

"Shifting Dynamics of the Health Market: From Traditional Medicines to Innovative Patches"

- Trisha

Abstract – This research paper provides insight into the relative revenue growth and growth drivers of the markets for insulin injections and the wearable glucose patch. The insulin injection market has the benefits of established products and consistent demand. As a result, it has a direct revenue generating model based on sales volume and sales price. The market for wearable glucose patches is new and innovative; therefore, it has a diverse and dynamic revenue generating model based on technology, market regulation, and patient uptake.

For each market, a theoretical revenue model is constructed based on market size, growth rate, and price. The revenue model for insulin injections is based on cost and market saturation to predict revenue growth. In contrast, the revenue model for the wearable glucose patch incorporates revenue potential, cycles of innovative technology, and market adoption to predict revenue growth.

Key Words: Wearable, Insulin, Patches, Market

1. INTRODUCTION:

Health impacts every facet of life, driving one's living standards, productivity, and even lifespan. Many people interpret health purely as the absence of disease. According to the World Health Organization, health also includes complete physical, mental and social wellness. With great and rapid changes of the world today, including urbanization, dealing with obesity, diabetes and other chronic diseases, sustaining wellness permanent vigilance, preventive strategies and sophisticated health care systems.

Healthcare systems cannot operate without medical devices. From the most rudimentary cum primary devices like thermometer, stethoscope, and sphygmomanometer, to the most sophisticated ones like imaging system, pacemakers, portable dialysis machines, and health trackers, every device helps someone somewhere in the world. The achievement of modern devices makes the work of clinicians and the demands of patients more exact, safer, and more efficient.

The provision of medical devices, especially during the COVID-19 pandemic, had to transgress their traditional hospital and clinic settings. Patients and even healthy individual can now use devices to monitor their health forecast. Portable health monitoring devices and wearable health sensors makes it easy to track health patterns. Prevention health care has become easy and more convenient. The shift of conventional health care practices towards preventive measures has been greatly facilitated by health technologies.

2. HEALTH AND MEDICAL EQUIPMENT:

The integration of health and medical equipment forms the very basis of contemporary healthcare systems and underpins prevention, diagnosis, treatment, and rehabilitation. Health equipment refers to an assortment of tools and devices that promote general well-being, personal health tracking, and daily wellness, while medical equipment is of a more specialized nature and is primarily used for therapeutics. The two categories are interdependent, proving that healthcare is accessible to the public even outside of hospitals and clinics, and is streamlined into everyday life.

Health equipment comprises devices that monitor health, like thermometers, fitness trackers, digital weighing scales, and pulse oximeters, which encourage the individual to become conscious of their health and detect any abnormalities early on, thus allowing for lifestyle changes to be made. Nobody can argue that medical equipment is more complex, advanced, and specialized, as it includes imaging systems, ventilators, insulin pumps, and pacemakers, which require supervision of a medical professional for diagnosis and treatment. The two sets of devices used together illustrate a continuum of care that personal monitoring and life-saving medical interventions provide.

Technology rapidly advances, and the health equipment/ medical equipment lines become even more undefined.

3. DIABETES HEALTHCARE DEVICES:

Healthcare's value in developing technologies for diabetes care cannot be overstated since diabetes is one of the most common global health conditions. Initially glucose level monitoring required finger prick tests. While these tests provided accurate metrics, their invasive nature and the resultant discomfort led to reluctance in monitoring glucose levels frequently. Modern glucose level monitoring technologies address these concerns by offering non-invasive and continuous testing.

Even though glucometers allow for home testing, patients must still actively perform these tasks. Continuous glucose monitors (CGMs) and wearable glucose monitors have changed this by using minimally invasive sensors to measure interstitial fluid glucose levels. These devices offer patients real-time and historical glucose level data, helping them identify problematic trends in their data. These devices take the monitoring even further by offering alerts so patients can real-time respond to dangerous hypo- and hyperglycemia. Smart glucose patches have even more advanced features, combining glucose monitoring and drug delivery to automated deliver insulin when glucose levels rise. These devices take pancreas monitoring and drug delivery to modern diabetes patients.

Moreover, most currently available sugar trackers combine with smartphones and cloud services enabling users to send information to practitioners to obtain tailored suggestions. Such connected devices enhance self-management as well as facilitate preventive approaches to health care. The changing sugar equipment and trackers highlight how the technology used in the care of diabetes is becoming better, more precise, and less invasive. Most importantly, the devices more the monitors empowering the patients to control their health and, in turn, enhance their lives both in the present and in the future.

4. DEVICES TO MEASURE GLUCOSE LEVELS:

- **Glucometer (Finger-Prick Device):**
 1. Uses a drop of blood from fingertip.
 2. Portable, affordable, and widely used.
 3. Accurate but invasive and uncomfortable for frequent use.
- **Flash Glucose Monitoring System:**
 1. Sensor worn on the arm; glucose checked by scanning with a reader or smartphone.
 2. Less invasive, convenient, and provides trend data.
 3. Does not give automatic alerts like CGMs.
- **Smart Patches (Experimental/Advanced):**
 1. Use microneedles or biosensors to detect glucose through interstitial fluid or sweat.
 2. Some patches integrate insulin delivery, acting like an artificial pancreas.
 3. Non-invasive or minimally invasive, still in development.
- **Continuous Glucose Monitor (CGM):**
 1. Small sensor inserted under the skin measures glucose in interstitial fluid.
 2. Provides continuous, real-time data with alerts for high/low glucose.
 3. Reduces need for multiple finger pricks but can be costly.
- **Wearable Smartwatches & Trackers (Emerging):**
 1. Aim to measure glucose using optical sensors or sweat analysis.
 2. Non-invasive and user-friendly.
 3. Still under research, not widely available for medical use yet.

5. INSULIN DELIVERY DEVICES AND INJECTION MARKET:

The global insulin delivery devices market is experiencing steady growth, increasing from \$11.5 billion in 2018 to an expected \$28.1 billion by 2030. This expansion is largely driven by the rising prevalence of diabetes worldwide, advancements in technology, and growing patient preference for convenient and effective methods of insulin administration. Between 2018 and 2023, the market grew from \$11.5 billion to \$16.4 billion, reflecting a compound annual

growth rate (CAGR) of around 7.4 percent. From 2023 to 2030, it is projected to rise further to \$28.1 billion, with an anticipated CAGR of about 8.2 percent, showing accelerated adoption of modern insulin delivery technologies.

The main factors contributing to this growth include the increasing number of diabetes patients caused by aging populations, obesity, and lifestyle changes. There is also a clear shift toward home-based care, with patients adopting insulin pens, pumps, and wearable patches for greater convenience and better disease management. Technological innovations such as smart insulin pens, patch pumps, and integration with digital health tools are enhancing compliance and efficiency. Growing awareness, educational campaigns, and improved access to healthcare in emerging markets such as Asia-Pacific and Latin America are also driving demand.

Despite these opportunities, the market faces challenges such as the high cost of advanced devices, regulatory barriers that slow down new product launches, and patient reluctance in some regions to switch from traditional methods due to fear of needles or lack of awareness.

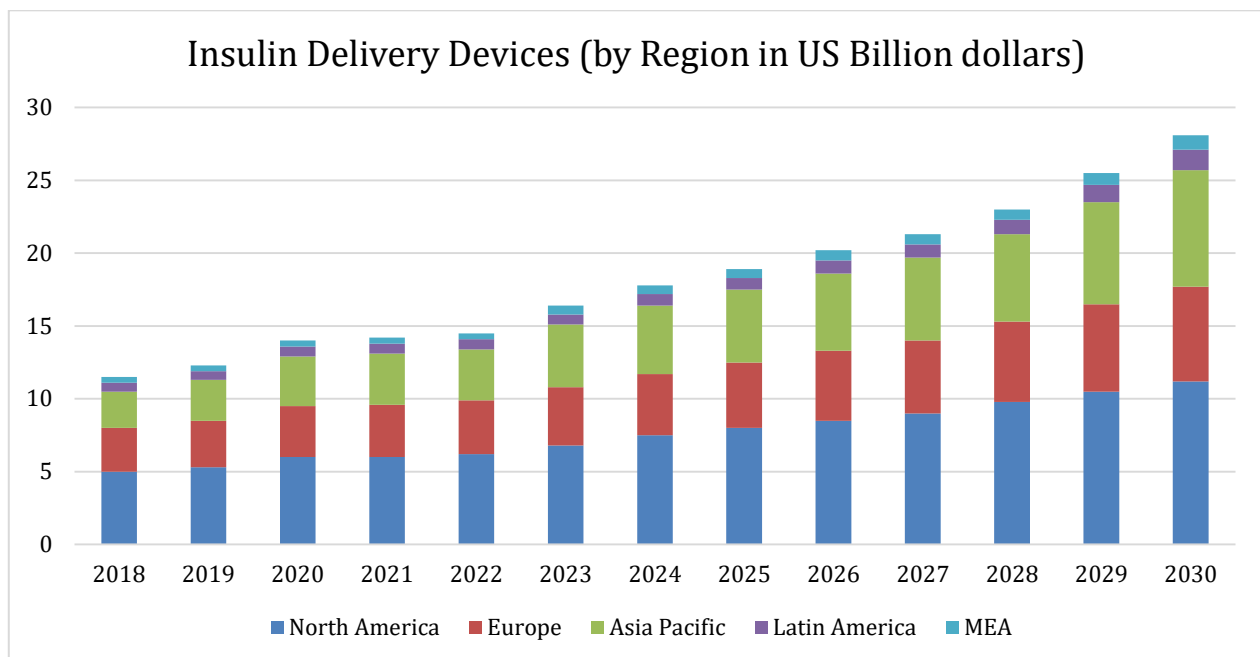
Regionally, North America holds the largest share of the market due to advanced healthcare infrastructure and early adoption of technology, while Europe follows closely with strong government healthcare policies. Asia-Pacific is the fastest growing region, supported by a large diabetic population and rapid improvements in healthcare access. Latin America and the Middle East & Africa contribute smaller shares but are expected to expand steadily.

By 2030, the insulin delivery devices market is set to nearly double compared to 2023. The future will be shaped by wearable technologies such as insulin patches and pumps, deeper integration with mobile health applications, personalized diabetes care, and broader availability of devices in developing economies.

Year	North America	Europe	Asia Pacific	Latin America	MEA	Total Market Size
2018	5	3	2.5	0.6	0.4	11.5
2019	5.3	3.2	2.8	0.6	0.4	12.3
2020	6	3.5	3.4	0.7	0.4	14
2021	6	3.6	3.5	0.7	0.4	14.2
2022	6.2	3.7	3.5	0.7	0.4	14.5
2023	6.8	4	4.3	0.7	0.6	16.4
2024	7.5	4.2	4.7	0.8	0.6	17.8
2025	8	4.5	5	0.8	0.6	18.7
2026	8.5	4.8	5.3	0.9	0.7	19.8
2027	9	5	5.7	0.9	0.7	21
2028	9.8	5.5	6	1	0.7	23
2029	10.5	6	7	1.2	0.8	25.5
2030	11.2	6.5	8	1.4	1	28.1

Table 1: Market Size of Insulin Delivery Devices by Region from 2018 to 2030

Source: <https://www.grandviewresearch.com/industry-analysis/insulin-delivery-devices-market>



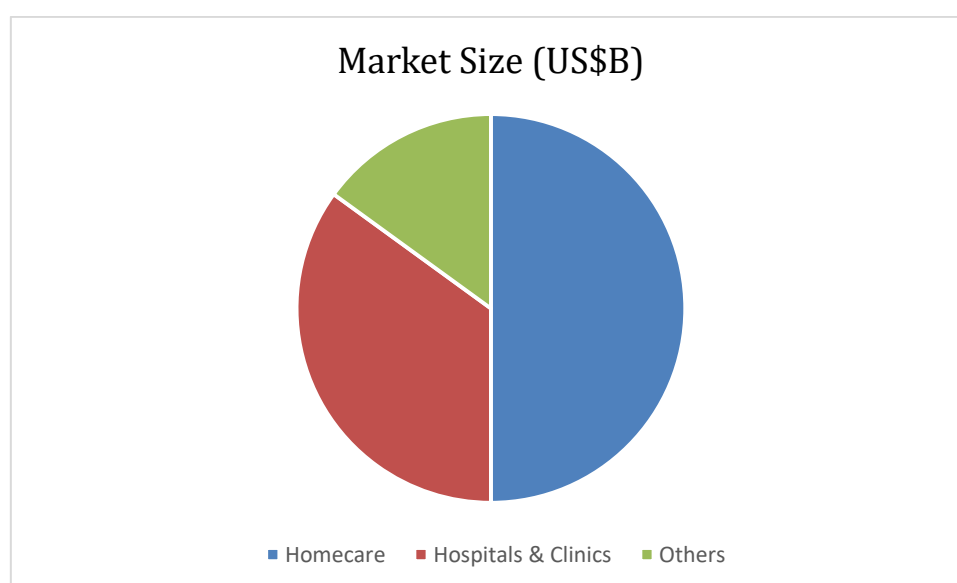
Graph 1: Market Size of Insulin Delivery Devices by Region from 2018 to 2030

Source: <https://www.grandviewresearch.com/industry-analysis/insulin-delivery-devices-market>

End-use Segment	Market Size (US\$B)	Share (%)
Homecare	8.2	50
Hospitals & Clinics	5.74	35
Others	2.46	15
Total	16.4	100

Table 2: Market Size of Insulin Delivery Devices by End users from 2018 to 2030

Source: <https://www.grandviewresearch.com/industry-analysis/insulin-delivery-devices-market>



Graph 2: Market Size of Insulin Delivery Devices by End users from 2018 to 2030

Source: <https://www.grandviewresearch.com/industry-analysis/insulin-delivery-devices-market>

6. WEARABLE SUGAR PATCHES MARKET:

The wearable patch market is rapidly expanding as medical technology advances and the demand for remote and personalized healthcare grows. Wearable patches are skin-applied devices that can monitor vital health parameters, deliver medications, or both. They are used in applications such as glucose monitoring, cardiac monitoring, temperature measurement, and fitness tracking. These devices offer a less invasive and more convenient alternative to traditional medical equipment, allowing patients to manage their health in daily life and enabling healthcare providers to access real-time data for better decision-making.

Key points of the wearable patch market include

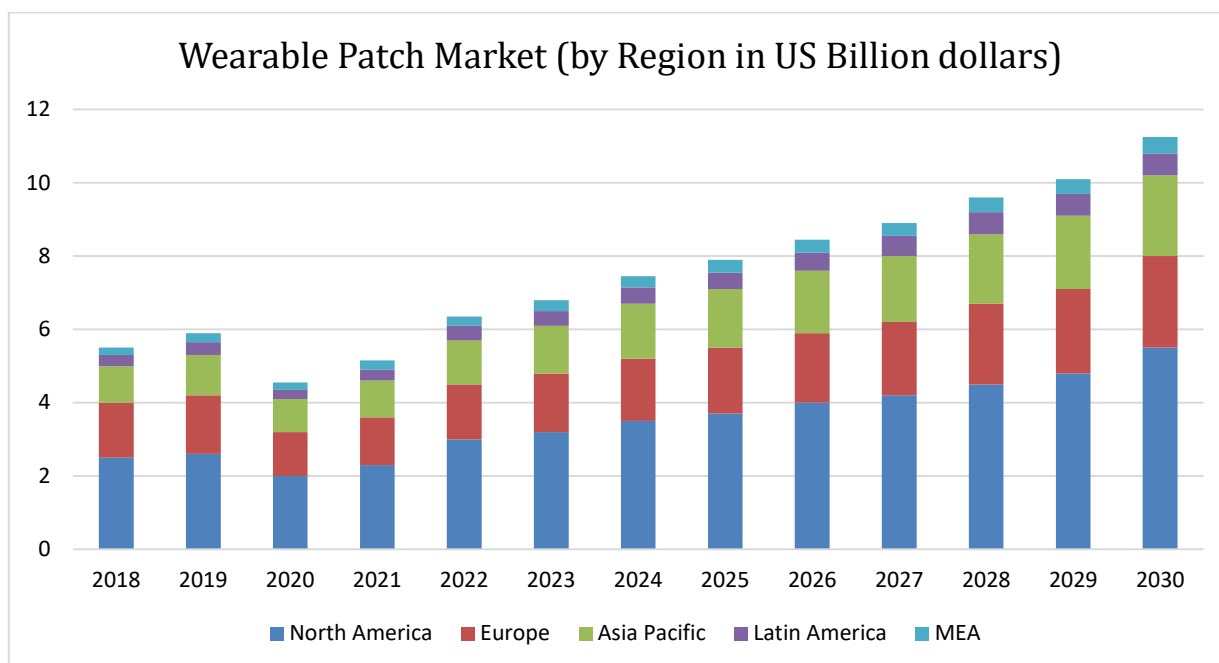
- Global market valuation in 2024 is approximately USD 10 billion, expected to reach USD 15–26 billion by 2030–2035 with a CAGR of 8–10.5%
- Smart connected patches dominate the market, offering real-time monitoring and wireless connectivity
- Applications in healthcare, chronic disease management, and home-based care drive the largest market share
- North America is the leading region, while Asia-Pacific shows the highest growth potential due to rising chronic disease prevalence and improving healthcare infrastructure
- Smart glucose patches are a fast-growing segment, valued around USD 1.14 billion in 2024, projected to grow at a CAGR of 17–18% to reach approximately USD 5 billion by 2033
- Major players include Abbott Laboratories, Medtronic, Dexcom, iRhythm Technologies, Insulet Corporation, VivaLNK, and VitalConnect
- Market trends include miniaturization, flexible and skin-compatible materials, multi-parameter monitoring, AI integration for predictive alerts, and improved connectivity
- Challenges involve ensuring accuracy, biocompatibility, battery life, comfort, cost, regulatory approvals, and data security

The wearable patch market represents a significant opportunity for innovation in patient-centered healthcare, enabling continuous monitoring, reducing hospital visits, and improving disease management outcomes, especially in chronic conditions like diabetes.

Year	North America	Europe	Asia Pacific	Latin America	MEA	Total
2018	2.5	1.5	1	0.3	0.2	5.5
2019	2.6	1.6	1.1	0.35	0.25	5.9
2020	2	1.2	0.9	0.25	0.2	4.55
2021	2.3	1.3	1	0.3	0.25	5.15
2022	3	1.5	1.2	0.4	0.25	6.35
2023	3.2	1.6	1.3	0.4	0.3	6.8
2024	3.5	1.7	1.5	0.45	0.3	7.45
2025	3.7	1.8	1.6	0.45	0.35	7.9
2026	4	1.9	1.7	0.5	0.35	8.45
2027	4.2	2	1.8	0.55	0.35	8.9
2028	4.5	2.2	1.9	0.6	0.4	9.6
2029	4.8	2.3	2	0.6	0.4	10.1
2030	5.5	2.5	2.2	0.6	0.45	11.3

Table 3: Market Size Wearable Sugar Patches Market by region from 2018 to 2030

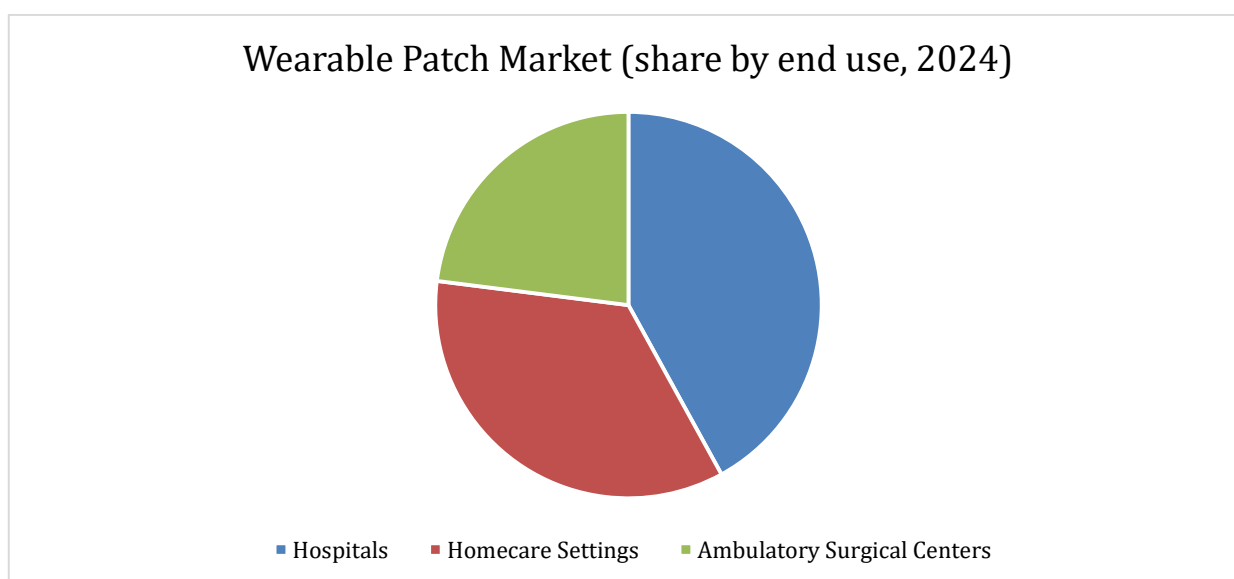
Source: <https://www.grandviewresearch.com/industry-analysis/wearable-patch-market>



Graph 3: Market Size Wearable Sugar Patches Market by region from 2018 to 2030
Source: <https://www.grandviewresearch.com/industry-analysis/wearable-patch-market>

End-use Segment	Market Size (US\$B)	Share (%)
Hospitals	4.158	42
Homecare Settings	3.465	35
Ambulatory Surgical Centers	2.277	23
Total	9.9	100

Table 4: Market Size Wearable Sugar Patches Market by end users from 2018 to 2030
Source: <https://www.grandviewresearch.com/industry-analysis/wearable-patch-market>



Graph 4: Market Size Wearable Sugar Patches Market by end users from 2018 to 2030
Source: <https://www.grandviewresearch.com/industry-analysis/wearable-patch-market>

As technology continues to advance, so do the patches we wear on our skin. A personalized health care experience now includes the ability to monitor your own health. Wearable patches monitor, dispense, or do both, in clinical situations. Among other uses, patches monitor glucose, cardio health, body temperature, and fitness. The convenience of managing your health passively and in real time is a welcome change for both patients and for health care providers who obtain real time data that is invaluable and goes well beyond the snap shot data gained by traditional equipment.

Patches provide an opportunity to innovate patient-centered continuous monitoring, minimizing the need for hospital visits. This is especially important for the management of chronic conditions to improve overall outcomes and disease management, such as in diabetes.

7. COMPARING WEARABLE PATCHES AND INSULIN DELIVERY DEVICES:

Managing diabetes requires consistent monitoring and regulation of blood glucose levels. Traditional insulin therapy involves **subcutaneous injections**, which deliver insulin directly into the bloodstream. While highly effective, injections can be painful, inconvenient, and reduce patient compliance due to the frequency and discomfort associated with multiple daily doses.

Wearable **sugar patches** are an innovative alternative that provide **non-invasive or minimally invasive glucose monitoring** and, in some cases, **automated insulin delivery**. These patches use microneedles or sensors to measure glucose in interstitial fluid, transmitting real-time data to connected devices such as smartphones. Some advanced patches also release insulin when glucose levels rise, mimicking natural pancreatic function. This reduces the risk of hyperglycemia and hypoglycemia while improving convenience and quality of life.

Key points of comparison:

- Delivery method: Injections are invasive; patches are minimally invasive or non-invasive
- Monitoring: Injections require manual blood glucose checks; patches provide continuous monitoring with real-time alerts
- Comfort and compliance: Patches are more comfortable and user-friendly, improving adherence
- Accuracy: Injections provide direct insulin delivery; patches rely on sensors and interstitial fluid, which may have slight time lag
- Convenience: Patches reduce the need for multiple daily injections and finger-prick tests
- Technology integration: Patches can connect to apps and health platforms for data tracking and predictive alerts
- Cost: Patches may have higher upfront costs but can reduce long-term complications through better glucose control
- Personalized therapy: Patches can adjust insulin delivery automatically, supporting more precise glycemic management

Overall, sugar patch wearables offer a promising alternative to traditional injections, combining convenience, continuous monitoring, and better patient adherence, though they still face challenges such as cost, sensor accuracy, and regulatory approval.

8. CALCULATIONS:

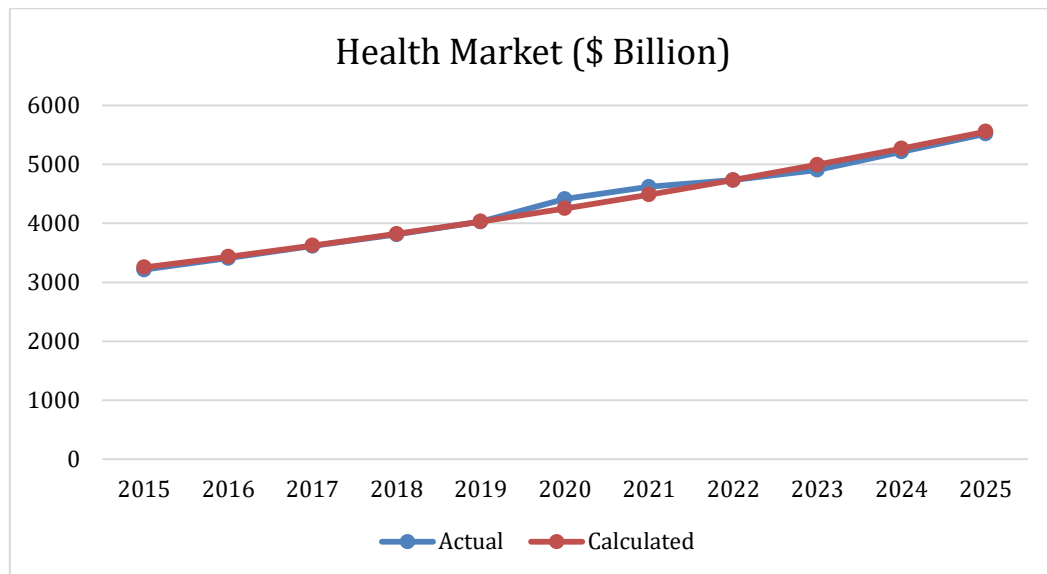
1. Health Market (in Billion Dollars):

In graph, x-axis as years from 2015 to 2025 and Y-axis show health market (in USD Billion dollars)
Let's consider 2015 as 1, 2016 as 2.....2025 as 11.

After manually drawing graph an on excel.

We concluded exponential equation covers maximum number of plots

Considering $y = A.B^x$



Graph 5: Actual vs Calculated Health market (in billion dollars)

$$\text{Formula: } y = 3085.04 * (1.055)^x$$

Where “y” represents health market (in USD billion dollars) and “x” represents 1, 2,3.....(1 represents 2015, 2 represents 2016 and so on).

The growth is of 5.5% year wise

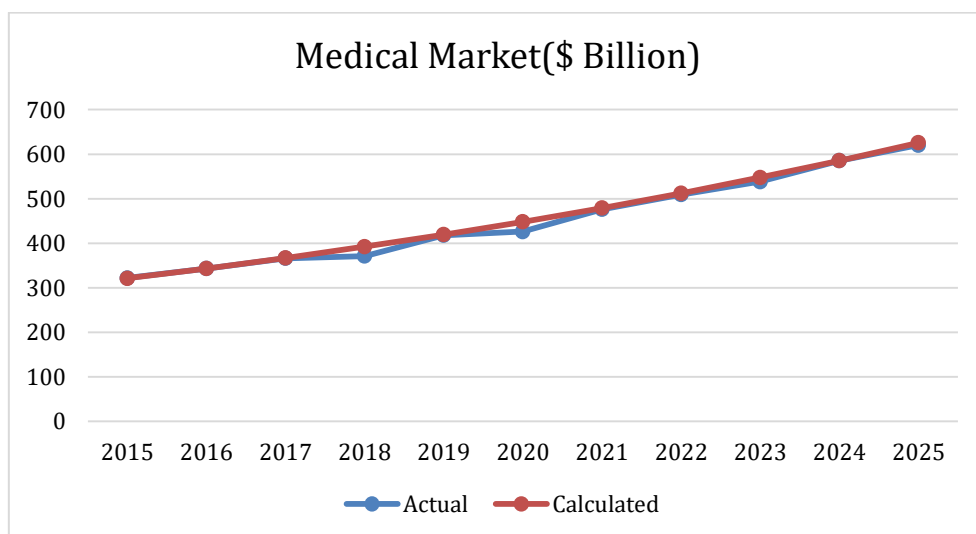
2. Medical Market (in Billion Dollars):

In graph, x-axis as years from 2015 to 2025 and Y-axis show medical market (in USD Billion dollars)
Let's consider 2015 as 1, 2016 as 2.....2025 as 11.

After manually drawing graph an on excel.

We concluded exponential equation covers maximum number of plots

Considering $y = A.B^x$



Graph 6: Actual vs Calculated Medical market (in billion dollars)

$$\text{Formula: } y = 300.393 * (1.069)^x$$

Where “y” represents medical market (in USD billion dollars) and “x” represents 1, 2,3.....(1 represents 2015, 2 represents 2016 and so on).

The growth is of 6.9%

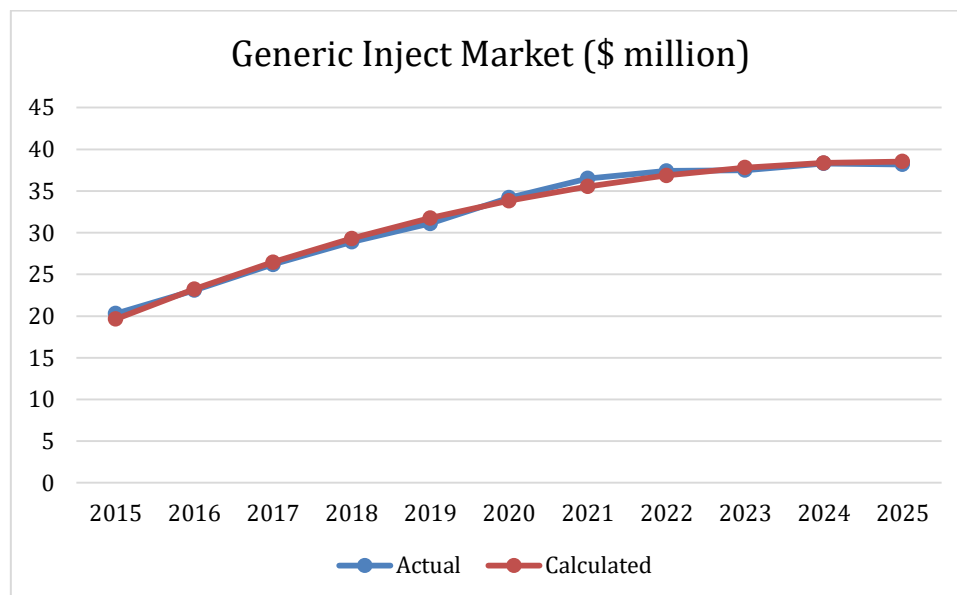
3. Generic Injection Market (in Million Dollars):

In graph, x-axis as years from 2015 to 2025 and Y-axis show patch market (in USD Million dollars)
Let's consider 2015 as 1, 2016 as 2.....2025 as 11.

After manually drawing graph an on excel.

We concluded exponential equation covers maximum number of plots

Considering $y = Ax^2 + Bx + C$



Graph 7: Actual vs calculated generic inject market (in billion dollars)

$$\text{Formula: } y = -0.19 * (x)^2 + 4.17 * x + 15.66$$

Where “y” represents patch market (in USD million dollars) and “x” represents 1, 2,3.....(1 represents 2015, 2 represents 2016 and so on).

The growth is of 6.5%

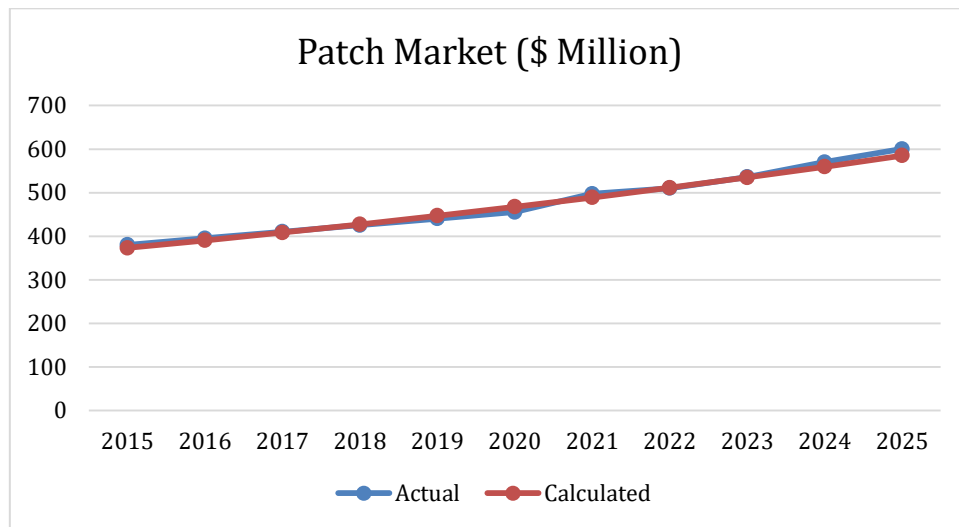
4. Patch Market (in Million Dollars):

In graph, x-axis as years from 2015 to 2025 and Y-axis show patch market (in USD Million dollars)
Let's consider 2015 as 1, 2016 as 2.....2025 as 11.

After manually drawing graph an on excel.

We concluded exponential equation covers maximum number of plots

Considering $y = A.B^x$



Graph 8: Actual vs calculated Patch market (in billion dollars)

Formula: $y = 356.91 * (1.046)^x$

Where “y” represents patch market (in USD million dollars) and “x” represents 1, 2,3.....(1 represents 2015, 2 represents 2016 and so on).

The growth is of 4.6%

5. Oral Medicines and Injections Market (\$ Billion):

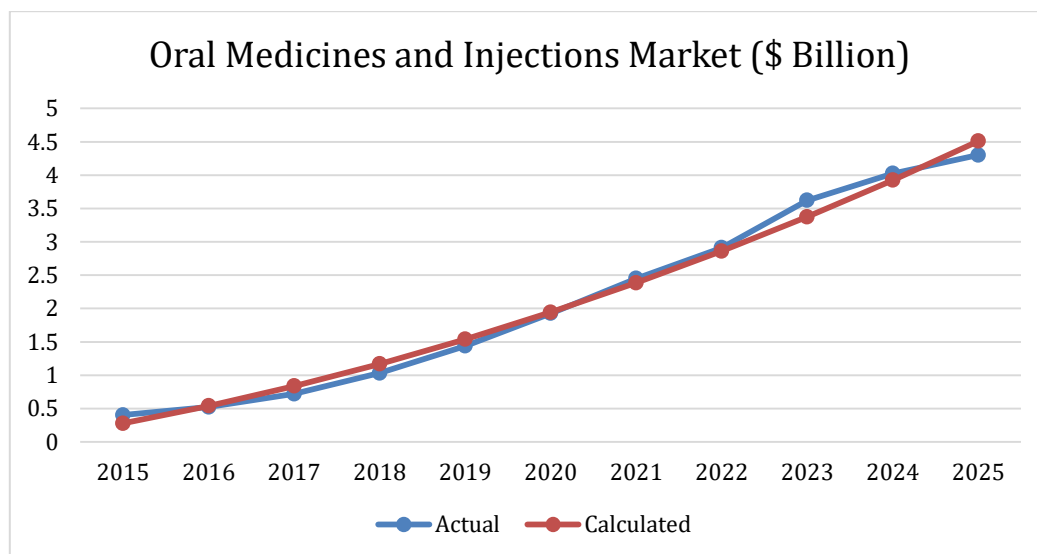
In graph, x-axis as years from 2015 to 2025 and Y-axis show oral medicines and injections market (in USD Million dollars)

Let's consider 2015 as 1, 2016 as 2.....2025 as 11.

After manually drawing graph on excel.

We concluded exponential equation covers maximum number of plots

Considering $y = A.B^x$



Graph 9: Actual vs calculated oral medicines and injections market (in billion dollars)

Formula: $y = 0.018 * (x)^2 + 0.207 * x + 0.053$

Where “y” represents oral medicines and injections market (in USD million dollars) and “x” represents 1, 2, 3.....(1 represents 2015, 2 represents 2016 and so on).

The growth is of 27.9%

9. Conclusion

The comprehensive analysis of the health market revenue across different drug types results in distinct growth patterns. Branded medicines show steady growth with 5.9%, but are challenged by the rising mix of generic medicines showing 6.9% growth, as supported by affordability and various government initiatives. Old medicines remain the favourable choice, with measurable growth still through injections and other traditional ways of treatment. However, shorter and faster-growing solutions are replacing older methods.

The most significant trend is the replacement of injections and health monitoring equipment by patches. Though the growth rate is slow, it may be due to affordability issues and lack of support from health agencies. But rapid acceptance is likely to expand quickly.

Data analysis results in concluding that acceptance of new, innovative patient-friendly patches is expected to replace old traditional medicines and monitoring systems, making this the fastest-growing sector in healthcare.

10. Conclusion

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11. Biographies:

Trisha Bansal

- **Education:** Class 12 student at Bhavan Vidyalaya, Chandigarh
- **National Winner** at BITS Pilani Young Entrepreneurs Bootcamp
- **Pursuing a healthcare-related patent** based on her microneedle innovation
- **Head Girl** of Bhavan Vidyalaya
- **Leader** of her school's student company *Ascension*
- **Deputy Convenor** of BVC MUN 2025 (national level Model United Nations)
- **Exchange Program:** Participated as an *exchange student in the United States*
- **Awards:** *Best Delegate* at La Martiniere College MUN, Lucknow
- **Interests:** Healthcare, economics, finance, and management

Under the guidance of:

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- M.Sc (Mathematics) (Double gold medalist)
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- 26 years of teaching experience
- Various Research Paper Published

Er. Raunaq Jain

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