Pattern

Recognition

Using AI to improve chronic disease outcomes

Featuring Francis R. Colangelo, M.D., M.S.-HQS, FACP, and Robert E. Matthews

Because of safety concerns related to the novel coronavirus (COVID-19), AMGA converted our 2020 Annual Conference to on-demand educational sessions. In lieu of a face-to-face meeting, AMGA is offering a series of on-demand breakout session presentations to provide our members with valuable education and learning. Here, we summarize one of those presentations, which are available for CME credit at **amga.org/ac20**.

Artificial Intelligence (AI) has become a buzzword in society and in health care. For some, AI has a positive, even fantastical, connotation, including a world where mistakes don't occur and most human work is done by computers or machines. For others, AI has a negative connotation—think HAL 9000 in *2001: A Space Odyssey* or T-800 in *The Terminator.*

Scientists predict that "singularity"—the inflection point where machines advance beyond human intelligence and thus become self-sufficient—is still in the far distant future; however, AI is beginning to make differences in a variety of fields and businesses, including health care.

Francis (Frank) Colangelo, M.D., M.S.-HQS, FACP, chief quality officer from Premier Medical Associates, and Robert (Bob) Matthews, vice president for quality and care redesign for PriMed

Physicians and president and CEO of MediSync, PriMed's management partner, described using AI to achieve superior medical outcomes in real-world groups in their presentation "Using AI to Improve Chronic Disease Outcomes."

Matthews started by quoting the Commonwealth Fund's report that 75% of all healthcare spending goes to patients with chronic diseases. The Centers for Medicare and Medicaid Services (CMS) spends 90% on chronic diseases because, without childbirth or other wellness expenditures, senior care is largely spent managing disease. Spending is not limited to treating the chronic diseases; it includes downstream costs related to additional heart attacks, strokes, renal damage, amputations, ER visits, hospitalizations, etc., which occur much more frequently when chronic diseases are poorly controlled.

Despite the importance of high control when treating chronic

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> **— Robert E. Matthews (quoting Toby Cosgrove, former president and CEO of the Cleveland Clinic)**
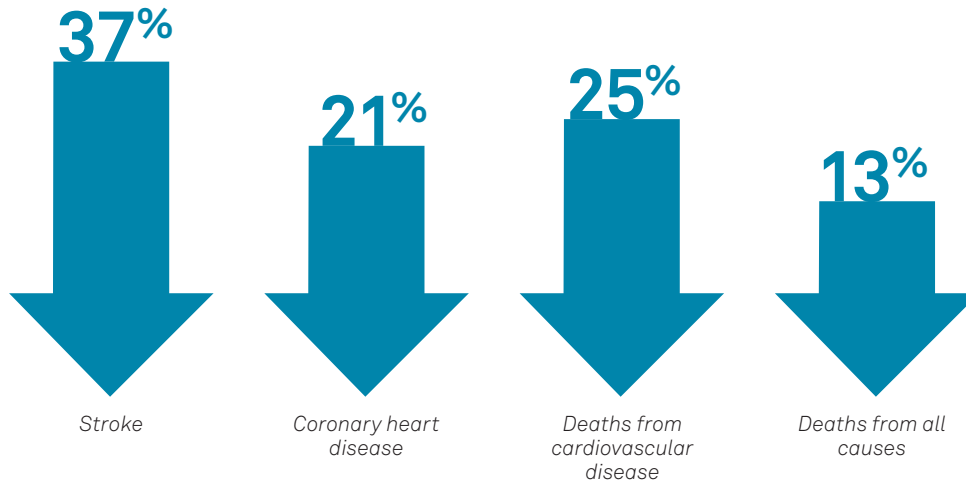
disease, the national average in achieving the evidence standard of successful management ranges from a high of 48% for controlling blood pressure in hypertension (HTN) to a low of 1.1% of heart failure patients being on the correct medications and doses. Thus, poorly controlled chronic diseases drive up costs and impose untold damage in our patients.

For the purposes of their presentation, Colangelo and Matthews focused on HTN, pointing out how costs are escalated by poor control. According to the Centers

Figure 1
Blood Pressure Control

Reducing average population systolic blood pressure by only 12–13 mmHg could reduce:

37%	21%	25%	13%
Stroke	Coronary heart disease	Deaths from cardiovascular disease	Deaths from all causes

Source: cdc.gov/bloodpressure/infographic.htm

for Disease Control and Prevention (CDC), the prevalence of hypertension in the country is around 29%, with that percentage increasing to 60% for individuals over 60.

The American Heart Association (AHA) has found that the average cost for patients with hypertension is $2,000 a year greater than the cost for a patient who does not have the condition, with the cumulative cost burden to the U.S. healthcare system estimated to be over $130 billion. The CDC also has estimated that simply reducing the average systolic blood pressure by 12–13 millimeters of mercury could reduce the incidence of stroke by 37%, coronary heart disease by 21%, deaths from cardiovascular disease by 25%, and deaths by all causes by 13% (see Figure 1).

The Problem of Complexity

Many groups have struggled to achieve better HTN outcomes. The most common approach is to hire care or case managers to prompt providers to change medications and to remind patients to take their medications.

Matthews proposes that these solutions are based upon incorrect root cause analysis of the blood pressure problem. He believes that the real problem is the enormous complexity that a physician or APP faces to get the medications right. He described three levels of complexity:

1. There are five different physiologic causes of hypertension. A patient can have vasoconstriction, where the patient's arteries are squeezed to become smaller. But many patients have a heart problem, either increased heart rate (increased beats per minute) or a contractility problem (the force of each heartbeat) is too high. Some HTN patients have too much intravascular fluid. And then there are those patients who are mixed hemodynamic, suffering from a combination of the other factors. Each of these factors respond to different drugs.

2. The process that Premier and PriMed use considers 28 comorbid conditions when selecting HTN drugs for a patient. These include the patient's age, race, the presence or absence of nine cardiovascular conditions (i.e., history of myocardial infarction, stroke, heart failure, angina, etc.), and another 18 non-cardiovascular conditions (i.e., diabetes mellitus, benign prostatic hyperplasia, asthma, migraines, etc.). The presence or absence of any of these conditions could preclude or promote the use of certain classes of drugs or change the order in which they are added for a patient. The point is that it is not possible to manage so many variables from memory.

3. PriMed and Premier regularly use 12 different classes of drugs to manage blood pressure (13 if you view ACEs and ARBs as different classes). Most physicians only use three to five classes of drugs when treating HTN, and many physicians are not familiar with how to use all the classes that PriMed and Premier find helpful or necessary.

While some HTN patients are "easy" —those with mild or moderate vasoconstriction who respond to an ACE/ARB + HZT, for example— many are very complicated and these are the patients that groups often cannot get to goal.

Colangelo goes on to put it even more succinctly: "I mean, the permutations, when you put everything together, are in the millions. That is why we have a 48% control rate in our healthcare system. There are way too many details. You almost have to have a computer sitting on top of your head if you want to be able to figure all the different variables."

Figure 2
PriMed Year-Over-Year % to Goal

% In Control (y-axis)
Provider Count (x-axis)

Columns: 2017, 2018, 2019, 2020
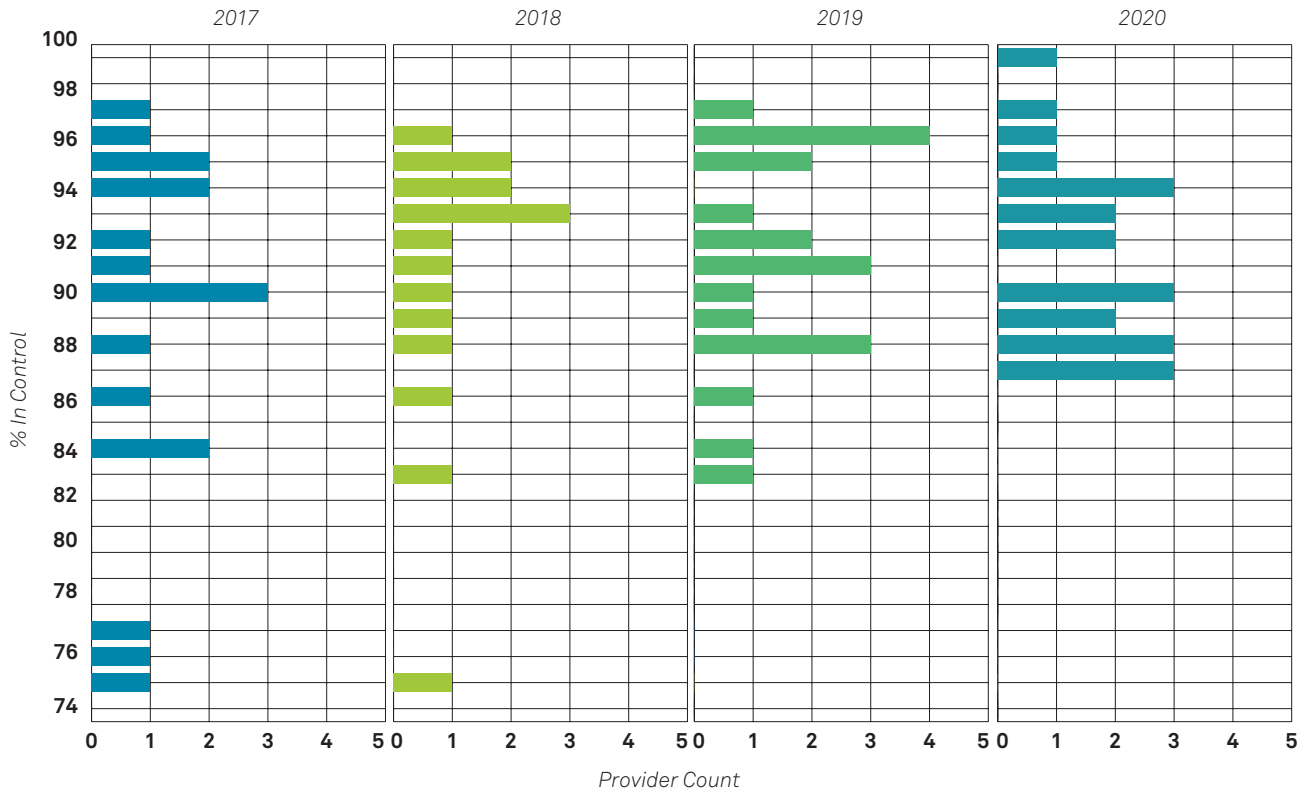
Computing Power

Colangelo and Matthews stated that to achieve better hypertension control in their patients, they needed to find a way to help their physicians become more precise medication prescribers, delivering the correct dosages of the correct medication.

"What we came to realize is that they invented computers for this kind of complexity," said Matthews. "Complexity is not a rare problem in other business or economic sectors. It is very common. And you turn to computers and AI, particularly when you're trying to solve for that."

To illustrate his point, Matthews turned to a quote from Toby Cosgrove, former president and CEO of the Cleveland Clinic, who now serves as an executive advisor:

"When the Cleveland Clinic was formed almost 100 years ago, the total amount of knowledge in health care doubled every 150 years. Now, it is doubling every 73 days. There are now 800,000 journal articles written every year. How is anybody going to keep track of that and be able to use it without help from artificial intelligence, machine learning?"

AI is different from digital decision support like that found in EHRs. Those simplified forms of assistance are used to generate calendar reminders on the health status of a patient or provide basic care path guidelines that follow an "if-then" course of potential actions that could be taken. AI, on the other hand, is designed to approach intense cognitive

functions, particularly in the realm of problem-solving.

PriMed turned to its management partner, MediSync, to help move from "paper and pencil" tools to computer-based AI solutions. MediSync created the MedsEngine AI solution, which is built using Microsoft's Azure cloud technology.

"So, a doctor comes into a meeting with a patient, and the doctor finds the patient to have high blood pressure, diabetes, etc." said Matthews. "They request that the AI solution help with the chronic disease, and that request goes via the EHR. The EHR adds a ton of data about the patient and brings that request together with all the data about that patient to the MedsEngine in the cloud. The MedsEngine then spins up an

Figure 3

PriMed and Premier Control Rates

BP at Goal, Current Month vs. Process Followed by Provider Correlation Analysis, Encounters through 2020-01-31

Doctor: % HTN Pt in Control + Use of Process When PT Not in Control
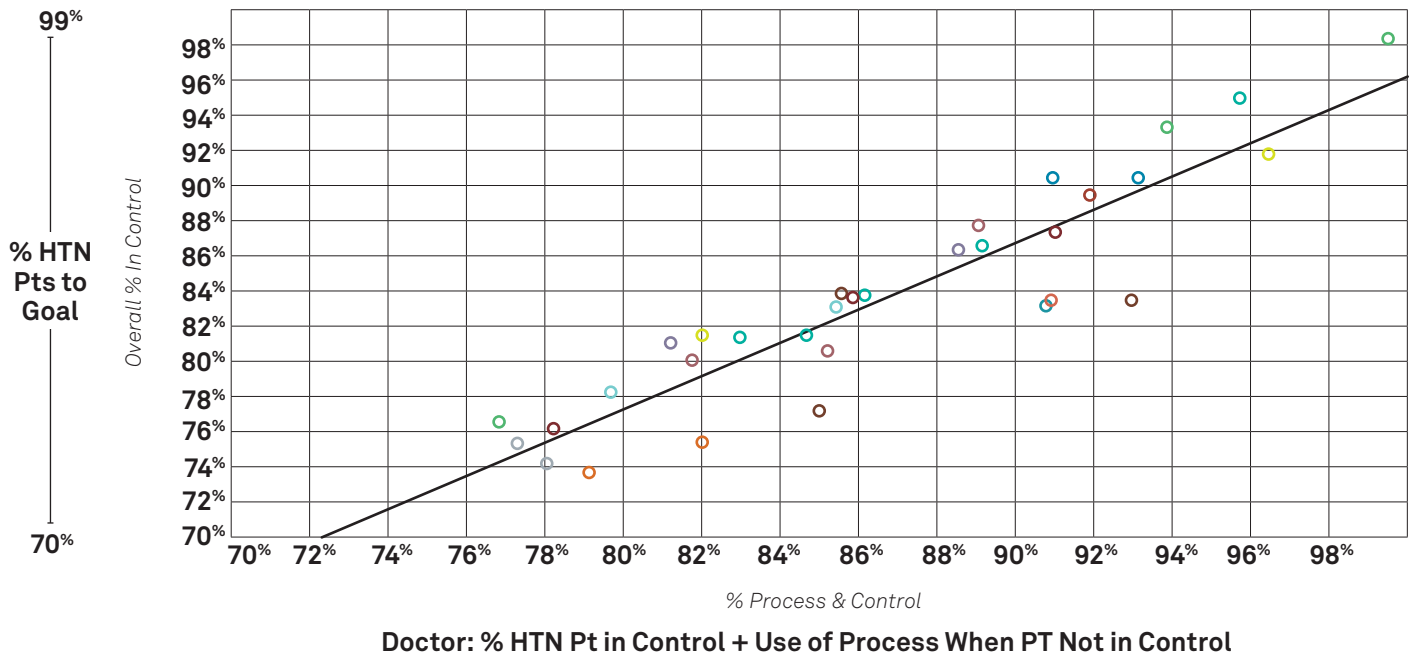
answer and sends it back, and there on the screen are recommendations with exactly which drugs—typically four or five—and in exactly which order the drugs ought to be prescribed. For some diseases like HFrEF and cholesterol, it also spells out the doses for each visit."

Colangelo's group heard about the MedsEngine and was the second group to implement it. Premier had a strong history in HTN, but had struggled mightily to stay at an overall 80% success rate.

Using a prior generation of "paper and pencil" tools to improve HTN, PriMed had a group-wide success rate above 90% for several years. Now, using the MedsEngine, the HTN process is faster and easier, accommodating more complexity without more time, and the group-wide success rate is >95% for most

suburban practices. Of particular pride is a PriMed office that serves mostly African American socio-economically challenged patients. Since using the MedsEngine, that office has been fluctuating between 88% and 92% HTN controlled on a month-by-month basis. The year-over-year improvement across PriMed offices is in Figure 2. At the present time, the lowest performing PriMed physicians are at or above 88% of all HTN patients in control.

Premier followed a similar trajectory. After spending years of physicians hovering at or just below an average 80% control rate, after just a few months employing the AI technology, numerous primary care offices have driven up to the high 80s in their control rates (see Figure 3). Colangelo's rate of control was at 98%.

The Chronic Catalog

While the majority of Colangelo's and Matthews' discussion focused on improving hypertension control, it is just a sample of how AI can be applied to other chronic diseases such as heart failure or high cholesterol.

"There are new AHA, ACC cholesterol guidelines," said Matthews. "The executive summary has 19 pages of decision trees. Think about it. Who is going to remember 19 pages of information and carry it in memory and apply it in real-world clinical practice? The old standard was if you had medium risk, you took a medium pill. If you had high risk, you took a big pill. The new standard is vastly more complex. It's more suited or tailored to a whole variety of issues, both in terms of the original classification and the concomitant correct
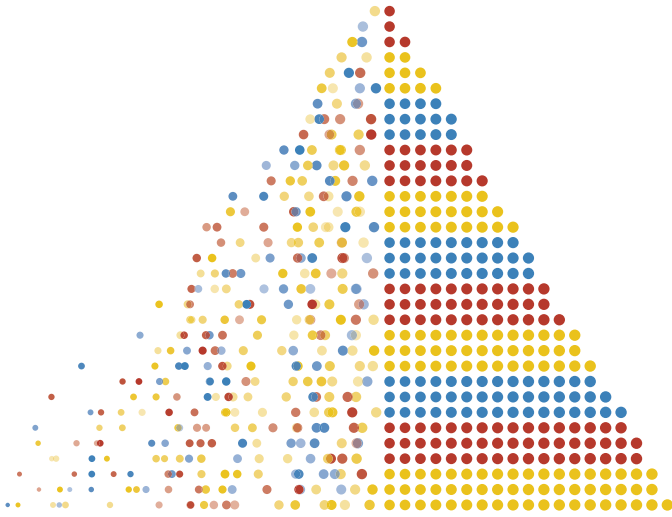
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treatment. I'm telling you, it can't be memorized. If you want to do the cholesterol evidence-based standard, you're going to have to have something to help, because you cannot remember this."

Concluding their presentation, Colangelo and Matthews stressed that if and when a health system or medical group decides to go down a path like Premier and PriMed did, introducing AI into the equation of patient care, it doesn't come across as the kind of machine takeover found in the cautionary sci-fi stories.

"When you bring something like this into clinical practice, there's a trick to it," explained Matthews. "We've learned some things. One is it has to be an organizational decision that we really want our chronic outcomes to be good. That's a priority. A lot of groups have a lot of priorities, and that may or may not be one of them.

"If you want high outcomes, you just can't say, 'Well, this tool or method is out there if anybody wants to use it,' and hope for a big change in your group. A second important point that change occurs best with lots of communication. Good change management includes endless communication about why we're doing this, how good it is to achieve success, how successful we've become, and what the benefit is to the patient, the physician, the staff, and the community."

According to Matthews, in "building a group where you really want to be among the best or the best in chronic disease, this is a way of fulfilling the physician's ideal identity as someone who helps to save and preserve life and function. I think that we built that in our group. I think there's a pretty strong commitment to that, and it was built by leadership. It doesn't just happen." GPJ

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To hear more from Dr. Colangelo, Mr. Matthews, and many other noted healthcare professionals, plan on attending the AMGA 2021 Annual Conference on April 20–22. For more information, visit amga.org/ac21.

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