

Medication Adherence at Scale The Role of CRM-Driven Patient Communication Programs in Chronic Disease Management

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Abstract:

Medication non-adherence represents one of the most persistent and costly challenges in the United States healthcare system. Across chronic disease populations (including diabetes, cardiovascular conditions, oncology, and autoimmune disorders) adherence rates remain suboptimal, with approximately 50% of patients failing to take medications as prescribed ¹. This widespread issue contributes to an estimated \$100 billion to \$300 billion in avoidable healthcare costs annually, driven largely by preventable hospitalizations, disease progression, and increased utilization of acute care services ².

AVOIDABLE HEALTHCARE COSTS DUE TO MEDICATION NON-ADHERENCE



The scale and persistence of this challenge require solutions that extend beyond traditional interventions. Technology-enabled patient communication programs, particularly those powered by customer relationship management (CRM) platforms such as Salesforce Marketing Cloud, offer a scalable and cost-effective approach to improving adherence. These platforms allow healthcare and pharmaceutical organizations to deliver personalized, timely, and behaviorally informed communications across multiple channels, supporting patients throughout their treatment journey.

Evidence consistently shows that improved adherence is associated with better clinical outcomes, reduced hospital admissions, and lower overall healthcare costs ¹. CRM-driven communication programs operationalize these benefits at scale by aligning data, automation, and patient engagement strategies.

The following examines how such programs function from both a technical and regulatory perspective, including consent management, data governance, and compliance with HIPAA requirements. It also explores how journey-based automation can deliver the right message at the right time, ultimately improving patient outcomes while reducing system-wide costs.

1. Introduction

Medication adherence is commonly defined as the extent to which a patient's behavior aligns with agreed recommendations from a healthcare provider, including taking medications at the correct dose, frequency, and duration ³. Non-adherence occurs when patients do not follow these recommendations, whether intentionally or unintentionally, and remains a significant barrier to effective treatment.

Adherence plays a central role in chronic disease management. Conditions such as diabetes, cardiovascular disease, cancer, and autoimmune disorders often require long-term pharmacotherapy to control symptoms and prevent complications. When medications are taken as prescribed, patients experience improved clinical outcomes and reduced mortality risk. In contrast, non-adherence is associated with increased hospitalizations, disease progression, and higher healthcare costs ¹.

Several structural and demographic trends continue to intensify the adherence challenge. The United States is experiencing a sustained rise in chronic disease prevalence, with six in ten adults living with at least one chronic condition and four in ten managing multiple conditions. This trend is closely linked to an aging population, as chronic illnesses are more common among older adults and typically require ongoing treatment. At the same time, treatment regimens have become more complex, often involving multiple medications, varied dosing schedules, and long-term management strategies. These factors increase the likelihood of missed doses, incorrect use, and early discontinuation.



Traditional adherence interventions (such as in-person counseling, printed educational materials, and periodic follow-ups) have shown limited effectiveness at scale. These approaches often lack personalization, continuity, and real-time engagement, making it difficult to address the behavioral and logistical factors that influence adherence.

As healthcare systems continue to digitize, there is growing recognition that scalable, technology-enabled solutions are required. CRM-driven patient communication programs represent a meaningful evolution in this space, enabling personalized, timely, and data-informed engagement strategies that support patients throughout their treatment journey.

2. The Economic and Clinical Burden of Non-Adherence

2.1 Scale of the Problem

Medication non-adherence remains a persistent and widespread issue across chronic disease populations. The World Health Organization estimates that approximately 50% of patients with chronic illnesses do not take medications as prescribed, highlighting a global and systemic challenge ¹.

Approximately **50%** of patients with chronic illnesses do not take medications as prescribed



In the United States, adherence challenges are evident across major disease areas. Among patients with diabetes and hypertension, cost-related barriers alone lead to significant non-adherence, with studies showing that more than two-thirds of affected patients may skip or delay medications due to cost pressures ⁴.

In cardiovascular disease, adherence is strongly linked to outcomes, yet many patients discontinue medications over time, contributing to preventable complications. The Centers for Disease Control and Prevention notes that non-adherence is associated with poorer outcomes and increased healthcare utilization in this population ⁵.

For other chronic conditions, including oncology and autoimmune diseases, adherence varies widely depending on treatment complexity, side effects, and patient support systems. Across all categories, the consistent pattern is that long-term treatment regimens introduce behavioral and logistical challenges that reduce sustained adherence.

2.2 Economic Impact

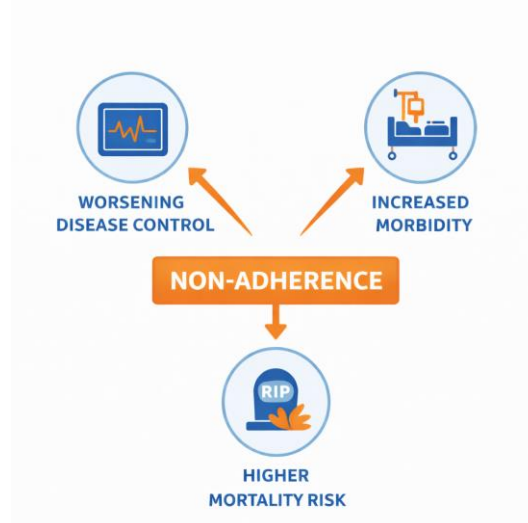
The financial burden of medication non-adherence is substantial and well documented. Estimates indicate that non-adherence contributes between \$100 billion and \$300 billion annually in avoidable healthcare costs in the United States ⁵.

These costs are driven primarily by downstream clinical consequences. Hospitalizations and emergency department visits increase when chronic conditions are not effectively managed. The CDC reports that non-adherence is associated with higher rates of hospital admissions and increased healthcare spending due to complications that could otherwise be prevented ¹.

In addition, disease progression resulting from inconsistent medication use leads to more intensive and costly interventions over time. This creates system-wide financial pressure. Payers face higher claims costs, providers encounter increased care demands, and pharmaceutical companies experience reduced real-world effectiveness of therapies, which can affect long-term treatment value and outcomes.

2.3 Patient-Level Impact

The consequences of medication non-adherence extend beyond economic impact and directly affect patient health and well-being. Non-adherence is associated with worsening disease control, increased morbidity, and higher mortality risk, particularly in chronic conditions requiring ongoing treatment ¹.



Patients who do not follow prescribed therapies often experience reduced quality of life, including increased symptom burden and functional limitations. Over time, these effects can lead to avoidable complications and a decline in overall health status ¹.

Importantly, adherence gaps are closely linked to health inequities. Data from the CDC show that cost-related non-adherence is more common among individuals with lower income, limited insurance coverage, or underlying disabilities. These disparities contribute to unequal health outcomes and reinforce broader systemic challenges in chronic disease management.

3. Why Traditional Adherence Interventions Fall Short

Despite decades of research and implementation, traditional medication adherence interventions have delivered limited and inconsistent results, particularly when applied across large and diverse patient populations. A key limitation is the historical reliance on education-focused, one-size-fits-all approaches, which do not adequately address the behavioral, social, and clinical factors that influence adherence. Evidence shows that interventions centered solely on patient education are often insufficient, and more effective strategies require multiple, tailored components that go beyond information delivery ⁶.

Another constraint is the limited frequency and personalization of traditional interventions. Many adherence programs rely on periodic counseling sessions or static educational materials, which do not adapt to changes in patient behavior or clinical status over time. Research indicates that adherence is influenced by a wide range of dynamic factors, including patient beliefs, treatment complexity, and system-level barriers, which require ongoing and individualized support ⁷.

Traditional models also depend heavily on in-person interactions, such as physician visits or pharmacist consultations. While these touchpoints are valuable, they are inherently constrained by time, workforce capacity, and access to care. As a result, continuous support between visits is often lacking. Systematic reviews of consultation-based interventions show variability in outcomes and highlight challenges in sustaining meaningful improvements in adherence within routine clinical practice ⁸.

A further limitation is the absence of real-time engagement. Many conventional approaches do not provide timely interventions when patients miss doses, experience side effects, or disengage from treatment. Without immediate feedback or support, adherence issues can persist unnoticed until the next clinical encounter, increasing the risk of adverse outcomes.

Finally, fragmented communication systems within healthcare organizations contribute to gaps in patient engagement. Data related to prescriptions, clinical care, and patient behavior are often stored across disconnected systems, limiting the ability to deliver coordinated and consistent messaging. The Agency for Healthcare Research and Quality notes that adherence interventions vary widely in design and delivery, with no single standardized approach demonstrating consistent effectiveness across populations ⁹.

Taken together, these limitations underscore the need for scalable, integrated solutions that can deliver continuous, personalized, and data-driven patient engagement.

4. CRM-Driven Patient Communication Programs: A Scalable Solution

4.1 What Are CRM-Driven Communication Programs?

CRM-driven patient communication programs use centralized customer relationship management platforms to coordinate, personalize, and automate interactions with patients across the care continuum. In a healthcare and pharmaceutical context, these programs integrate patient data (such as demographics, treatment history, and engagement behavior) to deliver targeted communications that support medication adherence and overall disease management.

Core components typically include data integration layers, segmentation tools, communication channels, and workflow automation engines. Platforms such as Salesforce Marketing Cloud enable organizations to design and execute patient engagement journeys using unified data and configurable workflows. Salesforce describes Marketing Cloud as a platform that supports personalized, cross-channel communication at scale, including email, mobile messaging, and digital engagement ¹⁰.

In healthcare settings, these capabilities are increasingly applied to patient support programs, where consistent and timely communication plays a critical role in improving adherence and outcomes.

4.2 Why CRM Platforms Are Uniquely Positioned

CRM platforms are well suited to address the limitations of traditional adherence interventions due to their ability to operate at scale while maintaining individualized engagement. These systems are designed to manage large volumes of patient data and interactions simultaneously, making it possible to support millions of patients within a single infrastructure.

A major advantage is real-time data integration, which allows CRM platforms to ingest and process information from multiple sources, including electronic health records (EHRs), pharmacy systems, and patient-reported data. This capability enables timely updates to patient profiles and supports responsive communication strategies. The Office of the National Coordinator for Health Information Technology (ONC) highlights the importance of interoperability and real-time data exchange in improving care coordination and patient outcomes ¹¹.

CRM platforms also enable multichannel orchestration, allowing organizations to engage patients in channels such as SMS, email, mobile applications, and voice messaging. Research shows that digital communication tools, including mobile health interventions, can improve medication adherence by providing reminders and educational support directly to patients.

In addition, automation capabilities allow for consistent and scalable delivery of communications without requiring continuous manual intervention. This ensures that patients receive timely messages aligned with their treatment plans.

4.3 Personalization at Scale

One of the most significant advantages of CRM-driven programs is the ability to deliver personalized communication at scale. Personalization is achieved through behavioral segmentation, where patients are grouped based on characteristics such as condition, medication regimen, adherence patterns, and engagement history.

These platforms support lifecycle-based messaging, enabling communication strategies that evolve as patients progress through different stages of treatment, from onboarding to long-term adherence support. Messages can be tailored to address specific needs at each stage, improving relevance and engagement.

Trigger-based interventions further enhance effectiveness by enabling real-time responses to patient actions or inactions. For example, missed doses, delayed refills, or changes in engagement can

automatically initiate targeted communications. Evidence suggests that timely reminders and tailored messaging are associated with improved adherence outcomes, particularly when delivered through digital channels.

By combining data integration, automation, and personalization, CRM-driven patient communication programs provide a scalable and effective framework for addressing medication non-adherence across chronic disease populations.

5. How Personalized, Automated Communication Improves Adherence

5.1 Behavioral Science Foundations

Personalized, automated communication programs are effective when they are grounded in established behavioral science rather than generic outreach. Medication adherence is influenced by memory, routine, motivation, perceived benefit, treatment burden, and day-to-day interruptions. Digital interventions can address several of these barriers by pairing reminders with behavioral cues, reinforcement, and timely follow-up. A 2024 systematic review and meta-analysis of mobile app interventions in chronic disease found a positive overall effect on medication adherence, with stronger results in interventions that included interactive features, advanced reminders, data sharing, and connected devices rather than static messaging alone ¹².

This aligns with the broader literature on nudging and habit formation. A review of habit-based medication adherence research found growing evidence that interventions tied to routines and repeated cues can support long-term adherence behavior. Separately, a randomized controlled trial involving 46,581 insured U.S. adults tested behaviorally informed reminders and concluded that adherence interventions are more likely to succeed when their design reflects behavioral science principles rather than simple notification logic ¹³.

5.2 Types of Communication Interventions

In practice, effective programs combine several communication types. Medication reminders remain a core component, particularly for patients managing daily oral therapies or multiple prescriptions. A systematic review of SMS reminder interventions found that text-based reminders frequently improved medication-taking behavior and are valued for their low cost, speed, and automation potential ¹⁴. For patients with type 2 diabetes, a 2023 systematic review and meta-analysis concluded that mobile phone text message reminders improved medication adherence relative to usual care.

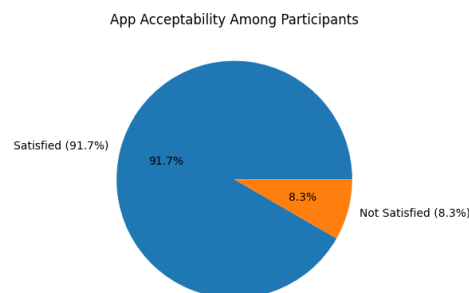
However, reminders alone are often insufficient. Adherence also improves when programs include education and disease awareness, side-effect management guidance, and refill prompts. These elements address common reasons patients stop or interrupt therapy, including uncertainty about treatment benefits, concerns about adverse effects, and missed refill opportunities. A 2018 study of tailored, interactive text messaging for Medicare patients reported improved refill rates, supporting the use of digital prompts as part of refill management programs ¹⁵. At the same time, a 2024 randomized trial in cardiovascular patients found that text reminders aimed at delayed refills did not improve adherence or clinical events over 12 months, underscoring that message timing alone does not overcome all adherence barriers.

5.3 Multichannel Engagement Strategy

A multichannel strategy improves reach because patients vary in how they prefer to receive health information. SMS is useful for immediate prompts and high-visibility reminders; email is better suited to longer educational content; app notifications can support two-way engagement, self-reporting, and ongoing tracking. Survey research has shown that patients use and value multiple digital communication formats, and that communication effectiveness can improve when the mode matches the patient's preferences and circumstances¹⁶. Salesforce states that Marketing Cloud and Marketing Cloud Personalization supports real-time, cross-channel personalization, which is directly relevant to orchestrating adherence journeys across email, mobile messaging, and digital touchpoints.

5.4 Measurable Impact

The measurable impact of personalized, automated communication is most often assessed through changes in adherence, persistence, and engagement. Across 14 studies in adults with chronic disease, a meta-analysis found that mobile apps were associated with a significant improvement in medication adherence compared with usual care (Cohen's $d = 0.40$; 95% CI 0.27–0.52). In stroke populations, a meta-analysis of randomized trials found that mHealth interventions improved adherence scores and increased the medication adherence ratio (OR 2.81; 95% CI 1.35–5.85), with app- and messaging-based interventions outperforming telephone calls. In addition, app acceptability was high in one meta-analysis, with 144 of 156 intervention participants (91.7%) reporting satisfaction where acceptability was measured, which is relevant because engagement is a practical prerequisite for sustained adherence support¹⁷.



Taken together, the evidence suggests that automated communication improves adherence most reliably when it is personalized, interactive, behaviorally informed, and delivered through the channel and timing most appropriate for the patient, rather than through a uniform reminder program alone¹².

6. Technical Architecture of a Compliant Patient Communication Platform

6.1 Core System Architecture

A compliant patient communication platform typically begins with a data architecture that can ingest and normalize information from multiple enterprise systems, including electronic health records, claims platforms, pharmacy systems, and CRM environments. In practice, this means bringing together clinical, administrative, and engagement data so that communication logic can reflect a patient's treatment context and communication history. At the interoperability layer, HL7 FHIR is now a foundational standard for electronic healthcare data exchange, and the U.S. Office of the National Coordinator for Health

Information Technology (ONC) identifies FHIR as central to modern API-based interoperability. Legacy HL7 v2 messaging also remains widely used in healthcare environments for operational data exchange ¹⁸.

Within this architecture, Salesforce Marketing Cloud can serve as the orchestration layer for outbound patient journeys. Salesforce documents that Journey Builder supports API-based access to journey functionality and event-driven entry through defined sources such as sendable data extensions and event definitions. This allows organizations to connect upstream systems to downstream communication workflows without rebuilding messaging logic for each channel or program ¹⁹.

6.2 Consent Management Frameworks

Consent management is a core architectural requirement because patient communication programs must track whether a person has agreed to receive specific categories of messages and whether that permission has later been withdrawn. In Salesforce Marketing Cloud, unsubscribe and opt-out status can be captured at the subscriber level, and profile or preference centers can support more specific communication choices. Salesforce also documents the use of publication lists and suppression lists to manage communication preferences across email and SMS sends ²⁰.

For healthcare SMS and voice communications, consent and revocation processes also need to align with the Telephone Consumer Protection Act (TCPA) framework enforced by the Federal Communications Commission (FCC). The FCC's rules govern consent requirements for certain autodialed and prerecorded communications and also address opt-out handling ²¹.

Auditability is equally important. Salesforce's Audit Trail capability records access and activity information in Marketing Cloud Engagement, while the HIPAA Security Rule requires covered entities and business associates to implement administrative, physical, and technical safeguards for electronic protected health information ²².

6.3 Segmentation and Personalization Engine

Once consented data is available, the platform can segment patients into cohorts based on condition, treatment stage, and behavioral signals such as refill timing, prior engagement, or channel preference. Salesforce documents that dynamic content can be rendered according to subscriber attributes, data extension values, or audiences, allowing the same communication asset to display different content depending on patient data. Salesforce also documents integrations between Marketing Cloud Personalization and Journey Builder for targeting, identity merging, and individualized experiences ²³.

6.4 Journey Orchestration

Journey orchestration is the layer that translates patient data into action. In Salesforce, an entry event is the action that places a contact into a journey, and Journey Builder can monitor the underlying data source on a configured schedule. This supports event-triggered workflows, such as onboarding after therapy initiation, adherence support after a refill gap, or re-engagement after communication inactivity.

This architecture is well suited to lifecycle journeys that move from onboarding to adherence support to retention, with messaging updated as patient status changes. Although Salesforce documentation describes

scheduled monitoring rather than universal instantaneous processing, it does support API-defined events and journey logic that can approximate real-time decisioning when upstream systems are integrated appropriately.

6.5 Regulatory Guardrails

In pharmaceutical contexts, communication workflows also need guardrails that prevent the release of content outside approved rules. At the regulatory level, the FDA Office of Prescription Drug Promotion (OPDP) states that prescription drug promotion must be truthful, balanced, and accurately communicated. This is the regulatory basis for formal content approval workflows before deployment ²⁴.

Operationally, those guardrails can be reinforced in Marketing Cloud through send classifications, suppression lists, exclusion lists, and frequency controls. Salesforce documents send classifications for distinguishing transactional and commercial messages, suppression and exclusion tools for preventing delivery to restricted audiences, and communication capping features to reduce over-messaging. Business units can also be configured to separate data and communications by team, market, or program, which helps support geographic and regulatory restrictions where different rules apply.

7. HIPAA-Compliant Data Governance in Patient Communications

7.1 Core HIPAA Requirements

Patient communication programs in healthcare and pharmaceutical contexts must align with the requirements set out under the Health Insurance Portability and Accountability Act (HIPAA). At the center of these requirements is the protection of protected health information (PHI), which includes any individually identifiable health data transmitted or maintained in any form. The U.S. Department of Health and Human Services (HHS) defines PHI and outlines how covered entities and business associates must safeguard it under the HIPAA Privacy Rule and Security Rule ²⁵.

A primary principle within HIPAA is the “minimum necessary” standard, which requires organizations to limit the use, disclosure, and access to PHI to only what is needed to accomplish a specific purpose. This principle directly impacts how patient data is used in communication programs, particularly when designing segmentation and personalization strategies.

7.2 Data Security Measures

To comply with HIPAA, organizations must implement appropriate administrative, physical, and technical safeguards. The HIPAA Security Rule specifically requires protections for electronic PHI (ePHI), including encryption, access controls, and system monitoring. While encryption is categorized as an “addressable” implementation specification, HHS strongly encourages its use for data both at rest and in transit to reduce the risk of unauthorized access ²⁶.

Role-based access controls are another essential measure, ensuring that only authorized personnel can access sensitive patient data based on their job function. In cloud-based environments, secure infrastructure must include identity management, authentication protocols, and safeguards against unauthorized access, all aligned with HIPAA requirements.

7.3 Governance Frameworks

Effective data governance extends beyond technical safeguards to include policies and processes that manage data throughout its lifecycle. This includes data collection, storage, usage, retention, and disposal, all governed by clearly defined policies.

In patient communication programs, governance frameworks must also incorporate consent-driven communication policies, ensuring that patient preferences are respected and that communications align with permitted uses under HIPAA. Organizations must maintain audit trails and monitoring capabilities to track access, changes, and data usage. These controls support accountability and enable organizations to demonstrate compliance during audits or investigations.

7.4 Pharma-Specific Considerations

In pharmaceutical contexts, additional considerations apply, particularly within patient support programs (PSPs) that involve direct-to-patient engagement. These programs must clearly distinguish between medical communications (such as adherence support or safety information) and promotional or marketing communications, which are subject to different regulatory standards.

Regulatory alignment is required not only with HIPAA but also with guidance from the U.S. Food and Drug Administration and the Federal Trade Commission. The FDA requires that prescription drug communications be truthful, balanced, and not misleading, particularly when related to patient-facing materials.

Together, these requirements establish a governance framework that ensures patient communications are secure, compliant, and aligned with both privacy and promotional regulations.

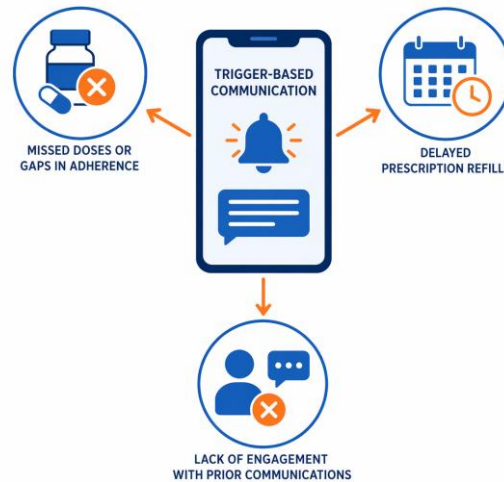
8. The Role of Marketing Cloud Journey Automation

Customer relationship management platforms such as Salesforce Marketing Cloud provide a structured framework for orchestrating patient communication programs at scale. Within this ecosystem, Journey Builder functions as the central orchestration layer, enabling organizations to design, automate, and manage multi-step communication workflows that guide patients through defined engagement pathways. Salesforce describes Journey Builder as a tool that allows organizations to “design and automate campaigns that guide customers through their journey,” with contacts entering through defined data-driven entry points and progressing based on evaluated conditions.

8.1 Journey Builder as the Orchestration Layer

Journey Builder operates through three primary components: entry sources, activities, and flow controls. Entry sources determine how a patient enters a journey (e.g., enrollment in a patient support program or a prescription event), while activities define the communication actions (such as sending an SMS or email). Flow controls (including decision splits and wait steps) govern how patients progress through the journey based on their data and behavior²⁷.

8.2 Trigger-Based Communication



A main capability of journey automation is the use of trigger-based communication, where patient actions or system events initiate specific messages. Salesforce supports behavioral triggers, allowing communication workflows to respond to events such as inactivity, missed engagement, or other predefined conditions.

In healthcare applications, this model can be adapted to scenarios such as:

- Missed doses or gaps in adherence
- Delayed prescription refills
- Lack of engagement with prior communications

These triggers enable timely intervention, which is critical for addressing adherence challenges as they occur rather than after they have escalated.

8.3 AI-Driven Optimization

Salesforce Marketing Cloud incorporates artificial intelligence capabilities through tools such as Einstein AI, which can analyze engagement patterns to optimize communication strategies. These capabilities include predicting optimal send times, preferred channels, and content selection for individual users.

By leveraging data-driven insights, organizations can improve message relevance and increase the likelihood of patient engagement, which is a key factor in adherence outcomes.

8.4 Integration with Patient Data Ecosystems

Journey Builder is designed to integrate with broader data ecosystems, including CRM systems and data platforms. Salesforce documentation highlights that journey orchestration is driven by unified data models and can incorporate inputs from multiple systems to support personalized engagement.

This integration enables communication strategies that reflect real-time patient context, including treatment stage, engagement history, and behavioral signals.

Future Outlook: The Evolution of Adherence Programs

Emerging technologies are shaping the next phase of adherence programs. Artificial intelligence and predictive analytics are increasingly used to identify patients at risk of non-adherence and enable earlier, targeted interventions. The U.S. Food and Drug Administration has recognized the growing role of AI in healthcare, particularly in supporting decision-making and patient management. At the same time, the integration of wearables and digital therapeutics is expanding the range of real-time patient data available, allowing for more responsive and personalized communication strategies.

CRM-driven platforms such as Salesforce Marketing Cloud are positioned to operationalize these advances by enabling hyper-personalized, multichannel engagement at scale. As these capabilities mature, adherence programs are evolving into broader patient engagement ecosystems that address not only medication-taking behavior but also education, lifestyle management, and long-term condition support.

The evidence is clear that improving adherence leads to better clinical outcomes, reduced hospitalizations, and lower total cost of care. CRM-driven communication programs provide a scalable pathway to achieve these outcomes by aligning data, automation, and patient-centered design.

Healthcare and pharmaceutical leaders now have an opportunity to implement these technologies in a compliant and strategic manner, advancing patient outcomes while improving system efficiency at scale.

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