MARKET RESEARCH NOTE

Wireless wellbeing: How Bluetooth® technology is at the heart of healthcare transformation

Bluetooth®

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Executive summary

Bluetooth is transforming how we care for ourselves and each other by empowering healthcare systems, caregivers, and individuals alike. From seniors regaining peace of mind with wearable fall detection to parents monitoring their premature newborn's vital signs while they sleep to clinicians relying on real-time data to make informed decisions, Bluetooth is reimagining real-world health challenges across consumer, clinical, and public health spaces, helping create a world where healthier lives are within reach for everyone.

This paper looks at how Bluetooth® technology is playing a central role in empowering wellness and personal care through a range of well-being wearables and dedicated personal and remote patient monitoring devices. It also highlights how Bluetooth is transforming patient care by enabling safer, cleaner, more efficient healthcare facilities, as well as creating healthier and more comfortable spaces thanks to the deployment of wireless sensors, networked lighting control, and wider human-centered building design incentives.

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As senior research director for ABI Research's strategic technologies team, Andrew conducts research into the rapidly changing wireless connectivity market, with an emphasis on market forecasts and qualitative insight covering Bluetooth technology, Wi-Fi, 802.15.4, near-field communications (NFC), HaLow, WiGig, and other emerging wireless standards and protocols. Andrew also writes reports on the technological evolution and long-term prospects for wireless connectivity technologies, particularly as they increasingly target new verticals across the Internet of Things (IoT).

Introduction

Healthcare systems around the globe face enormous challenges. Growing demands on healthcare services, rising costs, chronic underfunding, dated healthcare infrastructure, uneven provision, long-term backlogs, and wider impacts from the COVID-19 pandemic have all exposed an increasing number of frailties across the sector.

Demographic shifts, including an ageing population (many of whom are living with serious health problems), are expected to place additional burdens on already stretched healthcare services. According to the CDC, six in ten Americans have at least one chronic disease, including heart disease, cancer, and diabetes, which are the leading causes of death and disability in the United States, as well as the primary driver of the $4.9 trillion annual healthcare spend in 2023. Meanwhile, according to the World Health Organization (WHO), adult obesity has more than doubled since 1990, while adolescent obesity has quadrupled. With the proportion of the world's population over 60 years doubling from 12 percent in 2015 to 22 percent by 2050, according to the WHO, these challenges are expected to become increasingly acute over the next couple of decades.

Many healthcare providers are also suffering from widespread staff shortages, reducing the quality of care, placing additional stress on existing staff, and increasing the risk of burnout. In addition to the need for new recruitment, there is a growing risk of losing experienced healthcare personnel in the coming years, and the WHO estimates that there will be a shortfall of 11 million health workers by 2030. To meet these growing challenges, various healthcare services around the world are continuing to increase their healthcare spending as a proportion of their GDP, an approach that is not sustainable in the longer term.

Making the world a healthier place through the growing availability and utilization of digital healthcare technologies (wearables, remote patient monitoring and diagnostics devices, telehealth systems, etc.), more efficient healthcare facilities, and the creation of healthier environments will be fundamental to successful health outcomes in the coming decades.

Thanks to its diverse member ecosystem, ubiquitous presence in mobile and computing devices, strong presence in healthcare wireless infrastructure, support for small form factors, low power consumption, strong security, and continued technological innovation, Bluetooth is uniquely placed at the heart of healthcare transformation and will play a vital role in increasing healthcare resilience in the years to come.

Empowering wellness and personal care

Bluetooth® technology is helping us take control of our health and well-being, enabling real-time monitoring of key health metrics to provide the insights we need to make proactive health decisions and empowering us to lead healthier, more engaged lives.

Fitness and wellness tracking

Bluetooth® technology has enabled the availability of a wide range of wearable devices, including smartwatches, fitness bands, and smart rings, that are capable of monitoring multiple fitness and wellness metrics. These include the ability to measure activities, heart rate, sleep quality, stress levels, blood oxygen levels, and skin temperature, among other variables.

Smartwatches

250M

Bluetooth® enabled smartwatches will ship annually by 2030

Source: ABI Research, 2025

By 2030, nearly 250 million Bluetooth® enabled smartwatches are expected to ship annually. Devices from Apple, Google, Huawei, Samsung, and Xiaomi, among many others, all offer the ability to track an increasing number of health metrics, enabling continuous monitoring and real-time synchronization with Bluetooth® enabled smartphones and health apps. This allows users to stay proactive about and optimize their fitness goals and activities, have better visibility into their overall health, make informed lifestyle and care decisions, discover potential health issues, and prevent any existing issues from worsening.

Smart rings

70M

Bluetooth® enabled smart rings will ship annually by 2030

Source: ABI Research, 2025

Meanwhile, in recent years, Bluetooth has enabled a new category of smart ring devices from the likes of Oura and Samsung, among others. Due to their small form factors, these devices can support more discreet tracking of various activities and health metrics while still supporting up to a week of battery life on average. ABI Research expects this to be one of the fastest-growing segments for wearable devices, achieving a 27 percent CAGR between 2025 and 2030, with annual shipments expected to reach over 70 million units by 2030.

Activity and health trackers

387M

Bluetooth® fitness trackers will ship annually by 2030

Source: ABI Research, 2025

In addition to smartwatches, thanks to the low-power capabilities of Bluetooth® technology, these wearables can come in increasingly small form factors while offering impressive battery lifespans, enabling users to wear them continuously to receive more precise insights, whether exercising, working, relaxing, or sleeping. For example, some of the latest Bluetooth® wrist-worn activity and health trackers are designed to be worn 24/7 and support a 14-day battery life while capturing data points every single second.

Increasingly, these wearable devices are blurring the lines with dedicated health monitoring devices, adding new capabilities and receiving clearances from organizations such as the US Food and Drug Administration (FDA). For example, for several years, multiple smartwatches and companion health apps from the likes of Apple, Garmin, Fitbit, and Samsung have received FDA clearance to detect atrial fibrillation (AFib). Similarly, Samsung and Apple have both recently received authorization from the FDA for their ability to detect signs of sleep apnea. Meanwhile, Google recently received FDA approval for Loss of Pulse Detection on its Google Pixel Watch 3, enabling the ability to automatically call emergency services after detecting a loss of pulse from primary cardiac arrest, respiratory or circulatory failure, overdose, or poisoning. These features are in addition to a range of other health and safety features, such as fall detection or car crash detection.

Conversely, there is also a range of healthcare-centric smartwatches that have emerged in recent years, such as the Withings ScanWatch Nova, a hybrid smartwatch that combines multiple sensors and a 30-day battery life for advanced healthcare tracking. Likewise, the Happy Ring from Happy Health is a smart ring that has been cleared to diagnose obstructive sleep apnea, insomnia, and other sleep-related conditions in the home, alongside 24/7 physiological monitoring.

Bluetooth is uniquely placed to address these devices thanks to its low power consumption, ability to support small form factors, and widespread presence in smartphones to enable data sharing to companion apps. In total, Bluetooth® enabled smartwatches, activity trackers, smart clothing, and smart rings are forecasted to reach over 387 million annual device shipments by 2030.

Personal health monitoring and remote patient monitoring

Bluetooth® technology has enabled an enormous range of personal healthcare devices (PHDs) and remote patient monitoring (RPM) solutions that empower users to manage chronic conditions independently. These medical-grade solutions are also capable of sharing real-time health data with healthcare providers for better telehealth and remote care, ensuring that healthcare providers have access to up-to-date patient information to deliver timely, personalized care. This proactive care reduces the need for frequent in-person visits, facilitates early intervention, and reduces the strain on healthcare systems while promoting healthier outcomes for patients.

60M

Bluetooth® home health monitoring devices will ship annually by 2029

Source: ABI Research, 2025

Continuous glucose monitors (CGMs)

In recent years, there has been a rapid expansion in the availability of Bluetooth® continuous glucose monitors. These devices can provide 24/7 monitoring of blood sugar levels to help users with diabetes manage their symptoms more effectively, provide better visibility into trends and patterns throughout the day and night, receive alerts when levels are too high or too low, and share this information with healthcare providers. Notable vendors include Dexcom, Abbott, Medtronic, i-SENS, SiBionics, and Roche, among others. According to ABI Research, tens of millions of Bluetooth® CGMs are already shipping annually, and with the recent availability of over-the-counter (OTC) solutions, this is likely to accelerate further in the coming years Meanwhile, many traditional blood glucose monitors, such as the ReliOn™ Premier BLU Blood Glucose Meter and GlucoRx Nexus Blue, also come equipped with Bluetooth® technology to connect with companion apps for more effective data tracking.

Insulin delivery systems

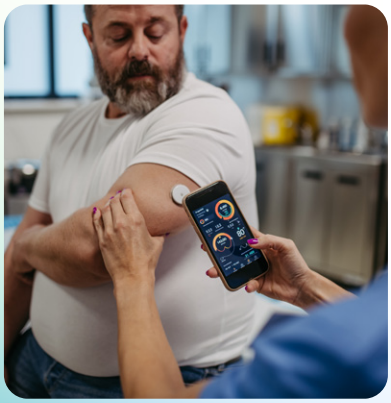
In addition to CGMs, Bluetooth® connectivity is also being leveraged for diabetes management in the form of smart insulin pens and automated insulin pumps. Smart insulin pens, such as the Medtronic InPen™, connect via Bluetooth® technology to a mobile app to calculate the ideal insulin dose using glucose levels and carbohydrate estimates as well as automatically logging doses and sending reminders. The app can also enable the sharing of reports with healthcare providers to provide tailored management. Meanwhile, several insulin delivery systems combine CGMs with smart insulin pumps to automatically adjust insulin delivery to prevent highs and lows and avoid the need to have multiple daily injections. Some examples include the Insulet Omnipod® 5, and the Medtronic MiniMed™ 780G, among others. These solutions can help to ensure a higher time-in-range (TIR) percentage to reduce complications while also making management of their conditions considerably easier.

Electrocardiogram (ECG) devices

Personal, portable, and wearable electrocardiogram (ECG) devices can monitor and detect potential cardiac issues such as atrial fibrillation, bradycardia, or tachycardia. These devices can send data to the user's smartphone or a medical professional administering the reading, enabling faster and more accurate in-home readings from patients and visiting medical professionals alike. Notable examples include the AliveCor KardiaMobile and the Movesense Medical sensor, among many others.

Blood pressure monitors

Blood pressure monitors from the Omron, Withings, and many others connect to companion apps via Bluetooth® technology to track the latest measurements and share readings with healthcare professionals. In addition to hypertension, several of these devices can also help to track irregular heartbeats and atrial fibrillation.



Pulse oximeters

Other personal and remote patient monitoring devices include pulse oximeters. These are typically battery-powered, portable, fingertip-worn solutions that can provide accurate readings of blood oxygen (SpO2) and pulse rate. Some notable examples include the Nonin Model 3230 and the ChoiceMMed MD300CI218 Bluetooth® Finger Pulse Oximeter, among various others from Beurer and Wellue (Shenzhen Viatom Technology Co., Ltd.). Meanwhile, new ring form factors, such as the Wellue PO2 Wearable Ring Pulse Oximeter, are designed to be worn while sleeping to enable more comfort while still supporting up to 16 hours of battery life. Additionally, innovative ear-worn pulse oximeters from the likes of OxiWear offer a more discreet solution that can provide continuous oxygen monitoring and low oxygen alerts even while completing activities.

Respiratory health devices

Other Bluetooth® enabled healthcare devices target respiratory issues. For example, handheld spirometers from the likes of Contec Medical Systems and Aluna, among others, can detect lung function changes for patients with various conditions, potentially enabling caregivers to intervene before hospitalizations are necessary. Meanwhile, others have developed chest-worn wearables that can directly measure respiration for those with COPD and congestive heart failure. In addition, coin-sized wearable stethoscope solutions can enable continuous respiratory monitoring by sending lung sounds to a gateway device via Bluetooth® connectivity, enabling patients and healthcare professionals to monitor and detect early signs of respiratory distress. Related to this, smart inhaler devices and sensors such as the Hailie® Sensor can attach to existing inhalers and record medication usage to the Hailie® App via Bluetooth® technology, giving caregivers greater insights into how to improve health outcomes.

Sleep therapy solutions

Many CPAP and BiPap machines also leverage Bluetooth® technology to transmit sleep data to companion apps to track their progress in addressing conditions such as sleep apnea. For example,
devices such as the Resmed AirSense 11 series and AirMini portable CPAP machines, the Philips DreamStation CPAP & BiPAP, and the F&P SleepStyle CPAP all utilize embedded Bluetooth® technology to connect to their respective apps for remote configuration, optimization, training, analytics, and various other features.

Fertility, pregnancy, and postnatal healthcare devices

Bluetooth® technology is also being used in many fertility, pregnancy, and postnatal healthcare products. For example, Beurer's OT30 is a digital ovulation thermometer that shares data with an app via Bluetooth® connectivity, which can identify fertile and non-fertile days. In addition to this, other Bluetooth® devices have been developed to monitor fetal health during pregnancy. One example is the Novii+ Wireless Patch System from GE Healthcare, an abdomen-worn wearable patch that connects to a Bluetooth® enabled pod, which collects and transmits the data to a receiver device. Smart clothing solutions, such as the Owlet Dream Sock, wrap around the foot of a baby to provide real-time monitoring of different metrics, including pulse rate, oxygen levels, and sleep patterns. Immediate alerts can be sent if any potential issues are detected. Alongside this, there are multiple Bluetooth® enabled smart breast pumps from the likes of Medela, Ardo, Elvie, and others that enable users to track their sessions, monitor milk supplies, and control the device remotely.

Connected health appliances, dispensers, and accessories

In addition to these enormously varied solutions, there are also a whole host of other Bluetooth® connected devices, appliances, and products that are used to provide better healthcare outcomes. This includes smart thermometers that sync with apps to track temperature measurements, connected toothbrushes that track brushing habits and motivate regular brushing, and smart weighing scales that automatically track weight and can share updates with a remote patient monitoring platform. Meanwhile, smart medication dispensers can help to reduce the estimated $300B in healthcare costs associated with poor medication adherence.

These devices all take advantage of the small form factor, low power consumption, and ability for Bluetooth® technology to connect to mobile devices and healthcare hubs that can offload data to various remote patient monitoring platforms and healthcare providers. Meanwhile, the Bluetooth Special Interest Group (SIG) has published a set of specifications, known as the Generic Health Sensor (GHS) Profile, that standardizes the approach in which sensor data is collected from personal health devices (PHDs) when used for remote patient monitoring (RPM). With its arrival comes much greater potential availability of PHDs that can be recommended by healthcare providers for RPM. Work on this standard was conducted within the Bluetooth SIG Medical Devices (MED) Working Group, and Bluetooth SIG member companies are encouraged to join and get involved with this multi-vendor interoperable Bluetooth® standard. These Bluetooth® enabled personal health monitoring and remote patient monitoring devices are set to achieve a 28 percent CAGR between 2025 and 2030, highlighting the strong growth opportunity over the next few years.

Hearing assistance

Bluetooth® technology plays a vital role in improving hearing health, a crucial but often overlooked part of overall wellness that influences mental health, cognitive function, and social engagement. By providing seamless connectivity between hearing instruments and other personal devices like smartphones, laptops, and televisions and increased access to assistive audio in public spaces, Bluetooth helps people with hearing loss stay connected and engaged with their communities, supporting better communication and enriching lives.

34M

Bluetooth® enabled prescription hearing aids and OTC hearing aids will ship annually by 2030

Source: ABI Research, 2025

Recent Bluetooth® innovations, such as Bluetooth® LE Audio and Auracast™ broadcast audio, have brought significant enhancements to the assistive listening space. With Auracast™ broadcast audio, Bluetooth® devices can now broadcast audio to an unlimited number of in-range devices in private and public spaces, enabling greater accessibility, improved audio quality, and new user experiences. Over the last 12 months, the number of Auracast™ broadcast audio-capable solutions arriving on the market has accelerated significantly. These solutions, including transmitters, receivers, and assistant devices, are paving the way for increased hearing accessibility within both public and private arenas. Some examples of real-world Auracast™ locations can be found on the Bluetooth SIG website.

ABI Research expects Auracast™ broadcast audio to become a standard feature within the majority of Bluetooth® enabled audio devices, and, with nearly 3.5 billion Bluetooth® LE Audio-enabled device shipments by 2030 alone, Auracast™ broadcast audio is set to revolutionize the audio and assistive listening landscape. The recent increase in the availability of these solutions is very encouraging and will rapidly expand the potential of assistive listening technology over the next decade. For more information on the role of Bluetooth® technology in hearing assistance and enabling a more accessible world, please see the recently published When connection becomes inclusion: How Bluetooth® is redefining accessibility market research note.

Improving patient care

Bluetooth is transforming patient care by supporting more proactive, efficient, and connected healthcare where both patients and providers benefit from real-time insights, improved workflow, and stronger connections between care teams and patients. By supporting real-time monitoring and optimizing resource management and facility operations, Bluetooth® technology is helping healthcare providers deliver more proactive, personalized care like never before, leading to better patient outcomes and healthier lives.

Patient and equipment tracking

Healthcare facilities of all types use Bluetooth® technology to enable real-time tracking of patients and critical medical equipment, minimizing delays and ensuring that resources are always where they are needed most, when they are needed most, to accelerate emergency response times. Bluetooth® patient trackers can also be used to help prevent wandering in eldercare settings, enhancing patient safety and giving caregivers peace of mind to know that vulnerable individuals can be quickly located in case of emergency.

Real-time locating systems (RTLS)

For many years, Bluetooth® technology has enabled real-time locating systems across a wide range of healthcare settings, including hospitals, clinics, nursing homes, and outpatient facilities. These solutions can achieve enormous operational efficiencies, significantly reduce the prevalence of lost or stolen assets, and improve patient well-being, safety, wait times, and overall satisfaction. Over time, the Bluetooth® suite of positioning features has evolved significantly, with angle of arrival (AoA) and angle of departure (AoD) positioning techniques, also known as Bluetooth® Direction Finding, now enabling device direction alongside centimeter-level location accuracy.

In addition to dedicated RTLS infrastructure, Bluetooth® positioning capabilities are also embedded within many Wi-Fi access points deployed in healthcare settings. These can enable a more seamless rollout of Bluetooth® Location Services. Meanwhile, the prevalence of low-power

Bluetooth® enabled tags, badges, wearables, and other trackable devices can support active monitoring for up to several years, reducing the cost of maintenance and simplifying management. Many vendors also provide wearable bracelets for use in care facilities to prevent patient wandering. Some of these also include SOS buttons alongside continuous vital sign monitoring. There are many RTLS solution providers on the market that leverage Bluetooth® connectivity as a core technology within the healthcare sector. These include the likes of Kontakt.io, Cognosis, Minew, Quuppa, Advantech, BlueUp, Blueiot, and Zebra, among many others. These vendors offer a range of Bluetooth® RTLS tags, badges, and wearables for patients, staff, and equipment monitoring applications. These solutions are often small, lightweight, inexpensive, and can typically provide multiple years of battery life. Some examples of RTLS deployments in healthcare settings include the following:

- Cognosos, an RTLS solution provider for the healthcare industry, deployed a Bluetooth® based RTLS solution in a pediatric hospital wanting to reduce their expenditure on rented assets caused by limited asset visibility. Thanks to an already deployed Bluetooth® wayfinding solution, 90 percent of the facility was already covered, making additional infrastructure rollout less expensive and complex. As part of the rollout, 4,000 assets, including pumps, modules, ventilators computer carts, wheelchairs, and beds, were equipped with Bluetooth® tags, and the hospital is now able to track their room-level position in real time. This resulted in a $1 million annual saving thanks to preventing lost equipment, reducing their equipment rental costs alongside their annual equipment budget.

- Kontakt.io, a provider of AI-powered real-time-location systems (RTLS) for healthcare settings, deployed a complete RTLS solution at Riverside Medical Center, a 300-bed hospital in Kankakee, IL. The hospital was seeking to find a better way to locate medical equipment, alongside being able to track patients whose treatment had been completed, prevent patient elopement, and avoid patients entering restricted or dangerous areas of the facility. The rollout included Bluetooth® gateways, asset tracking tags, and patient wristbands, and enabled caregivers to locate assets and patient locations as well as be notified if they left a designated area.

According to ABI Research, Bluetooth® RTLS deployments within healthcare settings are expected to grow significantly in the coming years, reaching over 70,000 facilities by 2030.

70K

Bluetooth® RTLS deployments in healthcare settings by 2030

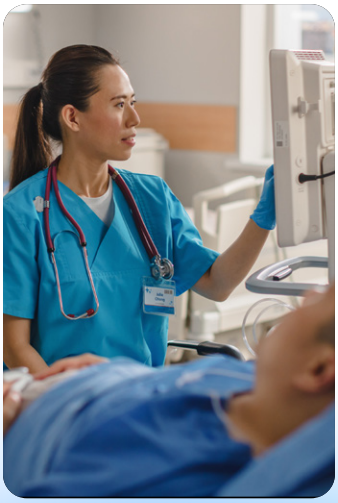
Source: ABI Research, 2025

Healthcare facility management

Bluetooth® technology helps healthcare facilities maintain a safer, more efficient environment by automating sanitation monitoring, guiding patients and staff to optimal paths, and ensuring hygiene compliance — ultimately improving facility operations, reducing infection risks, and allowing caregivers to focus on delivering compassionate, patient-centered care.

Staff safety solutions

In addition to patient safety, Bluetooth® technology is also vital in protecting the safety of healthcare staff. The 2024 National Health Service (NHS) staff survey reported that over 14 percent of staff had experienced at least one incident of physical violence from patients, service users, relatives, or other members of the public over a 12-month period. Badges or wearables that can track the location of personnel can also be equipped with panic buttons to enable them to summon help and share their location with a single button press. Several RTLS vendors have developed and deployed Bluetooth® workplace violence prevention solutions within healthcare settings.



Hygiene compliance solutions

Bluetooth® connectivity can also play a vital role in helping to enforce hand-hygiene compliance. According to the World Health Organization (WHO), healthcare associated infections (HAI) still cause complications in five to ten percent of admissions to acute-care hospitals in developed countries, while in the US alone there are at least 80,000 related fatalities a year, equating to 200 deaths per day. In addition to staff safety benefits, personnel badges can also help to monitor, encourage, and automate reporting of hand hygiene compliance. One such deployment from Quuppa in the University of Fukui Hospital in Japan resulted in a 300-percent increase in hand-hygiene compliance while attending to patients. Bluetooth® technology also played a key role in enabling the safe return to offices, commercial buildings, public spaces, and public venues post COVID-19, more information on which can be found in the How Bluetooth® technology is enabling safe return strategies in a COVID-19 era market research note.

Indoor navigation

RTLS deployments can also be combined with indoor wayfinding applications to enable patients, visitors, and healthcare personnel to efficiently get to their destination, saving staff time and reducing the chance of missed appointments or delays in care, as well as improving visitor satisfaction. In many healthcare settings, facilities can also benefit from existing Bluetooth® enabled networking infrastructure from the likes of Cisco, HPE, Huawei, Ruckus (ARRIS), and many others, to help streamline deployment and reduce the infrastructure capex of these solutions.

Creating healthier spaces

Bluetooth® technology is not just about personal health — it also helps create spaces that foster better health and improve the well-being of individuals and communities alike. By improving air quality, optimizing energy use, and ensuring health and safety compliance, Bluetooth® technology helps enable spaces to provide cleaner, more comfortable environments that foster better health and well-being.

An open letter organized by the International WELL Building Institute (IWBI), the global authority on healthy buildings, highlighted the benefits of revising building policies to be in alignment with public health goals, with a potential 101 percent improvement in cognitive function, supporting employee productivity benefits up to $7,500 per person per year, alongside a potential $200 billion annual productivity gain corresponding to a 20 percent to 50 percent reduction in sick building syndrome symptoms. This refers to buildings where occupants experience a range of symptoms causing discomfort and illness while working in them.

Air-quality monitoring

Bluetooth® sensors are widely deployed in smart buildings and urban spaces to monitor air quality in real time. These sensors track pollutants, allergens, and CO2 levels, providing essential data to help building managers optimize ventilation and filtration systems. By ensuring indoor air quality meets health standards, Bluetooth® reduces the risk of respiratory issues and promotes greater comfort for occupants.

Leading networking infrastructure vendors, such as Cisco Meraki, provide a range of Bluetooth® indoor air-quality sensors as part of its MT portfolio that are capable of monitoring CO2, PM2.5, TVOC, temperature, humidity, vape fumes, and ambient noise across a wide range of environments. Some of these are battery powered, enabling up to five years of battery life, and can seamlessly connect to their Bluetooth® enabled access points and gateways. These can help to enable safer, healthier, and less disruptive educational and working environments for staff, students, and other personnel.

Human-centered building design

Bluetooth® technology helps optimize energy usage in buildings, which not only benefits the environment but also enhances the comfort of visitors and occupants. Bluetooth® sensors regulate heating, cooling, and lighting systems based on occupancy and environmental conditions, ensuring that spaces remain comfortable without wasting energy. By maintaining appropriate temperature and lighting levels, these human-centric systems help reduce stress and fatigue, contributing to the well-being and productivity of those spending time in these spaces.

28%

improvement in working conditions through proper lighting

Source: Bosch

Occupancy and environmental sensors

For example, the Yealink RoomSensor is a compact, enterprise-level Bluetooth® sensor that comes equipped with occupancy, ambient light, humidity, and temperature sensors for use within meeting rooms. Thanks to Bluetooth, the device is battery powered and can easily be deployed without rewiring. Meanwhile, the ability to connect with other IoT devices and the Yealink Workspace Management Platform can enable it to automatically reserve and release rooms, switch lighting on or off, and adjust the temperature based on occupancy. The solution can also support larger rooms via multiple sensors using Bluetooth® Mesh Networking.

46M

Bluetooth® Networked Lighting Control devices will ship annually by 2030

Source: ABI Research, 2025

Networked lighting control

Commercial smart lighting is a significant contributor to human-centered building design incentives, and a wide range of research has proven the benefits of optimal lighting conditions in improving vision, increasing productivity and alertness, enhancing sleep quality and relaxation, accelerating patient recovery, and reducing stress, depending on the needs of the specific environment. According to Bosch, a 28 percent improvement in working conditions can be brought about by proper lighting. The arrival of Bluetooth® Network Lighting Control (NLC), a full-stack standard for wireless lighting control, has accelerated adoption of secure, reliable, and interoperable Bluetooth® NLC solutions from the likes of Silvair, DANLERS, Luceco, Inventronics, and Sylvania Group, among others. These can play a critical role in optimizing lighting to the specific requirements of each building, while also reducing energy consumption.

The Bluetooth SIG recently adopted the Bluetooth HVAC Integration NLC Profile. This specification standardizes how occupancy data from NLC systems is exchanged with thermostats, enabling greater HVAC automation via Bluetooth® NLC. In addition, there is a growing range of Bluetooth® Mesh Networking qualified lighting products that can enable scalable, interoperable networked lighting control and sensing across a range of building types. Bluetooth® NLC solutions, including sensors, switches, controllers, and luminaires, are forecasted to achieve a 15 percent CAGR between 2025 and 2030.

Building health management and compliance

By automating the monitoring of sanitation, occupancy, and environmental factors, Bluetooth® sensors alert facility managers when cleaning is needed or when crowding exceeds safe levels, ensuring that spaces stay healthy and meet health and safety compliance standards. In urban settings, those same sensors can also enable environmental monitoring systems to measure noise pollution and other environmental factors, contributing to healthier public spaces and safer, more comfortable environments for everyone.

Some connected washroom solutions leverage Bluetooth® Mesh Networking to provide real-time monitoring, control, and maintenance of restroom assets such as faucets, soap dispensers, urinals, toilets, doors, water mains, and paper dispensers. These Bluetooth® NLC-equiped fixtures can be used to optimize replenishment, improve staff productivity, reduce downtime, and create more healthy and hygienic environments. Similarly, the CWS smartMate IoT solution leverages Bluetooth® enabled paper and soap dispensers to enable personnel to monitor fill levels, battery life, and control settings via an app.

How Bluetooth is uniquely positioned to enable a healthier world

Bluetooth® technology is being leveraged in an increasingly diverse range of healthcare applications. These are directly addressing some of the major challenges facing service providers while enabling new devices that can promote healthier lifestyles, improve quality of care, make healthcare more accessible, deepen the relationship between patients and caregivers outside of hospital settings, and improve staff and patient safety. There are many characteristics of Bluetooth® technology that make it the ideal technology for enabling healthcare products, including:

- **Low power consumption:** Many healthcare products come in extremely small form factors with limited battery sizes. As a result, the ultra-low power benefits of Bluetooth® technology uniquely position it to enable hours, days, or months of operation. This enables users to use their products for longer, the creation of ultra-compact monitoring solutions, and swifter deployment and greater flexibility when installing smart building sensors.
- **A comprehensive suite of location capabilities:** Bluetooth technology can support multiple positioning techniques, including RSSI, direction finding, and channel sounding, offering a versatile portfolio of location-enabled devices that can be tailored to the specific enterprise requirements. This can include more comprehensive RTLS installations, basic beacon functionality, or proximity-based interactions for equipment tracking, patient and worker safety, indoor wayfinding, hygiene compliance, and other valuable use cases.
- **Inexpensive solutions for disposables:** Thanks to the availability of low-cost Bluetooth® chipsets, a variety of ultra-compact, disposable solutions can help track a broader range of assets. Meanwhile, new ultra-thin sticker tags can enable tracking of everyday healthcare items and assets, while smart labels equipped with motion, humidity, and temperature sensors can also help with wider healthcare supply chain monitoring.
- **Ubiquitous presence in mobile and computing devices:** Many healthcare products require connectivity to PCs, smartphones, or tablets to enable a variety of functions, including data transfer, firmware updates, remote configuration, diagnostics, remote control, and activity tracking. Bluetooth® technology's ubiquitous presence in these devices means it is uniquely positioned to enable these solutions.
- **Strong presence in healthcare wireless infrastructure:** Many enterprise and healthcare wireless access points and gateways already come equipped with Bluetooth® technology. This presence can enable swifter deployments of location services, sensor networks, and patient monitoring devices, reducing the burden of investing in new infrastructure.

- **Continued technology innovation:** Bluetooth® technology continues to evolve and add new features and capabilities, many of which will benefit the future development of healthcare products. The continued evolution of Bluetooth® NLC solutions, Bluetooth® Mesh Networking, positioning technologies, and the standardization of healthcare-related profiles are just a few examples.
- **A diverse member ecosystem:** The competitive and ever-growing ecosystem of Bluetooth® IC vendors and other solution providers continue to drive improvements on other key metrics, such as power consumption, robustness, size, and range, providing enhanced flexibility and convenience for users of healthcare products. These are enabling a growing number of manufacturers to create new healthcare products and bring innovative experiences to users faced with a wide range of health challenges.

This paper has demonstrated just a few notable examples of how Bluetooth® technology is enabling a healthier world, but this is by no means an exhaustive list. New products are emerging on a regular basis, and, with healthcare challenges expected to become more acute over the next few decades, the range of healthcare products will become even more diverse. While these are good initial steps, there is still much work to be done to support a healthier world, and product manufacturers should investigate the role that Bluetooth® technology can play in enabling next-generation healthcare products and experiences as the market opportunities grow.

Bluetooth market research community

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