' homes to monitor and display vital signs of patients' health conditions, such as blood pressure, blood glucose, respiration, temperature etc. This data enables doctors and medical practitioners to make treatment decisions.

Some examples of medical equipment in this category include patient monitoring, blood pressure and blood glucose monitoring, respiratory monitoring, and temperature monitoring.

## Infusion pumps



### Medical Device Industry Overview



#### Target/focus medical applications

Select each medical application to learn more about it.

Kidney dialysis machines

Respiratory

Diagnostic/analytical equipment

Hospital hardware

Dental equipment

Surgical instruments

Patient monitoring systems

Infusion pumps

- **Ensure delivery of fluids**
  - Uninterrupted
  - Accurate
  - Controlled
- **Detect occlusion or blockage**
- **Examples of infusion pumps:**
  - High-volume infusion pumps
  - Insulin pumps
  - Syringe pumps



Infusion pumps

Infusion pumps are used to deliver fluids, such as nutrients or medications, into a patient's body accurately and in a controlled manner. Sensors are used to monitor for occlusion or blockage preventing the delivery of fluids to the patient.

Some examples of medical equipment in this category include high-volume infusion pumps, insulin pumps, and syringe pumps.

## Course Summary



### Medical Device Industry Overview



#### Course summary

In this course, you learned that:

1. Medical devices are becoming smaller, portable, and personalized.
2. Small portable devices drive increased demand for sensors.
3. IOT makes gathering medical data for current and future analysis an effortless activity.
4. Eight medical applications aligned to Honeywell product offerings are:
  - Kidney dialysis machines
  - Respiratory
  - Infusion pumps
  - Diagnostic/analytical equipment
  - Patient monitoring systems
  - Hospital hardware
  - Surgical equipment
  - Dental equipment

In this course, you learned that:

Medical devices have become smaller, portable, and personalized offering people convenience of operating and using them in the home environment.

Small portable devices mean increased opportunities in the sensor sales market.

Internet of things, or IOT, has made gathering medical data for current and future analysis an effortless activity through digitization and interconnectivity of medical devices.

There are eight medical applications aligned to Honeywell product offerings including: kidney dialysis machines, respiratory, infusion pumps, diagnostic or analytical equipment, patient monitoring systems, hospital hardware, surgical equipment, and dental equipment.