

Role for Automated Communication Strategies in Medication Adherence Management

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Lack of medication adherence is a prevalent problem that causes a broad range of health- and health-economics-related issues. Adherence management is therefore an important strategy, but it also presents its own set of challenges. Interventional communication from care support teams at managed care organizations and disease management and wellness programs has proved effective at modifying patients' medication adherence and reporting behaviors. However, these communications do not work well from an economic standpoint. It is not economically feasible to scale call centers and the numbers of clinical and professional staff to communicate with the increasing number of patients with chronic diseases who require ongoing medication use. Using communication automation to augment traditional call center outreach can help to mediate patient medication-taking behaviors. Specific

design criteria for the automation of this interaction are discussed in this article, offering supporting data from a recent trial of 304 elderly patients with hypertension, and showing the benefits of using such a system for effective blood pressure monitoring, at reduced costs. [AHDB. 2008;1(9):20-27.]

"Drugs don't work in patients who don't take them." —C. Everett Koop, former US Surgeon General

Adherence to medications is essential for patients with chronic disease for optimizing clinical outcomes. When used appropriately, medication is a very cost-effective method for treatment and prevention of disease. Patients who fail to take their medications as prescribed do not get the full benefit from the drugs, and they may also end up with unnecessary hospitalizations, emergency department visits, and nursing home admissions. Cost-effective, scalable interventions are essential to reduce nonadherence. In this article, we examine the use of automated phone-based patient communication to support outreach efforts, as well as the impact this type of intervention can have on clinical outcomes and costs.

In their 2005 study of medication-taking behaviors, Osterberg and Blaschke observed that, "Common barriers to adherence are under the patient's control, so attention to them is a necessary and important step in improving adherence."¹ In that study, the following reasons were cited by patients for not adhering to their

medication regimens¹:

- Forgetfulness—30%
- No reason—27%
- Other priorities—16%
- Decision to omit doses—11%
- Lack of information—9%
- Emotional factors—7%.

Lack of information and forgetfulness combined comprise 39% of the reasons cited in this study for poor medication adherence.¹ These 2 areas can be positively affected by improved communications between the care provider and the patient that, in turn, can improve medication adherence.

One other common and well-documented reason for poor adherence is side effects.^{2,3} Patients who experience unpleasant or unexpected side effects may stop taking their medications, often without informing their physicians or other care providers.^{2,3}

In their study, Osterberg and Blaschke further observe that there are 4 general methods to help improve patient adherence¹:

1. Patient education
2. Revised dosing schedules

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3. Expanded hours when the clinic is open, including evening hours
 4. Shorter wait times and improved communication between physicians and patients.
- Although not all of these general methods are relevant to our topic, patient education and communication between physicians and patients are 2 areas that can be affected by effective communications.

Illustrative Case

Tom’s blood pressure (BP) was elevated during his past 2 visits to his physician. At the most recent visit, his doctor suggests an antihypertensive regimen and prescribes lisinopril. Tom fills the prescription order for lisinopril at the local pharmacy and takes it home. As part of his routine care, Tom schedules a follow-up examination. After a period of time, we may expect a reduction in Tom’s BP level. But instead, at his follow-up visit, Tom’s BP is still elevated. Was lisinopril ineffective in Tom’s case? Not necessarily. In fact, the medication might well have proved effective if Tom had remembered to take it. But Tom took the first day’s dosage, put the bottle in his medicine chest, and then promptly forgot about it. He also was not reminded to take the medication.

The Challenge: Improving Care for 10 Million “Toms”

Tom is not alone. Findings from Osterberg and Blaschke’s study show that, “Of all medication-related hospital admissions in the United States, 33% to 69% are due to poor medication adherence, with a resultant cost of approximately \$100 billion a year.”¹ In addition, according to well-documented surveys, failure to adhere to treatment, also known as noncompliance, is a large-scale problem.^{4,5}

The 2006 Case Management Adherence Guidelines, issued by the Case Management Society of America, offer insight into the magnitude of the issue, noting that “the number one problem in treating illness today is patients’ failure to take prescription medications correctly, regardless of patient age.”⁴

In a 2003 study, the World Health Organization found that approximately 50% of the 1.8 billion prescription medications dispensed annually in the United States are not taken correctly by patients.⁵ It is reasonable to assume that at least some of these nonadherent patients are not receiving the full benefits of the prescribed medication. In 1998, nonadherence to heart disease medication regimens alone was reported to be the cause of 125,000 preventable deaths each year in the United States.⁶ This places medication nonadherence among the major causes of health-related deaths in the

KEY POINTS

- ▲ Medication nonadherence is a major cause of morbidity and mortality, and is a large contributor to escalating health-related economic costs.
- ▲ Lack of information and forgetfulness are 2 main reasons for nonadherence that can be positively affected by improved patient–provider communication.
- ▲ With chronic diseases estimated to involve hundreds of millions of patients, the scale of disease management enrollment is too great to be cost-effective using traditional outreach methods.
- ▲ The challenge is to scale outreach programs efficiently, without losing the personal touch necessary to help change behavior.
- ▲ In a new study of automated telephony for blood pressure monitoring, this technology reduced the cost of blood pressure reading by 95% compared with supportive care reading.
- ▲ The study results suggest that efficient, effective automated communications with patients can produce positive clinical outcomes at reduced costs.

Table Medication Nonadherence Major Cause of Death in the United States

Condition	Annual deaths, N
1. Heart disease	652,091
2. Cancer	559,312
3. Stroke	143,579
4. Chronic lower respiratory diseases	130,933
5. Medication nonadherence	125,000*
6. Diabetes	75,119
7. Alzheimer’s disease	71,599

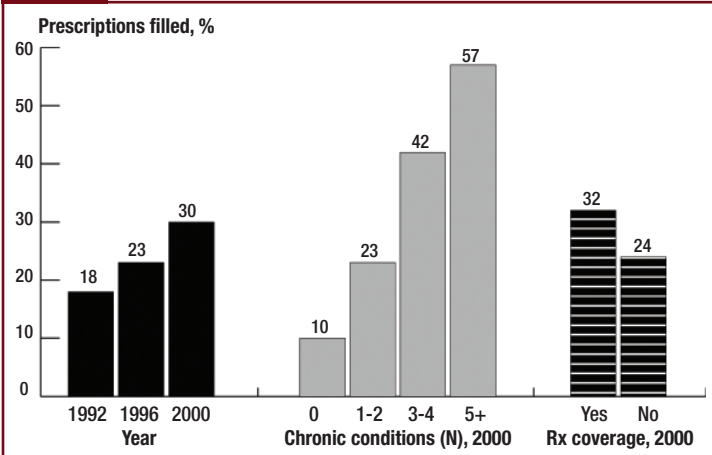
* This number refers to medication nonadherence deaths from heart disease alone; the number for all deaths from medication nonadherence could therefore be higher. Source: McCarthy R. The price you pay for the drug not taken. *Bus Health.* 1998;16:27-33.

Source: Kung HC, Hoyert DL, Xu JQ, Murphy SL. Deaths: final data for 2005. *Natl Vital Stat Rep.* 2008;56:1-120.

United States, after heart disease, cancer, stroke, and chronic lower respiratory diseases, according to the 2005 *National Vital Statistics Reports (Table)*.⁷ In reality, deaths from all medication nonadherence could be much larger than the 125,000 deaths for heart disease only.

Patients who stop taking medication as a result of forgetfulness, lack of information, or side effects can often be helped by effective outreach from their physician or clinical care professionals to remind patients to take their medications, elicit information about side effects and their impact on noncompliance, offer encouragement, and even connect them with their

Figure 1 Average Annual Prescriptions Filled by Noninstitutionalized Medicare Enrollees, ≥65 y



Source: Cherry DK, Woodwell DA, Rechtsteiner EA. National Ambulatory Medical Care Survey: 2005 summary. *Adv Data.* 2007;(387):1-39.

clinical care team, if needed. This, in fact, is one of the key premises around which managed care organizations (MCOs) and wellness programs are organized: by offering regular, relevant “interventional” communications in a structured program, these organizations can positively affect medication-taking behaviors of their program members.

Health Economics: The Costs of Noncompliance

Adherence is critical to everyone involved in healthcare: from patients and payers (insurance, government, employers) to retail pharmacies and pharmaceutical manufacturers. And it is the sheer number of these patients that forms the heart of the adherence challenge. For patients, adherence is an important factor in improving clinical outcomes; this issue has been well documented in the literature.¹ Indeed, the Case Management Society of America observes, “Nonadherence to medications is a common factor that prevents patients from achieving the full therapeutic benefit of their therapies.”⁴

For organizations, improved patient adherence means the ability to deliver better care while reducing medical expense ratios driven by unnecessary hospitalizations, emergency department visits, nursing home admissions, and excess consumption of interventional treatments.⁵

For manufacturers and retail pharmacies, whose nonadherent patients do not fill prescriptions as indicated, or who have poor medication possession ratios, improving patient adherence is not only important to

patient health but can also affect bottom-line revenues.

Let’s return briefly to our hypertensive patient, Tom. During the follow-up appointment, Tom’s doctor asks if he is taking his medication as prescribed. Tom sheepishly admits he has forgotten. Tom’s doctor reminds him of the importance of taking medications as prescribed, and provides information about hypertension, the associated health risks of stroke and heart attack, and strongly encourages him to “stick” with the medication regimen. Concerned about his health and encouraged by his healthcare provider, Tom signs up for a wellness program through his employer. A care representative from the wellness program contacts Tom, enrolls him in the program, and begins to provide him with information, tips, and additional encouragement. The outcome? Tom’s BP is much better managed now, and he will likely have an improved clinical outcome as a result.

Of course, Tom is a hypothetical patient, but this is a common story for millions of real patients with hypertension. Illustrative of the scale of this particular condition, the 2005 National Ambulatory Medical Care Survey revealed that there were 44 million visits to office-based physicians with hypertension as a primary diagnosis.⁶

Further complicating the issue is the fact that many of these patients may be older and may take more than 1 medication regularly.⁴ We live in a society experiencing a “graying” of its population, as the baby boom generation begins to mature past the age of 65 years. Many boomers, as well as millions of others, will be prescribed multiple medications (**Figure 1**) for chronic conditions, such as hypertension, high cholesterol, depression, and diabetes.⁸ The Centers for Disease Control and Prevention’s (CDC) *Health, United States, 2007*, survey shows that slightly more than 30% of all individuals between the ages of 45 and 64 had taken 3 or more prescription medications in the past month.⁹

Provider Communication

It is well-documented that clear, consistent provider communication can have a positive impact on patient well-being. In an article on literature searches for physician–patient relations, Stewart notes that “Most of the studies reviewed demonstrated a correlation between effective physician–patient communication and improved patient health outcomes.”¹⁰

Thus, it is not surprising that regular, consistent communications from care support teams, such as those in wellness organizations, can have the same

effect. If it were just 1 doctor effectively communicating to 1 patient the importance of consistently taking medication as prescribed, it might be easier to resolve the adherence problem. But, as we have noted, there are tens of millions of “Toms” with a variety of chronic conditions who require this type of outreach. The CDC notes in its *Health, United States, 2007*, that in 2005, the percentage of adults with 3 or more chronic conditions increased with age from 7% of adults aged 45 to 54 years to 37% of adults aged 75 years and older.⁹ Although managing chronic conditions is a problem of scale, the real challenge lies in scaling efficiently, without losing the personal touch necessary to help change behavior.

The Economics of Outreach: Scaling Clinical Call Centers Is Expensive

Clinical outreach centers typically employ a blend of trained care professionals and clinical care professionals, such as registered nurses and pharmacists. The fully loaded hourly wage of these individuals can exceed \$50, which means the cost of even a relatively brief (15-20 minute) phone call can approach \$20. This figure is conservative, given that the industry-standard cost for a call for technical support centers ranges between \$20 and \$40,¹¹ using significantly less costly staff. This cost does not decrease with increased call center staff or with larger numbers of patients to call, so organizations’ abilities to scale outreach programs using care representatives are significantly limited.

Today, health plans and disease management programs are evolving new strategies and solutions to help their patient populations adhere to treatment plans. We suggest that any strategy must meet 2 primary tests:

1. *Is it efficient?* Efficient solutions scale well and offer a low marginal cost of operation.
2. *Is it effective?* Effective solutions deliver similar response rates and engagement rates as the current gold standard—human outreach by care support representatives.

What Needs to Be Done Today and Tomorrow

Traditionally, MCOs and disease management programs use a broad range of outreach methods, including nurses or other specialty practitioners to contact participants, review program benefits, respond to questions, and ultimately, enroll members. Once enrolled, these same specialists may contact members for surveys, health status updates, medication reminders, and other communications designed to foster compliance.

In principle, this form of operation should be effec-

tive (and often is with small populations). For the organizations paying for these programs, cost benefits are largely dependent on the ability to reach large numbers of patients, enroll them, and provide ongoing health and wellness support. Considering that the number of individuals with chronic diseases is estimated to be in the hundreds of millions, the scale of enrollment is too great to manage cost-effectively with traditional outreach methods.

For organizations, improved patient adherence means the ability to deliver better care while reducing medical expense ratios driven by unnecessary hospitalizations and excess interventions.

Communication Works, but Not Cost-Effective

In the Medicare Health Support phase 1 study, the Centers for Medicare & Medicaid Services determined that the value delivered by these programs does not overcome program costs.¹² It was simply not cost-efficient (nor economically feasible) for clinical staff or care support specialists to communicate with even moderately large at-risk populations. And yet, the same study found that this type of interventional communication had a clear beneficial impact on participants. “Participating beneficiaries tend to be a healthier and less-costly subset of the intervention group. Thus, high participation rates will likely be a factor in the ability of the [Medicare Health Support organizations] to impact their assigned intervention populations.”¹²

And although human communication is certainly the benchmark for clinical results, automating communication shows some positive results. Properly implemented, this form of communication may deliver similar clinical results at a far lower marginal cost.

Communications Automation: Scalable Interaction for Large Populations

As noted earlier, any type of automated communication must be able to connect efficiently with large numbers of patients or members. Automated communication must also connect effectively, by delivering an experience that resembles an actual clinician–patient interaction. Modern communications systems can be modeled against good examples of productive clinical interactions (eg, a system could emulate the voice and

persona of an experienced call center representative or an outreach nurse).

Effective interventional dialogue with patients involves understanding the patient's specific concerns and health beliefs, embracing that information, and then using it to tailor interventions specific to their needs. When insights such as these are applied to the treatment regimen, adherence improves dramatically.¹³ And as discussed before, improved adherence can provide a positive boost to health outcomes, both proximal and for the long-term.

Automated patient communication offers additional potential benefits. With the majority of contacts managed through an automated system, organizations can optimize the use of live agent care support resources by triaging those patients most in need, thereby responding more efficiently to critical patient care questions (see below).

The ability to deliver automated patient communication programs efficiently and effectively may offer additional distinct advantages, including increased scope and improved health economics.

The ability to deliver automated patient communication programs efficiently (at a low unit cost) and effectively (with a positive result across the majority of respondents) may offer additional distinct advantages, including increased scope (the lowered unit cost improves the provider's ability to reach out to more patients or members) and improved health economics (improved individual outcomes across a broad segment of the at-risk population that contributes to improvement in the aggregate outcome profile).

Key Criteria for Successful Automation of Patient Outreach Communications

Varolii Corporation's healthcare division has been communicating with tens of millions of patients on a monthly basis on a variety of healthcare-related areas. Based on the experience of delivering these automated calls, and on Varolii's general experience in delivering billions of automated notifications over the past several years in a variety of industries, we believe that 5 key criteria can determine whether automated communica-

tions will serve as a useful adjunct to patient outreach. These criteria revolve around the concepts of efficiency and effectiveness discussed earlier:

1. **Scalability.** If you cannot reach large populations cost-effectively, then any other enabling criteria will not matter.
2. **Clarity.** Most people, particularly older or at-risk individuals, find artificial voices, varying intonations, pace, and variable volume levels not only annoying, but difficult to understand.¹⁴
3. **Personalization and Interactivity.** "Personalization," or tailoring the message to specifically address individual concerns, enables automated communications to more closely match the experience of conversing with a clinician or specialty representative. Results of Datamonitor's Patient Compliance Survey, 2004, authored by Adele Schulz, "support the idea that personalized communication with patients is an important tool in compliance initiatives."¹⁵

"Interactivity" is the ability to accept patient responses either through keypad presses or voice response, and deliver the next question or information based on the previous response. Interactivity can help ensure regulatory compliance by enabling appropriate authentication. As an example, HIPAA (Health Insurance Portability and Accountability Act) compliance through authentication, sometimes known as right party contact, could be managed as follows:

- Before giving any personalized information, an automated system could ask the individual to confirm that he/she is the correct party
- If further authentication is required, the system could ask for appropriate credentials.

This type of interactivity can also be used to collect survey data and patient feedback through survey questions.

4. **Reporting Visibility.** Reporting is important both to understand aggregate behaviors and make useful program changes, as well as to provide substantiated, auditable performance data. Automation offers significant advantages in data collection and speed of analysis. Reporting can help organizations measure the results of their outreach efforts more effectively. Demonstration of results against required objectives, such as the Health Effectiveness Data and Information Set and other programs from accrediting and regulatory bodies, may enable organizations to satisfy these requirements more efficiently with a better outcome.
5. **Analytics.** Analytics underlies useful personalization. Applying a detailed scoring model helps the

evaluation of several key factors, such as which patients are most likely to take action, and whether they are being contacted too little, too much, or the right amount using the best method. At a deeper level, analytics also provides insight on the best approach for contacting patients, evaluating such treatment strategies as the best calling windows, media (voice, e-mail, text message, or a combination of these), persona, retry strategy, among near-infinite combinations of these.

The impact of automated communication is further enhanced by tailoring interventional strategies on a per-patient basis, combining analysis of historical patient clinical data along with actual patient response data. For example, an analytics-enabled solution may initially help determine which patients should be contacted first, based on drug and therapeutic categories, number of maintenance medications, complexity of medication regimen, or patient demographics.

By looking at the history of patient refill behaviors, the system can determine whether, when, and how frequently to communicate with the individual patient. Over time, the system can become increasingly “intelligent” and better capable of determining the profile of the most receptive patients.

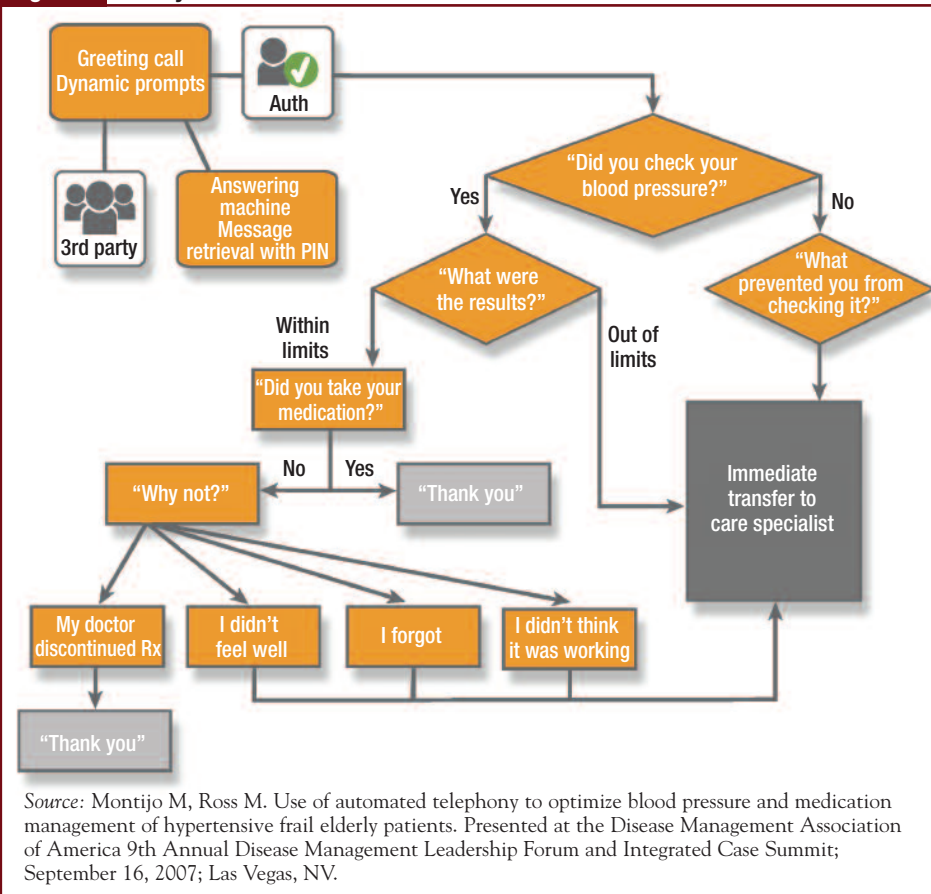
Results from automated systems capable of decision-making can support effective personalized communications with many patients on an individualized basis. This process is sometimes referred to as “mass personalization.”

Automated Communication Improves BP Monitoring in Frail Elderly: New Study Results

The following study was developed to address uncontrolled hypertension and the use of automated communication in a patient cohort from the Medicare Health Support (MHS) pilot program in Maryland and the District of Columbia during a 2-month period (March 19, 2007-May 24, 2007).¹⁶

The Treat to Target (TTT) initiative approaches uncontrolled hypertension by the simple principle that

Figure 2 Survey Call Flow



lower is better. The TTT also bases optimal target ranges on specific patient diagnoses, such as BP <140/90 mm Hg for patients with heart failure (HF) but BP <130/80 mm Hg for patients with diabetes.

For the present trial, a cohort of approximately 800 patients was selected from the MHS pilot population, based on a primary diagnosis of HF or diabetes and recently reported BP readings above the established target range.¹⁶ Of these, 318 agreed to participate in a trial of an automated telephony system and home BP monitoring. A matched cohort of 304 hypertensive beneficiaries continued to receive the usual nurse-based disease management services of the MHS program as a comparison group. The study examined whether frail, elderly (median age, 75 years) patients with hypertension were willing and able to listen and respond to weekly automated phone calls that provided support for therapeutic and medication regimens, while offering care support personnel with weekly reporting on the results. The study covered 2 areas—patient BP and patient adherence to specific antihypertensive regimens. The objec-

tives were to improve quality of care and lower care support personnel utilization.

The study posed a series of questions using branching logic to generate targeted questioning of yes/no and multiple choice questions. **Figure 2** depicts the format of the survey, showing the nature of the logic, the location of the transfers to human clinical support, and

Perhaps the most important outcome of this study was that 174 patients (54% of the study group) had their antihypertensive regimens altered.

the types of questions asked. The main results of this survey were¹⁶:

- 245 patients (87.5%) achieved systolic BP within target or had marked improvement from baseline >160 mm Hg
- 302 patients (96.8%) achieved diastolic BP within target or significantly improved from baseline >100 mm Hg
- 66% of the contacts validated as a “live answer” (ie, the patient answered the call, or someone else in the household handed the phone to the patient, after which the patient validated)
- Of those responding, 581 (33%) completed the entire survey, and 33% were transferred to a care support specialist for additional assistance
- No difference was seen between the automated telephony and nurse-contacted cohorts in percent achieving targeted systolic and diastolic BP or percent receiving antihypertensive medication adjustment
- Cost of automated telephony for a BP reading was 95% lower than using a care support representative to retrieve the reading.

Perhaps the most important outcome of this study was that 174 patients (54% of the study group) had their antihypertensive regimens altered based on survey responses.¹⁶ The clear inference is that frequent reporting on patient BP and medication-taking behaviors, along with the ability to efficiently gather and analyze that information, offers clinicians significant insights on ongoing titration of medication or other elements of a therapeutic regimen.

Better Health and Health Economics

Results of this study show how applying certain forms of automated communication to treatment adherence programs may potentially offer distinct

advantages to patients and organizations.¹⁶ In addition to the improvements in clinical outcomes delivered by regular communications, automating outreach programs may enable MCOs and disease management/wellness programs to:

- Reach out to more patients cost-effectively
- Target and reach substantially more patients, and enroll more patients overall into existing programs for improved return on investment
- Consistently manage patient adherence across large populations
- Gain potential insights into patient medication-taking and other relevant behaviors for further analysis
- Empower existing care support staff by driving inbound, interested patients into the call center and by triaging the more acute or at-risk individuals.

Conclusions

It is well understood that regular, consistent communications from care teams can mediate medication-taking behaviors in many patients with chronic diseases and, in many cases, the health outcomes are dependent on those behaviors. These communications comprise a focus area in healthcare that can be extended by using modern automated communications to augment other outreach strategies. Although all the data from the new study cited here are not in yet, automated communications satisfying the criteria outlined in this article are demonstrating some ability to connect with, and mediate behavior in, large populations of chronically ill patients. Our hope is that in the future, automated communications systems will enable organizations to provide communications at a scale that will improve health outcomes, both proximal and longer-term, for the millions of “Toms” with chronic conditions. ■

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Stakeholder Perspective

Efficient Automated Call System Improves Adherence, but What about Net Costs?

PAYERS/FINANCIAL OFFICERS: Managed care organizations (MCOs) strive to deliver the highest level of value for each healthcare dollar that the organization must spend. An MCO incurs an expense to buy pharmaceuticals for its members and, in turn, those medications should improve the health of the member/patient. The MCO, in return, wants its members to improve their health, maintain their current health, or avoid catastrophic health problems because of their member's adherence to a prescribed medication regimen. Dr Ross describes an outgoing automated phone calling system that he reports improves adherence for patients in following their prescribed antihypertensive medication regimen. He reports results of his recent study that follows 304 elderly patients with hypertension who are matched to another 304 control patients.

An automated phone system makes outbound calls to these patients. Dr Ross reports this automated calling system as having variable costs that are less expensive than those calls initiated from the clinical outreach call centers of disease management companies. It is appropriate to note that Dr Ross is Vice President of Healthcare for Varolii Corporation, which provides such automated calling systems.

At MCOs, the chief medical officers, medical directors, directors of pharmacy, directors of utiliza-

tion management, and directors of quality management are all interested in methods that improve patient compliance, improve outcomes for patients, or improve the documentation of that compliance.

The chief financial officers of these organizations, however, want to know if these programs that improve medication adherence will also save the MCO money. The present article clearly addresses the first issue by proposing a method where an MCO can efficiently improve pharmacy compliance. In that, this article is useful for those involved in medication compliance.

The article, however, does not address the chief financial officer's usual question, "How does efficiently increasing medication adherence save the MCO money in the long run?" That question is important and is worthy of further research, by Dr Ross or by others. It could be reframed as, "Will the cash outflows spent to operate an automated call center yield a positive net present value when measured against the future savings (ie, decreased cash outflows) in medical expenses on those same targeted patients?"

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