



An integrated digital ecosystem to support patient outcomes, health-system sustainability, and return on investment

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Executive summary

Connected health offers a solution for one of the more vexing problems faced by the healthcare industry – patient adherence to their drug regimen. Demand has increased for improved pharmaceutical care that provides an enhanced patient experience in addition to better health outcomes. Any efforts to combat lack of persistent and costly deficiencies in medication adherence must address the wide range of factors involved in taking medicines the right way and at the right time.

These factors include product design considerations and practical issues, such as forgetfulness or confusion over polypharmacy. Further factors involve the inherent complexities of patient attitudes toward medication and to the long-term commitment needed to treat the growing burden of chronic disease.

By applying technological expertise across the range of these drivers, a compelling solution is achievable. Collaboration between the right partners can provide a digital ecosystem that addresses the needs of all stakeholders with regard to adherence. This digital ecosystem will maintain engagement with patients, offer meaningful rewards for persistence and adherence, and educate program users about the wider benefits of staying on their medication.

The resulting flow of real-world data can also help product manufacturers to understand and therefore serve their customers more effectively. Additionally, this data stream can improve return on investment and lay the foundation for the next wave of innovative, patient-friendly products.



Collaboration between the right partners can provide a digital ecosystem that addresses the needs of all stakeholders

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Introduction: Defining a digital ecosystem

Concerns have been raised about the long-term sustainability of existing healthcare systems that need to serve a growing aging population. This trend results in an increased burden of age-related chronic diseases and contributes to the escalating costs of care. The result is an intensifying pressure on suppliers to demonstrate and deliver solutions that address these emerging needs. Delivery systems for sophisticated new medicines must exemplify innovation that is geared to enhancing the whole patient pathway, thereby addressing the considerable strain on healthcare budgets and resources worldwide.

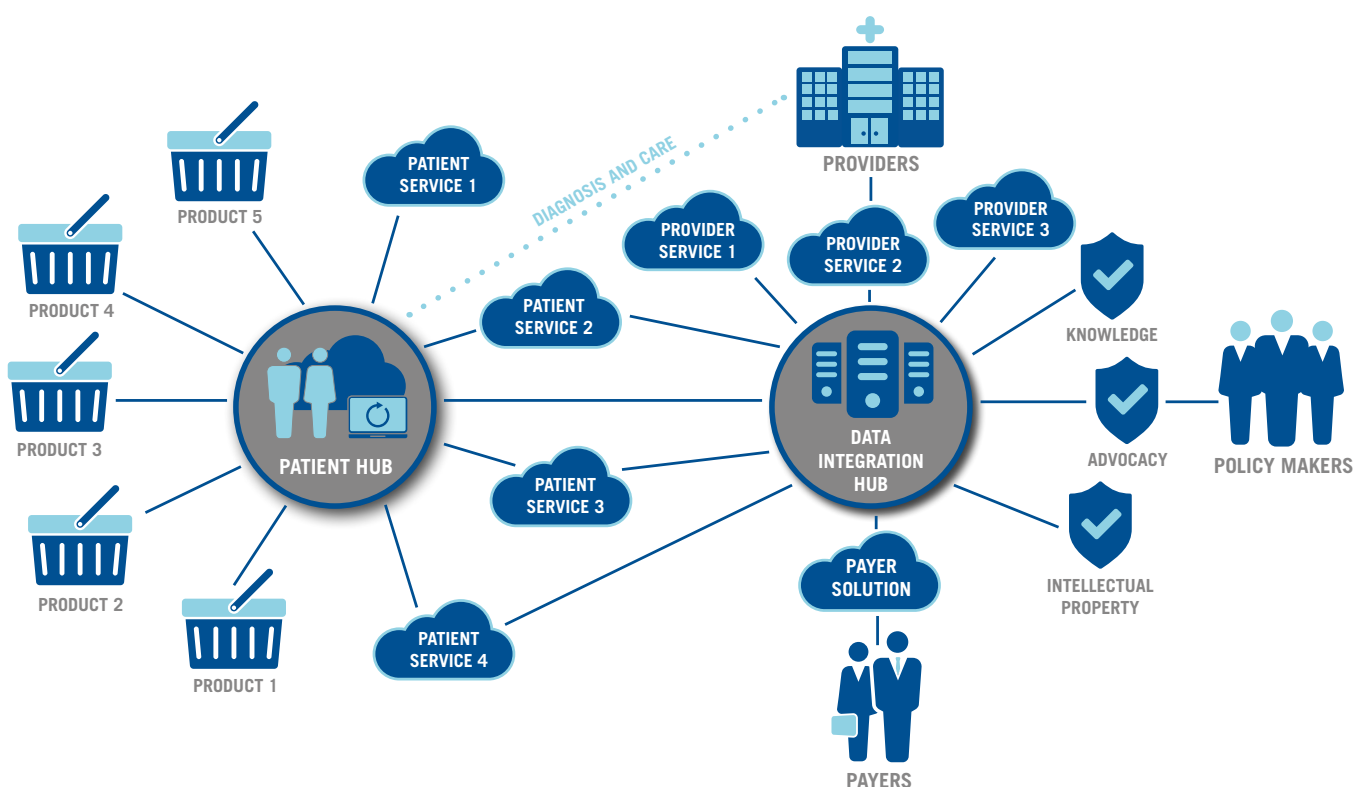
These tensions create a need for more holistic pharmaceutical care that extends the product offering in order to improve the overall patient experience and resultant health outcomes (including significant cost-benefit gains). This need for more holistic care reflects a marked shift in the pharmaceutical industry's customer focus. Previously, the focus was on the physician but now the perspective is much wider and includes the physician, plus the patients, the payers, and other key healthcare stakeholders, each with a range of priorities and needs. This shift also addresses the commercial imperatives of an industry seeking a competitive edge as well as sustainable income. Product differentiation is also an important concern in an ever more crowded and competitive marketplace.

The rapid evolution of connected-health systems and digital media has created new opportunities to reconcile these overlapping needs by constructing digital ecosystems that enable two-way communication and data exchange between stakeholders in real time. Such networks are of particular value in promoting and maintaining medication adherence and persistence, with the long-term benefit of better patient outcomes.

Due to the vast range and complexity of the various challenges (be they psychological, economic, or practical) involved in ensuring the right medicines are taken in the right way, in the right quantities, and at the right time, a multifaceted approach is critical to stemming revenue losses, minimizing healthcare-system waste, and optimizing patient outcomes.

This is the context in which a digital ecosystem promotes education and engagement: by placing the patient experience at the very heart of interconnectivity (Figure 1). At the same time, the real-time data flow from this kind of connectivity can help companies using the digital ecosystem to understand, and consequently target, their customers more effectively while also enabling further development of patient-centric innovations.

Figure 1: A digital ecosystem across the full spectrum of healthcare stakeholders



Creating a unique platform

Creating a partnership between suppliers and digital specialists is a logical route to designing networked solutions that enhance the utility and patient-centricity of medicines and accompanying systems. This partnership can be created by drawing on experience in areas such as social media, data architecture, and psychological insights about patient behavior that have been drawn from behavioral economics and related fields.

The advantages of connectivity in healthcare have not gone unnoticed. Any new alliances in this space need to deliver genuinely differentiated solutions with multiple benefits in what is already a dynamic, competitive market segment. This concept drove the creation of the strategic partnership announced in October, 2014, by West Pharmaceutical Services, Inc. (West) and HealthPrize Technologies LLC (HealthPrize).

West designs and manufactures packaging components and delivery systems for injectable drugs and healthcare products. HealthPrize uses online and mobile platform gaming dynamics, behavioral economics, and consumer-marketing strategies with the goal of engaging and sustaining medication adherence. These complementary assets and capabilities deliver an end-to-end connected health solution for both pharmaceutical companies and the patients they serve.

The initial drivers for connected-health initiatives tended to rest on the assumption that accessing and gathering data on products or services were of value in themselves. Yet these early forays lacked strategic direction and so they did not demonstrate a coherent sense of how connectivity could be harnessed both to enhance commercial assets and to generate outcomes-oriented benefits for customers.

In seeking a partner for its range of delivery systems for self-injected medicines, West has focused on building more productive relationships with patients using its systems both now and in the future. While data exchange and connectivity were important components of this objective, the partnership with HealthPrize offered both parties a broader perspective and a unique selling proposition, including:

- Connectivity across a variety of self-injection systems (manual, auto-inject, bolus injection, etc.)
- Patient engagement via a website or mobile app across the full range of digital channels
- A common interface regardless of the particular system or number of systems used
- Multiple-data transfer technologies, including smart labels, radio-frequency identification/near-field communication (RFID/NFC), bar-code/QR-code scanning, cellular, and Bluetooth low energy (BTLE)
- A flexible connected health platform that could be tailored to customer recommendations and patient needs as well as integrated with existing patient-engagement initiatives, websites, or portals

These capabilities support an advanced patient-engagement program, informed by HealthPrize's expertise in behavioral psychology and economics. This approach consolidates and extends the medication-adherence and persistence benefits of West's patient-centric delivery systems.

The West delivery systems are designed for ease of use, with flexible dosing protocols and minimal discomfort to the patient. When the HealthPrize platform is linked to a delivery system, it provides a virtual counterpart that engages patients while also monitoring their adherence to the given treatment. This platform also educates and rewards patients for usage which, in turn, encourages them to stay on course with their treatment. The linkage inherent in the West-HealthPrize digital ecosystem offers true connectivity where data about the routine usage of the delivery system flows automatically from the product to all stakeholders (see Figure 1). Data gathered through the connected delivery system may be fed back to pharmaceutical clients and healthcare payers, who can then use it to analyze relationships between product adherence/persistence and health outcomes, cost-benefit equations, and return on investment.

Providing multiple functionality at multiple levels

West's need for a system that works with multiple delivery systems, therapy areas, and stakeholders called for a partner with the right back- and front-end infrastructure to acquire, store, transmit, and manage the necessary data securely and effectively. Also needed was a partner that is in full compliance with the prevailing data-privacy legislation wherever the system is used. West required a system that would engage patients sufficiently to provide a useful data flow, as well as to track their medication activity and to encourage adherence regardless of whether they were connected to an injection delivery system.

All of these elements were already present in the HealthPrize platform. It already included a proprietary adherence-tracking system that operated through prescription refills and co-payment cards. With this system, the most basic level of patient engagement – self-reporting on medication usage through multiple digital interfaces including smartphone application and computer is achieved without connecting via a platform to the HealthPrize program (Figure 2). This incorporates a degree of validation, whether through cross-referencing to the prescription refill or patient uploads of pharmacy receipts and labels.

Figure 2: Self-reporting with the West–HealthPrize adherence program



The next iteration is the patient barcode scan that reinforces the validity of the self-reported data, providing further evidence that the drug has been taken and the delivery system used (Figure 3). It also provides supplementary information such as feedback to doctors when the patient begins the program.

The sum of the self-reporting and bar code inputs can provide a comprehensive adherence/persistence record that can be used by the stakeholders to provide insights into the patient's recorded health outcomes.

The data insights provided by the HealthPrize platform function on multiple levels. For delivery system manufacturers, the data is a window into how patients engage with the product and the adherence/persistence program. The manufacturer can use this information as an input to enhancing the patient experience or to improve the patient's interface with whichever channel they are using – web portal or mobile app – to access the HealthPrize platform.

“ Pertinent information and informed insights can be provided to payers, and offer a win-win opportunity for all stakeholders in the healthcare chain

Figure 3: Connecting to West–HealthPrize adherence program through a barcode



Datasets or dashboards allow drug manufacturers to track and analyze the activity and engagement of patients who opt into the adherence program. How often patients read the educational material or the level of engagement they have with other aspects of the program provide valuable information that can inform decisions regarding product improvements or the patient experience. This approach provides higher quality, more reliable information than relying on the current ‘push’ techniques of direct-to-consumer advertising or mainstream marketing.

This pertinent information and informed insights can be provided to payers, and offer a win-win opportunity for all stakeholders in the healthcare chain:

- doctors have the professional satisfaction of helping patients improve their medication adherence and persistence
- patients can achieve better health outcomes through adherence/persistence
- payers get better value due to improved patient outcomes
- pharmaceutical manufacturers can mitigate the revenue losses they incur through non-adherence/persistence and can validate that the product is taken in line with prescribing instructions

As the West–HealthPrize partnership moves toward a fully integrated digital ecosystem embedded within injection devices (Figure 4), the patient benefits associated with drug delivery will be expanded. This alliance will also deliver products that more seamlessly meet the goals of engaging, educating, and incentivizing patients toward better product adherence/persistence.

The West–HealthPrize alliance provides a turnkey solution for biopharmaceutical companies seeking the benefits resulting from a connected health solution for improvements to adherence. The technical and organizational complexities associated with implementation of a comprehensive connected health drug delivery solution are avoided and ongoing support is guaranteed.

This alliance affords an unmatched ability to design linked systems that consider the human factors involved in adhering to a drug regimen – particularly one with the many challenges of self-injection – while engaging patients optimally and promoting adherence at multiple levels.

Figure 4: Moving from supporting existing legacy products to fully integrated connected health

LEGACY CONNECTED HEALTH:

Using Bluetooth low energy solutions as an add on to current or already commercialized products



INTEGRATED CONNECTED HEALTH:

Using Bluetooth low energy solutions embedded within delivery system to send data to server



Handling with care

With the pharmaceutical industry and the cost of new medicines (i.e. injectable biologics) coming under increasing scrutiny, a system that incentivizes patients to medicate needs to be handled with care. Patients must be able to recognize and understand that the incentivization is geared to better awareness of their disease state, more rational use of medicines, and, ultimately, better health outcomes.

This is in addition to ticking all the relevant boxes on regulatory compliance and data privacy/security – requirements that may be partially or fully harmonized across some countries but may also vary significantly from market to market. There is some anxiety in the pharmaceutical industry about the level of validation required to comply with data-security and -privacy regulations when integrating software with a delivery system. Dealing with these issues requires the long-term vision and insight that comes from specialist providers with on-the-ground expertise in this space.

One way in which the West–HealthPrize partnership is easing the transition to fully integrated connected health is by emphasizing to clients that the adherence program may be launched iteratively, depending on whatever level of complexity the manufacturer is comfortable with. In the US, for example, the Food and Drug Administration (FDA) is focused on managing Mobile Medical Applications which are mobile apps that meet the definition of a device. When the intended use of a mobile app is for the diagnosis of disease or other conditions, or the cure, mitigation, treatment, or prevention of disease or is intended to affect the structure or any function of the human body, the mobile app is a regulated device. On the other hand, if the HealthPrize program is deployed at a less complex level, as an optional accessory – one that does not necessarily affect the way in which the patient takes the incorporated drug, or provide feedback intended to diagnose, prevent, cure, treat or mitigate the condition of the patient – the FDA intends to exercise enforcement discretion over these types of apps.



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Designing for adherence

Two additional important factors contribute to the utility and effectiveness of the medication-adherence program offered through the West–HealthPrize partnership.

One is the commitment of West to designing intuitive, patient-friendly delivery systems, such as its new Smart Dose® electronic wearable injector. This system is designed to reduce as much as possible the physical and psychological discomfort associated with self-administration of injectable medicines, while addressing scientific challenges such as the need to deliver large, consistent drug doses over time.

The second factor is making sure that patients are properly trained to use the system effectively from the outset. It can be a daunting prospect for a patient to learn they have a chronic disease, such as diabetes, that means that they will have to self-inject for the rest of their life. The approach to training for a drug delivery system when initiating treatment, whether by a pharmaceutical company or a healthcare professional, can often impact the patient's adherence and persistence profile on an ongoing basis.

For this reason, West endeavors to have associated training materials linked with the HealthPrize digital platform from the earliest point of the treatment cycle, giving patients a valuable head start with adherence. Patients can then return to these educational components at a later date if required. This is particularly relevant when an injectable drug, such as a monoclonal antibody, may be dosed only once or twice a month, increasing the risk of 'learning decay'.

Managing adherence and persistence

Poor adherence and persistence with therapy continues to pose enormous problems across the full spectrum of stakeholders in the safe and effective use of medicines (Figure 5). These problems will only escalate as lifespans increase worldwide and more patients live routinely with chronic conditions that require daily medication such as hypertension, elevated cholesterol, and diabetes – and, in many of these cases, polypharmacy, with all its potential for errors, oversights, confusion, and demotivation.

Non-adherence, and non-persistence in particular, inflate long-term healthcare costs, compromise health outcomes, and devalue medicines in the eyes of the end-user. They also dilute the revenues and profits relied on by industry to keep developing safer and more effective, patient-friendly medicines. In the US alone, at least \$290 billion in otherwise avoidable medical expenditure is incurred each year due to complications when patients do not follow – or, in many cases, do not even fill prescriptions for medicines to treat chronic conditions.¹ On a more global scale, the World Health Organization estimates that the average medication adherence rate for patients with chronic diseases is around 50%.²

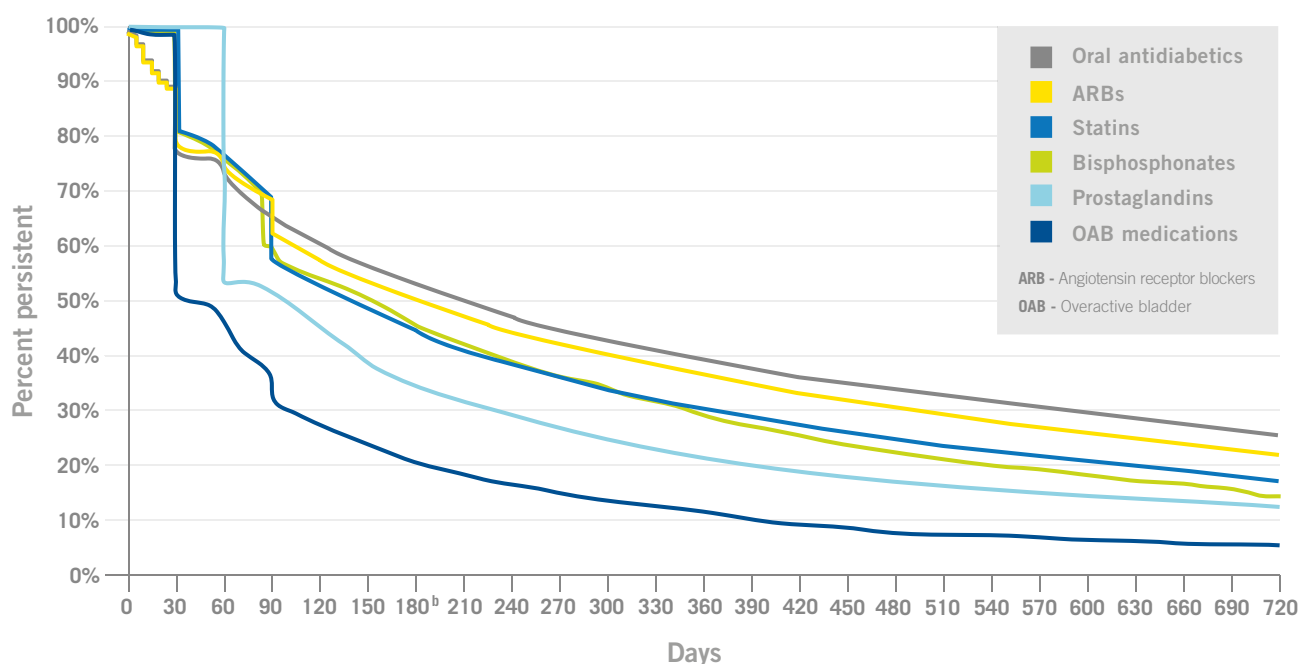
Moreover, the problem is not confined to ‘invisible’ or slowly progressing conditions such as hypertension or elevated cholesterol, where patients might be expected to neglect their medication when taking them has no palpable effect. It is also seen in more immediate life-threatening diseases such as cancer, human immunodeficiency virus (HIV), or immunosuppressive therapy after organ transplantation.

The difficulties often start as soon as the patient leaves the surgery. Primary non-adherence means that 15–20% of prescriptions are never filled, while 25–40% of patients unilaterally cease treatment after 90 days, and fewer than 50% of patients remain adherent after 12 months of therapy.²

The estimated cost to the pharmaceutical industry is significant. In terms of lost revenues alone, the impact of non-adherence/non-persistence may be as much as \$564 billion, or 37% of total potential revenues, worldwide each year, according to estimates by Capgemini Consulting and HealthPrize.³

While factors such as drug costs, forgetfulness, or fear of side-effects may contribute to patients neglecting or ignoring their medication, the psychological landscape of non-adherence/persistence is actually a good deal more complex. Some patients see medication as something to be avoided at all costs. Even the terminology around adherence can appear paternalistic or coercive. Other patients have difficulty understanding the true value of medicines, especially in conditions such as hypertension, where there is no immediate and recognisable health gain. Younger patients in particular are susceptible to ‘present bias’, where they may struggle to conceptualize long-term benefits and instead seek out tangible short-term rewards.

Figure 5: Medication adherence across six chronic-disease classes⁴



Engaging and motivating

If patients are really to learn about their medication and appreciate its long-term benefits, they must first be engaged and motivated in the act of taking the medicine. This calls for much more than traditional communication strategies such as leaflets or package inserts, which can risk alienating patients with their long statutory lists of side-effects.

A more effective approach is to find ways of enhancing the patient experience when a medicine is taken routinely. This gives the patient motivation to adhere/persist with treatment and to learn more about the long-term value of the medicine – which in turn will consolidate engagement and adherence.

Offered through a digital network with easy access via a website or a mobile app, gaming dynamics – what HealthPrize refers to as ‘gamification’ – can help to achieve these objectives by mimicking retail customer-engagement strategies such as points-scoring with loyalty cards. Since different patients respond to different motivators, gaming techniques can be combined with more traditional tools such as educational materials. Rewarding points for completing educational quizzes provides extra motivation to engage with these components of the program.

HealthPrize uses ‘fun factors’, such as a monthly leader board or a weekly sweepstakes to encourage and maintain engagement with the digital platform while keeping patients on course with their medication. These elements tap into patients’ competitive instincts and desire for immediate gratification. They also have cross-cultural appeal, although a broad range of motivators is offered to suit different personality types. Immediate rewards are available for each type of interaction (e.g. taking a quiz, self-reporting medication, verifying a refill), filling the vacuum in tangible short-term benefits that tends to undermine medication adherence/persistence. Earned points may then be redeemed for items of choice – anything from a gift coupon to a charitable donation – depending on local reimbursement conditions and regulations around incentives to take medicines.

While the educational component of the HealthPrize platform is key to understanding the value of the medicine and motivating long-term adherence/persistence, the aim is also to make this process as enjoyable as possible, and to offer rewards that encourage engagement.

Delivering a better patient experience

This emphasis on engaging and motivating patients makes West an excellent fit with the HealthPrize culture. In addition to the physical assets and technical expertise it brings to the partnership, West is highly patient-focused and sensitive to the ‘human factor’ in delivery system development. It aims to design products that are not only easy to use in the inherently difficult context of self-injection, but appealing enough for patients to want to use them and to feel good about using them. That means talking to patients, understanding their needs, trying out different prototypes with patients, and incorporating the learnings into product development: what West calls ‘designing for affinity’.

The company is also committed to the ‘effective patient’, as evidenced by its training programs and ongoing partnership with Noble International for ‘on-boarding’ patients during their first 30 days on a new system. This again helps to build an integrated, end-to-end ecosystem around product usage and medication adherence that can be fully customized to patient needs.

One particular benefit of the West–HealthPrize partnership, and its digital gateway to education and adherence, is that it allows patients to bring their delivery-system usage into the realm of everyday experience, tying adherence and persistence to something they do as a matter of course: checking their smartphone or switching on a computer. By normalizing the patient experience of using a delivery system, the West–HealthPrize program also delivers a psychological and emotional boost, making the experience that much more meaningful and removing the stigma of being ‘a patient’– itself a barrier to adherence/persistence.

It is often said that the best drug in the world is no use at all if a patient is not taking it. Improving the patient experience is a way to transform the negative connotations of injecting a drug into a positive choice, understood and embraced as a means to maintain health and deliver long-term beneficial outcomes with a ripple effect across healthcare systems and the whole of society.

Envisioning the future of connected health

Connected health offers a compelling solution to many of the challenges confronting modern health systems. It harnesses technological change to drive engagement, personal responsibility, informed choices, more effective patient management, and more cost-effective care. Yet the concept still has a long way to go before it is routinely incorporated into healthcare practice.

Around 20–40% of pharmaceutical and medical-device companies are aggressively engaged in trying to anticipate patient needs and address regulatory challenges in this space. The remainder are more interested in launching medicines and devices with next-generation features, such as add-on auto-injectors or devices with reusable components. They are aware of connected health, but not to the point of integrating it into their corporate strategies. In some cases, these companies may be held back by unresolved issues such as responsibility for addressing patient security through a hosted digital service.

They also have a tendency to regard connectivity as necessarily embedded within a delivery system. By contrast, the flexible, entry-level solutions offered by West and HealthPrize can be used with already marketed products and at varying levels of complexity, depending on the product involved and the manufacturer's comfort level with the associated legal and regulatory issues. One certainty is that connected health not only requires a digital ecosystem to function optimally but is best managed through a co-ordinated ecosystem of developers, designers, consultants, and consumers. That ensures the solution is pitched to, and accepted by, the right stakeholders, whether they are involved first-hand or on a more peripheral level.

Powering success through strategic partnerships

Much of the potential in this sphere resides with strategic alliances. This approach is a more productive use of resources rather than manufacturers taking what they want from digital specialists, or the same digital specialists trying to strike out on their own. Mutually beneficial partnerships also enable product manufacturers to tap into unique expertise that enhances interactions with patients, such as behavioral economics.

One factor to bear in mind is that healthcare payers will only recognize a connected-health program as a genuine value proposition if it offers them a clear economic benefit. In theory a better-managed disease should translate into enhanced health benefits and, by extension, better value for money. However, payers inevitably work within budget cycles and ceilings, meaning they will want to see outcomes expressed in cogent financial terms.

Another challenge with emerging connected-health initiatives may be integrating and centralizing data from different sources – be that a patient moving geographically between hospital systems or using more than one drug or device with associated adherence programs, yet unwilling to embrace several discrete connected-health systems.

As in other areas of connected health, these issues are best tackled through collaborative arrangements such as partnerships and strategic alliances. Technology companies tend to compete fiercely in their own space. For drug and device manufacturers, though, that same dynamism ensures a rich stock of innovation to help galvanize connected health from concept into reality.



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Case studies: Enhancing medication adherence through connected health

The case studies outlined below show how applying the HealthPrize platform to two existing products with very distinct customer bases produced impressive evidence of patient engagement and improved medication adherence/persistence.

#1: Motivating patients to engage with diabetes education and fill prescriptions

Background and aims

A leading injectable diabetes-medication franchise wanted to add the HealthPrize adherence platform to its existing – and successful – Customer Relationship Management (CRM) program.

The aim was to test the combined impact of applied behavioral economics, patient education, and rewards among the established audience for the CRM program. Adherence rates and engagement levels were measured and compared with those in the control CRM audience.

Patients signing up for the HealthPrize strand of the program received daily prompts via text message or e-mail to report on progress with taking their medication.

The patients earned points for self-reporting injections, refilling their prescriptions, taking weekly quizzes and surveys, and reading daily health tips. These points were redeemable for a variety of health-related merchandise in the HealthPrize Rewards Mall.

Program members were also eligible to win monthly leader board competitions and weekly sweepstakes, based on their levels of engagement with the adherence scheme. All prescription fills and refills were monitored through the platform's proprietary verification system.

Results

In total, 2,305 patients registered with the program, mostly during the first two months of the initial recruiting period. The average member logged into the program five times a week and spent two minutes on the site with each visit, amounting to a monthly average of 43.6 minutes on-site.

More than 75% of the registered patients completed the quiz and survey each week and around 60% read the daily health tip each day. The majority of members preferred the daily educational tip over other program features.

An interim analysis was conducted after eight months, based on third-party data comparing patients in the CRM program alone with patients in the CRM program as well as participating actively in the HealthPrize program.

It showed that medication adherence increased by 2.9 fills over the study period versus the baseline control, significantly enhancing return on investment for the brand while providing valuable insights into patients' adherence patterns and preferences. For example, 96% of members said they would miss the experience of engaging with the program if it ended.

At the end of the program, the mean prescription-fill interval – that is, the number of days from one fill to the next – was assessed for patients where pre-enrollment data were available. It was found to have narrowed markedly from 57.5 days pre-enrollment to 35.1 days post-enrollment.

#2: Encouraging young adults to stick with their acne medication

Background and aims

The goal here was to improve adherence on a leading prescription acne brand beyond the baseline prescription-fill rate of 1.3 fills per patient by finding a way to educate and engage brand users.

The HealthPrize platform and user experience were adapted to fit the brand's topical-delivery format, allowing for the different fill intervals that occurred with variable dosing. All prescription fills were monitored through the platform's proprietary verification system.

The platform design and messaging were also styled for the younger demographic using acne medication, including an integrated mobile application for both Android and iOS users.

Program members earned points for self-reporting daily application of their acne medication, refilling their prescription, taking weekly quizzes and surveys, and for opening daily 'fortune cookies' containing educational tips and trivia.

Points were redeemable for a variety of gift cards and merchandise in the HealthPrize Rewards Mall. Participating patients were also eligible to win monthly leader board competitions and weekly sweepstakes based on their levels of engagement.

A range of customizable prompts, via email, text, and push notifications, were set up to keep the brand and medication schedule top of mind for program members. HealthPrize also developed content that blended brand- and condition-related facts with enjoyable trivia, so that the user experience was not too strictly focused on health issues.

Results

Following an initial 30-day trial period, program members had to prove they were still on therapy by using the HealthPrize prescription-verification system.

A total of 7,800 patients registered for the program, with an average age of 24 years. The mean number of prescription fills per member for patients actively engaged in the adherence program was 4.0, nearly three times the brand's baseline fill rate. The mean fill rate for all verified members was 1.8 fills each, a 39% increase over the brand's historic baseline.

The average member logged in 2.7 times per week and spent more than two minutes on the site with each visit. One third of all participating patients completed the quiz each week and over 200,000 survey responses were collected from patients confirmed to be on therapy.

Among the important insights delivered for the brand were:

- 73% of program members believed that learning about acne helped them to stay more adherent with their medication
- 41% said that their tube lasted three to six months, longer than was anticipated by the brand
- 36% reported receiving three to five or more product samples from their physician. This prompted the brand to review their sampling procedures, since patients with a high volume of samples tend to wait longer before filling the initial prescription

Conclusions

As is clear from the case studies, promoting adherence to, and persistence with, required long-term use of medication calls for a multi-faceted, multidisciplinary approach that starts with patient-friendly product development. An integrated digital ecosystem can then be built around that product, using insights from diverse fields such as data collection, storage, and management; social-media interaction; behavioral economics; patient education; and data security/privacy requirements. With the right input and application, this system will be capable of delivering a holistic experience that maintains engagement with patients while promoting adherence and persistence through a well-balanced combination of education, verification, and tangible rewards. At the same time, it will enhance commercial understanding of customer preferences and usage patterns to the benefit of further product development, return on investment, and, ultimately, health outcomes.

This strategy is best addressed through partnerships between expert providers of the required technologies. Digitizing this data optimizes the patient outcome and drives the creation of products and delivery systems that patients will want to use – and keep using. The alliance between West Pharmaceutical Services and HealthPrize Technologies is a compelling example of that strategy in action. It is moving towards a fully integrated system of connected health that will set the gold standard for innovation, effectiveness, and cost-effectiveness in medication adherence for years to come.



Promoting adherence to, and persistence with, required long-term use of medication calls for a multi-faceted, multidisciplinary approach that starts with patient-friendly product development

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Chris has been in product development for over 20 years, primarily in healthcare packaging/device development, and holds 19 U.S. patents with several more pending. He is responsible for new product and technology development, focusing on understanding user's needs and enhancing the patient experience. He also manages West's Connected Health Initiative and the ongoing strategic alliance between West and Insight Product Development of Chicago.

Graham Reynolds, Vice President & General Manager, Global Biologics, West Pharmaceutical Services, Inc.

Graham joined West in 1980 as a Polymer Technologist, and throughout his long career with West has held a range of positions with increasing responsibility. He was recently appointed to lead the Biologics market unit, one of three primary areas of focus for growth for the company's proprietary products and services. Prior to this role, Graham worked within the Delivery Systems organization, leading initiatives to market novel delivery systems, including injection devices, safety and administration systems, auto-injectors and prefillable syringes. He also worked to develop strategies for future growth, including the acquisition and development of new technologies to enhance the West portfolio.

West Pharmaceutical Services, Inc.

West Pharmaceutical Services, Inc. is a leading manufacturer of packaging components and delivery systems for injectable drugs and healthcare products. Working by the side of its customers from concept to patient, West creates products that promote the efficiency, reliability and safety of the world's pharmaceutical drug supply. West is headquartered in Exton, Pennsylvania, and supports its customers from locations in North and South America, Europe, Asia and Australia. West's 2014 sales of \$1.42 billion reflect the daily use of approximately 110 million of its components and devices, which are designed to improve the delivery of healthcare to patients around the world.



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HealthPrize Technologies LLC

HealthPrize provides a Software-as-a-Service (SaaS), HIPAA-compliant platform and services to create unique digital experiences proven to drive patient engagement, education and increased medication adherence for healthcare companies and pharmaceutical brands. Using a proprietary gamification approach, and patented technology, combined with a deep understanding of behavioral sciences and patient psychology, HealthPrize consistently delivers high levels of patient engagement resulting in over 50% increased lifts in prescription adherence versus control. For more information, visit www.healthprize.com and follow us on Twitter at @HealthPrize.



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Carol Nast, Founder and President, Enterprise Catalyst Group

Carol is founder and President of Enterprise Catalyst Group. She is a recognized industry leader with a track record of success in guiding strategic, management and technical initiatives for companies of all sizes. She actively participates on advisory boards and specializes in alliance and interim management with a focus on the establishment of effective and efficient systems, processes and practices associated with product development and commercial operations. Prior to launching ECG, Carol was Chief Operating Officer at NuGen Technologies, VP of Device Manufacturing at Inhale Therapeutics and was Director of Operations at Syva (a division of Syntex/Roche) and BioRad. She began her career in research at Nuclear Medical Laboratories, a division of Warner Lambert (Pfizer).

Enterprise Catalyst Group

Enterprise Catalyst Group (ECG) provides technical and management consulting services to biopharmaceutical and medical device and diagnostic companies. Clients include large multinational corporations and early stage companies with emerging technologies.

For over 15 years, ECG has provided management support to our clients for:

- Development and deployment of product and technology strategies
- Technical assistance/expertise with combination products, drugs/biologics, device and diagnostic product development and commercialization
- Establishment and enhancement of manufacturing, development, supply chain and quality systems and processes
- Interim and alliance management

The company is headquartered in Palo Alto, CA and has provided consulting services to over 80 clients in North America, South America, Asia, Africa and Europe.