

# **The Use of Cell Phone Technology Provides Teens More Control and Independence and Healthcare Cost Savings in the Management of Chronic Disease**

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A major component of healthcare reform centers on the use of technology to empower patients in their healthcare decisions. This article addresses the use of technology to disseminate health information to teenage patients with diabetes, a particularly difficult population. Although chronic diseases are more common among older adults, they affect people of all ages.<sup>1</sup> Approximately, one in every 400 to 600 children and adolescents has type 1 diabetes.<sup>2</sup> Of the estimated \$4 trillion dollars spent per year on healthcare,<sup>3</sup> 75 percent of our healthcare resources are consumed by patients with chronic diseases.<sup>4</sup> A 2003 study by Maldonado et al. estimated that the average cost for treating diabetic ketoacidosis (DKA) was more than \$10,000 per admission.<sup>5</sup> Nyenwe and colleagues (2007) indicate that hospitalization rates for DKA are increasing, especially among ethnic minority groups with type 1 and type 2 diabetes, particularly in African Americans.<sup>6</sup> The use of technology to improve access to care and control costs is crucial.<sup>7</sup> The following scenario illustrates a potentially powerful use of health-related cell phone applications for the prevention of serious medical emergency associated with diabetes.

A 15-year-old African American female, “Becky,” suddenly becomes unresponsive and weak, and collapses at her school desk. The teacher present when Becky collapsed tells health personnel that Becky was taking quick, deep breaths right before she passed out. Becky had asked to go to the bathroom several times during the day and complained of needing something to drink. During the teacher’s conversation with the emergency medical technician, Becky’s best friend chimes in and states that Becky had forgotten her lunch and bought a snack and drink from the vending machine. The friend recalls Becky complaining of stomach pain and vomiting after eating the snack. The friend also recalls that Becky’s breath had an unusual odor. Becky is transported to the emergency room. Details are as follows:

Physical examination: Elevated respiratory rate, rapid deep breaths, dry mucous membranes, poor skin turgor, and fruity-smelling breath.

Labs: Elevated blood glucose of 550 mg/dL. Urine analysis indicated ketonuria and glucosuria. Electrolytes indicated hyponatremia (130 mEq/L); hyperkalemia (6 mEq/L); hyperchloremia (110 mEq/L), and decreased bicarbonate (6 mEq/L).

Diagnosis: Diabetic ketoacidosis (DKA). DKA is a common complication in type 1 diabetes and can also occur in type 2 diabetes. Becky has type 1 diabetes.

Treatment: IV fluids for dehydration, slow replacement of potassium, and continued insulin until pH returns close to normal.

Nearly three-fourths of all teens in the United States have a cell phone.<sup>8</sup> If Becky had possessed a cell phone that provided her with information to manage her diabetes, the outcome could have been different. An application on her cell phone could have provided dietary information giving her a healthier alternative from the vending machine. Becky could have entered her blood glucose level and/or symptoms into the cell phone, and information could have been provided to warn her of the danger of DKA, alerting her to administer insulin. This same application could have then alerted her emergency contacts (parents/caregivers) and physician, indicating that she may require medical attention. The information could be stored in Becky's personal health record (PHR), which would provide information to her primary care provider and improve the management of her diabetes. In addition, cell phone applications could provide video games to improve nutrition, education, prevention, and overall care of diabetes and offer tips on how to avoid crises. Cell-phone applications similar to the diabetes phone application program at the University of Maryland could also be used to access blogs or discussion boards allowing teens to exchange information and experiences that would foster socially and culturally appropriate support.<sup>9</sup> In schools with no access to medical personnel, cell phone technology can give teens with diabetes the ability to put in blood glucose levels and know how much insulin or food should be consumed to regulate their blood sugar.

As healthcare reform progresses, it is important that policy makers allocate funding to conduct research on the use of health information technology, such as the personal health record (PHR) and cell phone application technology, and provide resources for such technology to poor and underserved populations to help address health disparities. As the scenario presented in this article illustrates, cell phone technology could provide teens more control and independence in the management of chronic disease and educate them about their disease and treatment.

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## Notes

1. Centers for Disease Control and Prevention (CDC) National Center for Chronic Disease Prevention and Health Promotion. *Chronic Diseases: The Power to Prevent, the Call to Control—At a Glance 2009*. Atlanta, GA: Centers for Disease Control and Prevention, 2009. Available at <http://www.cdc.gov/chronicdisease/resources/publications/AAG/pdf/chronic.pdf>.
2. American Diabetes Association. *Diabetes Statistics*. 1995–2010. Available at <http://www.diabetes.org/diabetes-basics/diabetes-statistics/>.
3. Patrick, K., W. G. Griswold, F. Raab, and S. S. Intille. “Health and the Mobile Phone.” *American Journal of Preventive Medicine* 35, no. 2 (2008): 177–81.
4. Centers for Disease Control and Prevention (CDC) National Center for Chronic Disease Prevention and Health Promotion. *Chronic Diseases: The Power to Prevent, the Call to Control—At a Glance 2009*.
5. Maldonado, M. R., E. R. Chong, M. A. Oehl, and A. Balasubramanyam. “Economic Impact of Diabetic Ketoacidosis in a Multiethnic Indigent Population: Analysis of Costs Based on the Precipitating Cause.” *Diabetes Care* 26, no. 4 (2003): 1265–69.
6. Nyenwe, E., et al. “Admission for Diabetic Ketoacidosis in Ethnic Minority Groups in a City Hospital.” *Metabolism* 56, no. 2 (2007): 172–78.
7. Centers for Disease Control and Prevention (CDC) National Center for Chronic Disease Prevention and Health Promotion. *Chronic Diseases: The Power to Prevent, the Call to Control—At a Glance 2009*.
8. Lenhart, A. *Teens and Mobile Phones over the Past Five Years: Pew Internet Looks Back*. Pew Internet. August 19, 2009. Available at <http://www.pewinternet.org/Reports/2009/14--Teens-and-Mobile-Phones-Data-Memo.aspx>.
9. University of Maryland Medical Center. *University of Maryland Researchers Test Software to Help Patients Manage Their Diabetes Using Their Cell Phones*. News release. May 7, 2008. Available at [http://www.umm.edu/news/releases/diabetes\\_cell\\_phones.htm](http://www.umm.edu/news/releases/diabetes_cell_phones.htm).