Harnessing Collaborative Technology to Accelerate Achievement of Chronic Disease Management Objectives for Canada

COMMENTARY

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ABSTRACT

Morgan and colleagues put forth a call to action for the transformation of the Canadian healthcare system through the adoption of a national chronic disease prevention and management (CDPM) strategy. They offer examples of best practices and national solutions including investment in clinical information technologies to help support improved care and outcomes. Although we acknowledge that the authors propose CDPM solutions that are headed in the right direction, more rapid deployment of solutions that harness the potential of advanced collaborative technologies is required. We provide examples of how technologies that exist today can help to accelerate the achievement of some key CDPM objectives.

In their new book *Wikinomics*, Don Tapscott and Anthony Williams (2006) focus on the power of collaboration. They predict that scientific discovery and learning will accelerate in unprecedented ways as we move into an emerging era of what is called *collaborative science*. The ability to adapt to rapidly changing environments is critical for high performance in any industry, including healthcare. In the private sector, failure to adapt, innovate and respond to changing customer dynamics will put any company out of business.

To date, several incremental attempts at moving the chronic disease prevention and management (CDPM) agenda forward have been made from various independent silos of the healthcare system, and it is clear that Canada lags behind other jurisdictions when it comes to putting CDPM theory into practice. We agree that more effective levers are required to drive the transformation of CDPM, and our view is that the technology advances need to be considered in a much more deliberate way if are to have solutions that are not already outdated by the time they are implemented. In addition, more recognition of the impact that disruptive technologies, mass collaboration strategies and other technology-based industry trends are already having in society is required.

The Role of Technology in CDPM

The importance of clinical information technologies is highlighted in the CDPM transformation agenda proposed by Morgan et al., and we applaud this focus. Electronic medical records, disease registries, self-management devices, clinician and patient portals and telemedicine solutions are all key enablers. We agree that careful evaluation of new and emerging technologies is required before widespread deployment; however, this approach needs to be balanced with improved access to solutions that have a high potential to facilitate more rapid implementation of CDPM objectives. This means simultaneously building business cases to support (1) smaller-base case demonstration projects to accommodate the early adaptors or visionaries of innovative technologies and approaches, (2) expansion of best practices or best evidence to broader applications and (3) a full-scale rollout of proven solutions at a regional, provincial or national level. There is also the need to look at the connection among these various technologies, tightly integrated with an overall program of care, to achieve the real transformation, not individual parts implemented in isolation.

Investing in technology solutions that deliver maximum return is essential. Chronic disease management systems and electronic health records (EHRs) have been a focus of technology applications in CDPM, and they are available with varying degrees of complexity and utility. The current view of EHR considers 100% of the information on 100% of people at all times. This is too expansive a solution to solve a difficult problem. This type of overload will extend the time horizon for when benefits will be realized far beyond what should be considered acceptable. While there have been various attempts at constructing a "core data set" with basic information that could be augmented for different patient groups, most efforts have still been predicated on the assumption of all information, all the time, everywhere.

Condition-based EHRs can simplify and focus EHR implementation efforts as most estimates suggest that more than 50% of healthcare costs are concentrated in less than 10% of patients. As such, focusing initially on a subset of the population could drive up the value of the EHR by concentrating available resources on those for whom there is the best clinical and business case. The value of the EHR will also be enhanced with the availability of real-time analytics. These offer

healthcare providers a means of aggregating and interpreting data about an individual's health and environment. For instance, instead of a doctor being able to see only that a patient's blood pressure is up today, real-time analytics would enable the doctor to see what the pattern has been over the past week or two. Real-time analytics offers healthcare providers the ability to better interpret information and filter out only what is most relevant so that they can act immediately.

Patient Self-Management Tools and Telecommunications

A relatively new class of technology that is gaining momentum in the CDPM arena is patient self-management tools. The increasing use of collaborative and autonomous technologies is empowering the patients, as well as the clinicians, to access clinical information in timely ways in support of optimal disease management outcomes (Barrett 2005). The expanded telecommunications platforms, especially mobile technology, can provide new channels for virtual care teams to engage patients, who become informed empowered self-managers of their own care. This is at the heart of chronic care models. Cellular telephones and other mobile devices are now multimedia devices, providing global positioning system navigation and enabling communication through voice and data transfer. The reach and convenience of the mobile devices are opening a new world of virtual, real-time monitoring and connectivity.

As the concept of patient accountability and self-monitoring becomes mainstream, patients with chronic diseases such as diabetes and heart failure could receive their medical therapies remotely as well as special telecommunications services as part of their healthcare plan. The use of a mobile handheld device with a preloaded application will automate the process to collect, track and trend the relevant data. In addition, the service provided will extend to virtual customized educational sessions, daily tips and reminders as well as automated alerts should the data exceed a predetermined out-of-range limitation set by the remote clinical resource.

Such a model has been explored by a consortium of companies under Continua Health Alliance. The alliance is working toward industry guidelines, standards and certifications for devices such as Bluetooth-enabled glucometry, pulse oximetry and weight and blood pressure devices designed to be interoperable and for consumer use (Continua Health Alliance 2007). Globally and locally there are studies under way that are evaluating the combined value of mobile multimedia devices along with clinical devices that help patients with chronic disease manage the important metrics of their condition in an automated and seamless fashion. Human factor analysis is providing additional insights into the dynamics of how people learn and adapt to the use of these connective technology innovations.

Taking Integrated Models of Care to New Level

For those living with insulin-dependent diabetes, connective technology advances have already opened up new opportunities for better self-management of this chronic disease and an improved quality of life. The combined use of automated insulin delivery, continuous glucose monitoring and personal software data-management tools along with reliable data transfer and remote clinician monitoring capabilities are taking integrated, personalized diabetes care for a particular segment of the diabetic population to new levels. Positioned within the context of an overall diabetes strategy at regional, provincial or even national levels, the value of connective technology becomes clearer. We will elaborate

briefly on how the individual components of the model work together, and then show how the connective technologies can be viewed through a chronic care model lens.

The treatment goal in diabetes is to keep the blood glucose at near-normal levels, and long-term prospective clinical trials have shown the importance of intensive insulin therapy and self-monitoring of blood glucose (DCCT 1993 , UKPDS 1985).

Most patients with type 1 diabetes currently self-inject exogenous insulin three to four times a day and also monitor their blood glucose levels several times per day. Some studies have shown low adherence and compliance to therapy among diabetics – partly due to the inconvenience of self-injection and to the lack of adequate and real-time information – which results in suboptimal outcomes. Three related technologies address these issues directly. First, insulin-pump technology has been used by patients with type 1 diabetes for almost 20 years; the pump delivers insulin in patterns similar to how the human body delivers insulin throughout the day and night, which decreases the risk of severe hypoglycemic events, and allows patients more flexibility to lead active, normal lives. Second, insulin pump therapy can now be combined with continuous glucose monitoring (CGM) technology that helps patients monitor their plasma glucose levels via a sensor under the skin, and this provides real-time information of blood glucose levels, including the direction in which it is trending and how quickly it is increasing or decreasing. Third, a secure, web-based therapy management software program, in conjunction with the insulin pump and/or CGM device, gives the patient and the clinician remote Internet access to information that helps them understand the effects of insulin dosage, eating habits, exercise routines and medication on glucose levels, which is key to improving diabetes control. Research has shown that interventions that involve monitoring and feedback, those that simplify dosing requirements, and those that are delivered over multiple sessions have the greatest probability for affecting outcomes and

Table 1. Connective technology for type 1 diabetes care

CCM Item		Technology	Benefits and Outcomes
Patient	Patient empowerment	Insulin pump + CGM	• Accurate real-time information on blood glucose levels • Increased adherence to therapy and monitoring
	Self-management support		
System	Decision support	Therapy management software and database	• Care based on best practice evidence and patient preference enabled • Communication among care team and dissemination of evidence-based best practices enhanced
	Clinical information support		
	Delivery system design		
		Telecommunication and data-transfer platforms	• Care delivery model more efficient, productivity gains at the clinic level, facilitation of multidisciplinary care and access to specialty care enabled • Central intake and monitoring of patients with devices supports regional/provincial program goals
		EHR	• Registry functionality can be linked to EHR; tracks outcomes at individual and population levels

CCM: Chronic Care Management, as described in Morgan et al's paper; CGM = continuous glucose monitoring; EHR = electronic health record.

not just adherence (Kripalani et al. 2007). The software provides individualized charts, tables and graphs to allow people to better identify patterns and problems and to figure out the root cause of blood glucose variations so that appropriate action can be taken on individual level or in collaboration with the care team. The value of this approach can increase even further when linked to the electronic medical records, disease registries and databases that allow for population-level analysis

It is interesting to examine the use of the various technologies described in this paper through the lens of Wagner's Chronic Care Model. We mapped the technology interventions to individual components of the model and identified benefits and outcomes at patient and system levels to test our assumption that, taken together, technologies could contribute to the achievement of overall chronic disease management program objectives for a specific patient population (Table 1). Challenging ourselves to think about the use of technology from this perspective was a valuable undertaking.

Concluding Thoughts and Recommendations

Harnessing the full potential of collaborative technology can help accelerate the achievement of CDPM objectives. The increasing convergence of clinical and information technologies is a trend that will help increase patient empowerment, improve clinical outcomes and optimize the use of health system resources. The significance of the patient experience in a CDPM model that deploys collaborative technology is an important area for further study. To ensure success, we will need to better understand the factors and barriers for adoption of technology for patients and customize the approaches to create more effective uptake and adoption.

The rapidly changing medical technology and telecommunications world will continue to have a significant impact on the health of individuals, as well as the healthcare system. As we move toward the execution of national CDPM strategies, opportunities for innovation must be embraced and traditional boundaries of thinking be constantly challenged. Discovering new ways to collaborate and connect across multiple industry and health system silos is also critical for success. Some companies are already positioning their products and services within the type of framework and demonstrating their value in the context of broader CDPM objectives. This approach should be encouraged. At the health system level, responsible forward-thinking investments need to be made, corresponding policy issues addressed and the impact of changes monitored closely so that patient access to new standards of care is accelerated. While working on multiple fronts at the same time, it will be important not to get bogged down with the process or the inevitable politics arising from setting priorities for change. In closing, we agree that a more high-profile national strategy for CDPM in Canada is essential, and that the time to act is now.

Acknowledgement

The authors thank Hamid Sadri, PharmD Director Health Economics, Medtronic of Canada, for his contributions to this paper.

References

Barrett, M.J. 2005. *Patient Self-Management Tools: An Overview.* Oakland, CA: California Healthcare Foundation.

Continua Health Alliance. 2007. *Disease Management.* Beaverton, <www.continuaalliance.org/use_cases/disease_management/>.

Kripalani, S., X. Yao and R.B. Haynes. 2007. "Interventions to Enhance Medication Adherence in Chronic Medical Conditions: A Systematic Review." *Archives of Internal Medicine* 167: 540–50.

Tapscott, D. and A. Williams. 2006. *Wikinomics: How Mass Collaboration Changes Everything.* New York: Penguin Group.

The Diabetes Control and Complications Trial Research Group (DCCTRG). 1993. "The Effect of Intensive Treatment of Diabetes on the Development and Progression of Long-Term Complications in Insulin Dependent Diabetes Mellitus. *New England Journal of Medicine* 329: 977–86.

UK Prospective Diabetes Study Group (UKPDSG). 1998. "Intensive Blood Glucose Control with Sulphonylureas or Insulin Compared with Conventional Treatment and Risk of Complications in Patients with Type-2 Diabetes." *Lancet* 352:837–53.