

New approaches to reduce barriers to care for Latinos with poorly controlled Type 2 diabetes



Cindy Bonilla¹ & Richard W Grant^{*,1}

Practice points

- This article reviews current evidence and potential future directions for novel patient-centered care models designed to improve diabetes treatment outcomes and achieve optimal management for Latinos, especially patients with significant linguistic and cultural barriers.
- The goal of this perspective article is to support the further consideration, research and implementation of community health worker (including 'promotores') services, peer-based mentoring and health information technology tools as emerging areas for the potential improvement of diabetes management in Latinos.
- Healthcare systems, policy-makers, researchers, providers and caregivers should consider the potential benefit of these innovative interventions for the following reasons:
 - The incidence and prevalence of Type 2 diabetes is expected to increase, with Latinos experiencing a higher prevalence and worse health outcomes.
 - Estimated direct and indirect costs of diabetes in 2012 amounted to US\$245 billion.
 - With the Affordable Care Act, more Latinos are entering primary care and are in need of effective diabetes management.
 - Linguistic and cultural barriers make it difficult for many Latino patients to achieve optimal diabetes management.
 - Community Health Workers (CHWs) can be effective as liaisons between Latino patients and providers.
 - Using promotores as part of an interdisciplinary team can result in significant glycemic control improvements. Since former patients can volunteer to become promotores, this model is potentially cost effective.
 - Peer-mentoring, including reciprocal peer support, can serve as effective formal healthcare supplements for Latino adults with T2D. Peer-support can also complement CHW or 'promotora' interventions. Peer volunteers make this intervention potentially low-cost.
 - More Latinos are becoming familiar with using technology (computers, internet, mobile phones and text messaging). Cell phone approaches may be more cost effective than web-based programs.
 - Technological advances can address the hiring, funding and training limitations to CHWs and peer support. They may also be integrated into these latter interventions, in which navigators use health information technology tools.
 - In response to the diabetes epidemic that is disproportionately affecting Latinos, health systems of the future must substantially lower barriers to care by implementing flexible and multicomponent programs so that all patients can benefit from the proven prevention and treatment strategies known to prevent the costly complications of poorly controlled diabetes.

¹Division of Research, Kaiser Permanente Northern California, Oakland, CA 94612, USA

*Author for correspondence: Richard.W.Grant@kp.org

SUMMARY During the past three decades, the prevalence of Type 2 diabetes has risen much more rapidly among US Latinos compared with other groups. Achieving optimal diabetes management requires coordination among various providers, significant lifestyle modifications and adherence to multiple concurrent medications, making effective Type 2 diabetes management a particular challenge for many Latino patients. In this Perspective article, we review current trends and potential future directions for care innovations designed to improve diabetes treatment outcomes for Latinos with low English proficiency or with significant cultural, literacy or numeracy barriers to effective care.

KEYWORDS

- health information technology
- Latino health
- Type 2 diabetes

Scope of the problem

Approximately 29.1 million people (9.3% of the population) were living with diabetes in the USA in 2012 [1]. Total costs of diagnosed diabetes that year were estimated at US\$245 billion, a 41% jump from the 2007 estimate of US\$174 billion [2]. According to the US National Health and Nutrition Examination Survey, Mexican Americans (15.6%) have over double the prevalence of diabetes as white Americans (7.6%) [3]. Latinos with Type 2 diabetes (T2D) also have lower glycemic control rates, greater disease severity, higher rates of complications and overall have worse health outcomes than non-Latino whites with the same condition [4–6]. Current estimates project the incidence and prevalence of T2D to increase. At least 1 out of 3 people will develop the disease in their lifetime [1] and prevalence can potentially reach 33% (Figure 1) by 2050 [7]. This trend is expected to disproportionately affect Latinos.

With the advent of the Affordable Care Act, many previously under- or un-insured Latinos are now entering into primary care [8]. The question is whether our US care system is prepared to meet this growing demand for high quality T2D management. Foreign-born patients or those with limited literacy or numeracy often find it difficult to engage with the US health system. Given the costs and consequences of inadequate diabetes risk factor management, innovative approaches are needed to better overcome barriers to effective care in this population. Emerging areas of research innovation include community health workers (including ‘promotores’), patient navigators, peer-based support and health information technology (IT) tools.

Language & cultural barriers to effective diabetes care

Although many Latinos achieve excellent diabetes management, there are several barriers that are both common and potentially amenable within this population. One obvious barrier for many Latinos is lack of or limited English

proficiency (LEP). Between 2005 and 2007, 41.7% of the Latino population was born outside of the USA and more than a third of these foreign-born Latinos have LEP [9].

Language is a critical determinant of healthcare utilization [10]. Language discordance between patient and physician is associated with worse patient self-reported healthcare quality, especially LEP Latinos who are less likely to have access to primary care and to engage in follow-up care [11]. Current trends in graduate medical education predict that Latinos face a continuing shortage of culturally and linguistically concordant healthcare providers [12].

Separate from language proficiency is the concept of cultural proficiency, which describes the ability for healthcare providers to recognize and work within common Latino cultural beliefs and practices. Conversely, Latinos (as with many other patients) must recognize and understand how to work within ‘medical’ culture. While individual variation from any cultural norm exists, ethnographic research has identified four key constructs within Latino culture: ‘Confianza’ (trust) and ‘personalismo’ (the expectation of being dealt with in a caring and personal manner) influence Latino health-seeking behavior in general, while ‘familismo’ (family) and ‘respeto’ (respect) further influence how Latino patients engage with healthcare [13].

The Latino construct of *confianza* plays a role in healthcare because it is important for the Latino patients to build a trusting relationship with the physician, but language and cultural discordance can hamper this process and lead to poorer health outcomes. However, over time a physician can expect to win their patient’s trust by respecting their culture and demonstrating personal interest [14]. For Latino patients, personal rather than institutional relationships are important, which illustrates the construct of *personalismo*. This explains why many Latinos rely on community-based organizations and clinics for their primary care. They seek warm and friendly treatment from their healthcare

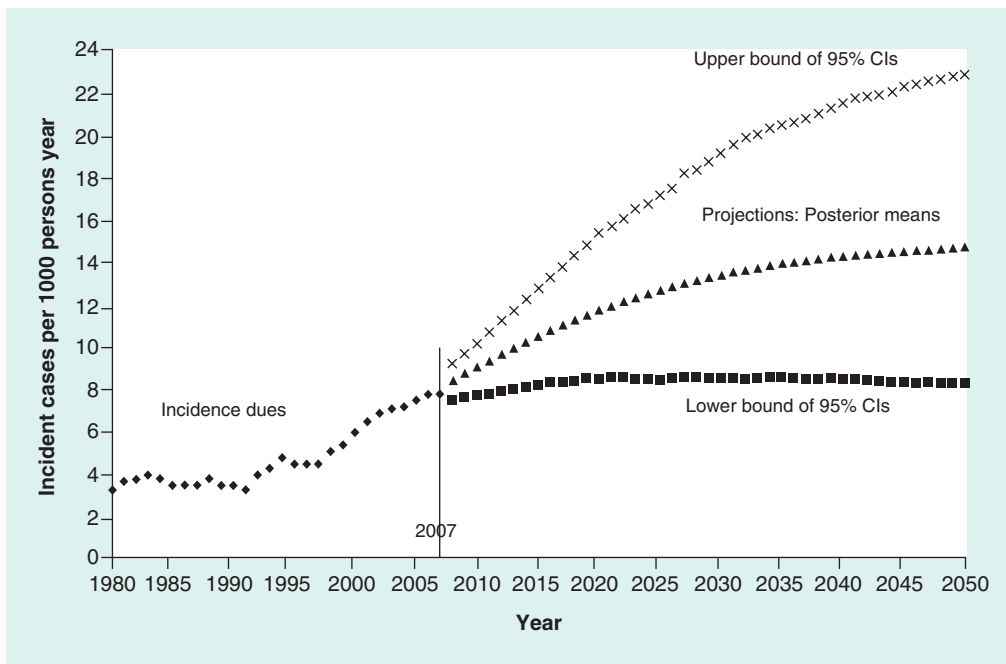


Figure 1. Incident cases of diagnosed diabetes per 1000 people, 1980–2007, and three scenarios for projected cases per 1000, 2008–2050: a middle scenario (posterior means) and low and high scenarios (lower and upper limits of 95% Bayesian confidence intervals) from the projection model of diagnosed diabetes incidence [7].

Reproduced from [7].

providers, which may be absent in settings unfamiliar with Latino cultural norms. Impairments to personalismo, such as time-constricted visits and physician rotations can prevent the building of trust (*confianza*).

Latino families traditionally emphasize interdependence over independence and cooperation over competition. As a result, they are very likely to be involved in the treatment and decision-making process for a patient (*familismo*). In addition, LEP Latinos often rely on their acculturated children to navigate the US healthcare system. Therefore, healthcare providers should be mindful and respectful of family dynamics [14].

A major cultural norm that mediates Latino socialization and dynamics is respect. *Respeto* dictates appropriate deferential behavior toward others based on age, gender, social position, economic status and authority. Research shows that many Latinos give a high level of respect to healthcare providers and view them as authority figures. While, *respeto* implies a mutual and reciprocal deference, studies have shown Latinos may avoid asking their provider questions or disagreeing with their judgment. This may result in patients not following treatment orders or even

terminating healthcare. Taken together, the interplay of these four common Latino cultural constructs has implications on health-seeking behavior, quality of care and health outcomes. Transgression of these norms can broaden the existing social distance between providers and Latino patients and increase the barriers to T2D control.

Lower rates of health insurance coverage, socioeconomic challenges and immigration-related issues all further complicate healthcare for Latinos with diabetes. Thus multifaceted, culturally sensitive interventions are needed to address this alarming disease burden experienced by the growing Latino population. These include community health workers, peer-based support and innovative health IT tools.

Community health workers & promotores

One of the most promising interventions to improve care of Latinos with T2D is the use of community health workers (CHWs) [15–17]. CHWs are defined as laypersons with differing degrees of health-related training who act as cultural mediators between patients, community resources and the greater healthcare system [18]. They possess the ability to build rapport with the

target population and provide health information in a culturally sensitive way [19,20]. A recent systematic review found significant improvements in diabetes-related knowledge, self-care and lifestyle and in HbA1c levels [16]. Today there are an increasing number of studies and trials attempting to examine the power of this model among Latinos.

One study tested the hypothesis that a CHW is effective as the sole T2D educator for Latinos [21]. The research team compared a newly designed Community Diabetes Education (CoDE) intervention with similar culturally appropriate T2D management programs tailored for Latinos. After 1 year, they found that individuals in the CoDE arm experienced significant A1c improvement leading the authors to conclude that CHWs can serve as the primary patient educator in the absence of a more highly educated personnel required by American Diabetes Association-certified diabetes education programs. Further support for the CoDE program comes from a recent follow-up randomized controlled trial that tested the effectiveness of the intervention for uninsured Mexican Americans and found that 53% of the intervention group achieved a A1c level below 7% compared with 38% from the control arm [22]. Aside from providing evidence of the beneficial role of CHWs, the findings suggest CHWs are a potentially low-cost model that can be integrated with existing T2D management interventions [21]. Similar conclusions were reached by a study that evaluated the effectiveness of a CHW-led T2D self-management (SM) education program focused on Latino patients [23]. After 1 year, patients who participated in the program saw statistically significant reductions in mean A1c levels and blood pressure readings. This study also sought to understand how CHWs and primary care providers work together to provide comprehensive diabetes care. The latter objective aligns with the belief that CHW-led programs should complement formal healthcare, not serve as substitutes.

A CHW-led diabetes SM training program was implemented at a Detroit federally qualified health center (FQHC) serving Latino communities since 2000 [24]. FQHCs are organizations receiving grants under Section 330 of the Public Health Service Act. They are legally required to assist underserved areas. Key components of the CHW-led program are culturally tailored interactive group sessions, action planning and clinic

visit preparation. Two randomized controlled trials showed that after 6 months, the intervention groups' A1cs were on average nearly 1 point lower than the control group [24]. However, sustaining gains beyond the intervention continues to be a challenge. This is partly due to limited resources, such as funding. Volunteer peer-support interventions could potentially remedy this problem.

A parallel, three-arm randomized controlled trial compared two models of SM support over 12 months to maintain gains achieved at 6 months immediately after CHW-led training program [25]. The models were a peer mentor program versus monthly calls from a CHW. Peermentors, who were former patients and received training, held weekly face-to-face sessions and contacted via telephone individuals who missed three consecutive sessions. CHWs did monthly telephone outreach. In all three arms, nearly all participants were Spanish-speaking Latinos (control = 79%, peer = 82%, CHW = 91%). Due to low attendance at group sessions, the peer arm relied extensively on telephone outreach. At 18 months, the mean A1cs of the peer group were 0.5 points less than baseline and 0.4 points less than the CHW arm. Despite a few limitations such as a low follow-up rate (67%), the study concluded that both strategies were effective in maintaining short-term gains achieved through a more intensive program and a future direction is to look toward individuals from the community as valuable sources of SM support.

Given the promise of CHW-led interventions, researchers continue to design randomized controlled trials in an effort to demonstrate their effectiveness at reducing T2D disparities. A recent systematic review identified 12 randomized controlled trial studies, in which seven reported statistically significant HbA1c improvements [26]. However, there is great variation in terms of intervention design and use of CHW services. Interventions for diabetes care among Latinos widely vary: stand-alone CHWs, CHW with a certified diabetes educator, CHW with nurse and dietician and CHW with nurse and medical assistant [27–31]. Clearly, findings of stand-alone lay CHW interventions are not comparable to interventions that integrate CHWs as part of a larger team. Therefore, future research is needed to study different models of care while improving the reporting of relevant factors such as CHW training, background and skills. A key area of innovation will be to figure out how to

effectively integrate CHWs with the rest of the clinical care team [26].

Promotoras are a specific type of CHW within the Latino community that have received basic health education training. Traditionally, promotoras have been female, but more men are entering the field and thus, the more gender-neutral term *promotores* is increasingly being used. Promotores have been proposed as a viable approach to reduce heart disease and stroke among Latinos, and are now being used for addressing T2D disparities [32–34]. A randomized controlled trial examined the effectiveness of a promotora intervention on the glycemic control, diabetes knowledge and diabetes health beliefs of Mexican–Americans with T2D [35]. After recruiting 150 participants at a Catholic faith-based clinic, the intervention consisted of participative group education, telephone contact and follow-up using inspirational faith-based health behavior change postcards. While no significant changes were observed at the 3-month assessment, the intervention resulted in decreased A1c levels and increased diabetes knowledge at 6 months. This and additional studies conclude that using promotoras as part of an interdisciplinary team can result in positive outcomes for Latinos with T2D [36,37].

Realizing the potential of CHW-led interventions, the CDC published a Policy Evidence Assessment Report to inform researchers, evaluators and practitioners about the strengths and limitations of the evidence bases for individual components of CHW policy interventions [38]. Of the 14 CHW policy components identified and assessed, eight have a strong evidence basis, meaning they fall into the ‘best’ category. These eight components are: CHWs provide chronic disease care services, inclusion of CHWs in team-based care model, core competency CHW certification, CHWs supervised by healthcare professionals, standardized core CHW curriculum, medicaid payment for CHW services, specialty area CHW certification and inclusion of CHWs in development of their certification requirements. Additionally, the remaining six components either fell into the ‘promising’ or ‘emerging’ categories.

Despite evidence to support benefit, it is not clear whether healthcare delivery systems will begin to implement CHW programs due to costs and the investment of time required to start a new program. Once established, there is evidence that such programs may be cost saving

over the long term. One long-term cost–effectiveness analysis of a CHW program for low-income Latino adults with T2D found that the intervention was cost effective, especially for individuals with A1c levels above 9% [39]. In addition, two studies found that CHWs as part of a team model were low cost [21,40]. Another study estimated that a CHW program for T2D care could result in annual cost savings of up to US\$2000 per Medicaid participant [41].

CHWs may be a tool to reach the populations that require a more human touch or personalized approach, and thus help address disparities in diabetes care. However, the current grant funding system creates persistently low wages, high turnover and low job security among CHWs [42]. Fortunately, in 2013, the Centers for Medicare and Medicaid Services created a new rule allowing state Medicaid agencies to reimburse for preventive services provided by professionals that may fall outside of a state’s clinical licensure system, such as CHWs, as long as a physician or other licensed practitioner recommends the services [43].

Patient navigators

Another emerging strategy to overcome barriers faced by Latinos involves patient navigators, who differ from CHWs or health coaches by relying less on motivational interviewing and more on using their knowledge of the health system itself to help patients [44]. Originally conceptualized at the National Cancer Institute for cancer care, navigators were trained and culturally sensitive healthcare workers who provided support and guidance throughout the care continuum by helping patients ‘navigate’ the multiple components of the healthcare system [45]. Today the patient navigation concept has been expanded to include a wider range of healthcare workers, from lay community members to trained professionals such as social workers, registered nurses and physicians [46].

Patient navigation was shown to increase health-seeking behavior in Latino women diagnosed with breast cancer compared with usual care [47]. Navigation significantly shortened the time from definitive diagnosis until initiation of primary therapy (57 days vs 74 days). Results were especially significant for the Latino strata (56 days vs 81 days). More Latino women were diagnosed within 60 days of abnormal screening (62.6% vs 47.5%) and more began treatment within 60 days of diagnosis (80% vs 56.3%).

These findings suggest patient navigation may show promise in decreasing some delays that contribute to health disparities among minority women with breast cancer and particularly effective for patients who are unfamiliar with how to interact with the healthcare system. To date, there are few patient navigation studies focused on glycemic control in patients with T2D.

Peer-based diabetes management

Peer-support interventions are increasingly being used to support self-care among adults with diabetes [48]. The model is defined as support from a fellow patient who shares the same condition and thus, shares experiential knowledge of a specific behavior or stressor [49]. Peer support improves T2D outcomes by providing informational and emotional support venues, while offering mutual reciprocity. In addition, because peer support is generally via volunteers, this approach is typically less expensive than interventions that depend on salaried personnel such as CHWs. Similar to the complementary role of CHWs to primary care providers, trained peer mentors can complement CHWs. The focus is to help support patients with their efforts to sustain SM and relay concerns or questions to providers.

One randomized controlled trial combined peer-support with promotoras by training individuals with T2D who exemplified natural leadership as promotoras over a 3-month period [18]. Known as Project Dulce (Sweet Project), the low-cost peer-educator intervention implemented a Spanish-language curriculum based on the American Diabetes Association standards of care. In this trial, all patients (207 Mexican–Americans) had baseline A1c levels greater than 10%, making them a very high-risk sample. Whereas no significant changes were noted in the control group, the intervention arm saw an A1c level decrease of 1.7% at 4 months and decrease of 1.5% at 10 months. These findings further suggest that this is an effective and low-cost approach to T2D SM education for low-income and high-risk Latino patients.

Health IT tools

While CHWs, patient navigators and peer-to-peer groups can potentially improve diabetes care for disadvantaged Latino patients, they all share two key limitations: hiring and training staff and organizing in-person groups is expensive, and to a greater or lesser extent, these three approaches are all meant to compensate for

limitations of the current health system. In an ideal world, health systems would be more easily accessible to all patients, and all patients would receive care from highly trained providers. As a greater proportion of the population becomes familiar with using online tools, health IT innovations that can effectively link patients to their care team hold the potential for future improvements in diabetes care that may overcome these two limitations.

The Health Information Technology for Economic and Clinical Health (HITECH) Act is largely driving the rapid adoption of health IT. This is especially true for nonvulnerable populations, where health IT tools are increasingly used for T2D SM [50]. However, given that the digital divide is beginning to narrow for minorities it is worth addressing the current challenge of how to fully engage Latinos with health IT T2D management tools [51].

Data from Pew survey indicate that 87% of American adults use the internet, up from 14% in 1995, including rapidly increasing rates among elderly and Latinos (83%) [52,53]. In addition, most Latino patients will have the hardware necessary to engage in IT-based interventions [51]. Several studies have found that Latinos can be engaged via bidirectional IT management tools, allowing for significant provider and patient communication in order to adhere to Latino cultural constructs such as personalismo and trust-building [54]. However, there remain concerns regarding adults with low health and computer literacy, especially in minority groups [55]. Among those 65 years or older, only 57% are internet users and only 10% with limited health literacy used the internet to get health information [56]. In addition, the pattern worsens for older adults with lower income or from minorities. To serve LEP Latino patients with T2D, the next generation of patient facing tools must be more easily accessible (e.g., via widely used smartphones) and have very simple user interfaces (e.g., more figures and fewer words).

There has been a growing use of web and email-based T2D peer support programs. Current research groups are interested in evaluating the effect of these tools providing evidence-based information to facilitate medication and other SM discussions between peer supporters and patients. The same idea has been postulated for CHWs. Could tailored, interactive health IT tools increase effectiveness of CHW outreach with adults with low health literacy compared

with when CHWs rely on printed educational materials alone? A recent randomized controlled trial evaluated the effectiveness of tailored, Web-based tools to support CHW outreach among low-income Latinos at a FDHC in Detroit [57]. Tailoring refers to personalized content based on personal information collected from individual assessments. Evidence shows that greater tailoring results in a larger effect size. CHWs used the program, called iDecide and available in English and Spanish, on iPads to facilitate discussions with patients. In addition, the tool guides the CHW and patient to formulate the patient's action plan and raise concerns to discuss with healthcare providers. The study found that participants in both arms improved significantly over the 3 month study period on nearly all measures, but iDecide arm participants reported greater improvements in reducing diabetes distress and in satisfaction with medication information.

Traditional Web-based tools may have limited reach [52]. An increasing number of meta-analysis and systematic reviews have shown the effectiveness of cell phone interventions and texting to improve health behaviors and disease-related health outcomes [58]. Prevalent ownership and use of cell phones and cheaper text-messaging services account for the growth in non-Web-based interventions [59]. Unlike computer technology, cell phone methods might be more cost effective and facilitate contacting hard-to-reach populations.

Integrated care delivery systems with robust health IT infrastructures are well positioned to take the lead in reducing traditional barriers faced by Latino patients. Kaiser Permanente (KP), for example, is the largest nonprofit integrated healthcare delivery system in the US. In California, Latinos are the fastest growing race/ethnic membership group. KP Northern California is currently implementing a multi-pronged strategy that includes providers (recruitment of Spanish-speaking providers, language course refreshers for current providers and organization of Latino practice modules with Spanish-speaking staff), tailored patient outreach using culturally appropriate and easily accessible materials and deployment of a Spanish-language patient portal with robust patient educational materials. Integrated strategies such as the approach taken by KP may be required to effectively improve diabetes care for Latinos facing language or cultural barriers to care.

Discussion

Improving the care of Latino patients with diabetes is an area of growing importance to care systems, policy-makers, researchers, providers and caregivers. The widely documented disparities in care in this growing patient population, and the corresponding costs, morbidity and mortality that accrue from suboptimal diabetes care mean that new strategies are needed to reduce barriers to care. Models to address cultural, literacy/numeracy and engagement barriers tend to focus around two domains: people and technology. As reviewed above, different personnel include CHWs, promotores, peer mentors and navigators (and combinations thereof). Key issues within this domain include: startup costs for new programs, level of training for staff, coordination with healthcare teams and payment models. Advances in technology hold promise for addressing two of these issues, namely integration with care teams and cost. While it remains a challenge to engage LEP and low literacy/numeracy patients in using health IT tools, advances in this area include extremely user-friendly interfaces, use of technology navigators, increased use of cell phones and text messaging and placement of health IT kiosks within medical practices.

The barriers to effective care faced by many Latinos are, to greater or lesser degrees, the barriers faced by all patients. Thus, as new care models and innovations are developed and tested to improve care for poorly managed Latinos with diabetes, these advances can and should be applied to other vulnerable patient populations to simplify navigation through our complex and often fractured health system and to help empower patients with diabetes to become more engaged in their healthcare.

Conclusion

Latinos with Type 2 diabetes are a fast growing group that presents several unique challenges to our health system. Although many Latino patients are able to successfully navigate health systems, for others new approaches such as community health workers (including promotores), peer-based mentoring and health information technology tools are needed to achieve successful diabetes management. Key to future success will be to find innovative and effective ways to combine the "human" element of promotores or peer mentors with the efficiency and reach of new health IT tools. Health systems of the

Box 1. Take-away points.

- There is considerable variation among CHW-led interventions, which undermine findings
- Peer-based support can complement CHW or promotores' interventions and be cost effective
- Latinos are increasingly becoming familiar with technology (computing, internet and mobile phones)
- Future research should separately test the efficacy of various CHW interventions, including promotores
- Studies of associations between peer-mentoring and HbA1c level improvement can elucidate the interventions' effectiveness
- It is recommended to study the integration of technology and the discussed interventions

CHW: Community health worker.

future must substantially lower barriers to care by implementing flexible and multicomponent programs so that all patients can benefit from the proven prevention and treatment strategies known to prevent the costly complications of poorly controlled diabetes.

Future perspective

Given the projected increase of diabetes prevalence, costs and complications that is expected to disproportionately affect Latinos, new strategies must be developed and implemented to reduce cultural and linguistic barriers to care (Box 1). Fortunately, the Affordable Care Act is tackling one major barrier: lack of health insurance. However, even insured patients face barriers to effectively engaging with our health system and successfully managing a complex disease like T2D.

A growing body of evidence continues to demonstrate the effectiveness of new types of personnel such as CHWs, promotores and peer mentors.

Similarly, technological advances are making it easier to engage hard-to-reach patients, whether by direct patient use or as a support to navigator interventions. Building on current research results, health systems of the future must substantially lower barriers to care by implementing flexible and multicomponent programs so that all patients can benefit from the proven prevention and treatment strategies known to prevent the costly complications of poorly controlled diabetes.

Financial & competing interests disclosure

RW Grant is supported by NIDDK (R01DK099108), NHLBI (R01 HL117939) and PCORI (SC14-1403-11992). The authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

No writing assistance was utilized in the production of this manuscript.

References

Papers of special note have been highlighted as:
• of interest

- 1 National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States. US Department of Health and Human Services, Centers for Disease Control and Prevention, GA, USA (2014).
- 2 American Diabetes Association. Economic costs of diabetes in the US in 2012. *Diabetes Care* 36(4), 1033–1046 (2013).
- 3 Cowie CC, Rust KF, Byrd-Holt DD *et al.* Prevalence of diabetes and high risk for diabetes using A1C criteria in the U.S. population in 1988 – 2006. *Diabetes Care* 33(3), 562–568 (2010).
- 4 Harris MI. Racial and ethnic differences in health care access and health outcomes for adults with Type 2 diabetes. *Diabetes Care* 24(3), 454–459 (2001).
- 5 Saydah S, Cowie C, Eberhardt MS, De Rekeneire N, Narayan KMV. Race and ethnic differences in glycemic control among adults with diagnosed diabetes in the United States. *Ethn. Dis.* 17(3), 529–535 (2007).
- 6 Stevens CD, Schriger DL, Raffetto B, Davis AC, Zingmond D, Roby DH. Geographic clustering of diabetic lower-extremity amputations in low-income regions of California. *Health Aff. (Millwood)* 33(8), 1383–1390 (2014).
- 7 Boyle JP, Thompson TJ, Gregg EW, Barker LE, Williamson DF. Projection of the year 2050 burden of diabetes in the US adult population: dynamic modeling of incidence, mortality, and prediabetes prevalence. *Popul. Health Metr.* 8(1), 29 (2010).
- 8 Doty MM, Blumenthal D, Collins SR. The affordable care act and health insurance for latinos. *JAMA* 312(17), 1735–1736 (2014).
- 9 American Community Survey. United States Census Bureau (2006).
- 10 Solis JM, Marks G, Garcia M, Shelton D. Acculturation, access to care, and use of preventive services by Hispanics: findings from HHANES 1982–84. *Am. J. Public Health* 80, 11–19 (1990).
- 11 Pippins JR, Alegría M, Haas JS. Association between language proficiency and the quality of primary care among a national sample of insured Latinos. *Med. Care* 45(11), 1020–1025 (2007).
- 12 Brotherton SE, Etzel SI. Graduate medical education, 2010–2011. *JAMA* 306(9), 1015–1030 (2011).
- 13 Larkey LK, Hecht ML, Miller K, Alatorre C. Hispanic cultural norms for health-seeking behaviors in the face of symptoms. *Health Educ. Behav. Off. Publ. Soc. Public Health Educ.* 28(1), 65–80 (2001).

- 14 National Alliance for Hispanic Health. Quality Health Services for Hispanics: The Cultural Competency Component. Department of Health and Human Services, Office of Minority Health, Health Resources and Services Administration Bureau of Primary Health Care. (2010). www.hrsa.gov/culturalcompetence
- 15 Carrasquillo O, Patberg E, Alonzo Y, Li H, Kenya S. Rationale and design of the Miami Healthy Heart Initiative: a randomized controlled study of a community health worker intervention among Latino patients with poorly controlled diabetes. *Int. J. Gen. Med.* 7, 115–126 (2014).
- 16 Norris SL, Chowdhury FM, Van Le K *et al.* Effectiveness of community health workers in the care of persons with diabetes. *Diabet. Med. J. Br. Diabet. Assoc.* 23(5), 544–556 (2006).
- 17 Thompson JR, Horton C, Flores C. Advancing diabetes self-management in the Mexican American population: a community health worker model in a primary care setting. *Diabetes. Educ.* 33(Suppl. 6), 159S–165S (2007).
- 18 Philis-Tsimikas A, Fortmann A, Lleva-Ocana L, Walker C, Gallo LC. Peer-led diabetes education programs in high-risk Mexican Americans improve glycemic control compared with standard approaches. *Diabetes Care* 34(9), 1926–1931 (2011).
- 19 Davis KL, O’Toole ML, Brownson CA, Llanos P, Fisher EB. Teaching how, not what: the contributions of community health workers to diabetes self-management. *Diabetes. Educ.* 33(Suppl. 6), 208S–215S (2007).
- 20 Liebman J, Heffernan D. Quality improvement in diabetes care using community health workers. *Clin. Diabetes* 26(2), 75–76 (2008).
- 21 Culica D, Walton JW, Harker K, Prezio EA. Effectiveness of a community health worker as sole diabetes educator: comparison of CoDE with similar culturally appropriate interventions. *J. Health Care Poor Underserved* 19(4), 1076–1095 (2008).
- 22 Prezio EA, Cheng D, Balasubramanian BA, Shuval K, Kendzor DE, Culica D. Community Diabetes Education (CoDE) for uninsured Mexican Americans: a randomized controlled trial of a culturally tailored diabetes education and management program led by a community health worker. *Diabetes Res. Clin. Pract.* 100(1), 19–28 (2013).
- 23 Collinsworth AW, Vulimiri M, Schmidt KL, Snead CA. Effectiveness of a community health worker-led diabetes self-management education program and implications for CHW involvement in care coordination strategies. *Diabetes Educ.* 39(6), 792–799 (2013).
- 24 Spencer MS, Rosland A-M, Kieffer EC *et al.* Effectiveness of a community health worker intervention among African American and Latino adults with Type 2 diabetes: a randomized controlled trial. *Am. J. Public Health* 101(12), 2253–2260 (2011).
- **Centered on a Detroit FQHC provides support for CHW-led interventions and suggests the consideration of volunteer peer-led programs. Overall, it highlights major barriers to the continuation of CHW-led programs and offers alternatives.**
- 25 Tang TS, Funnell M, Sinco B *et al.* Comparative effectiveness of peer leaders and community health workers in diabetes self-management support: results of a randomized controlled trial. *Diabetes Care* 37(6), 1525–1534 (2014).
- **This randomized controlled trial compared a peer leader versus a CHW telephone outreach intervention in sustaining improvements in A1c over 1 year after a 6 month diabetes self-management education program. Both low-cost programs maintained glycemic control improvements. This study underscores the importance of cost-effective maintenance programs in the form of peer support or CHWs.**
- 26 Little TV, Wang ML, Castro EM, Jiménez J, Rosal MC. Community health worker interventions for Latinos with Type 2 diabetes: a systematic review of randomized controlled trials. *Curr. Diab. Rep.* 14(12), 558 (2014).
- 27 Babamoto KS, Sey KA, Camilleri AJ, Karlan VJ, Catalasan J, Morisky DE. Improving diabetes care and health measures among hispanics using community health workers: results from a randomized controlled trial. *Health Educ. Behav. Off. Publ. Soc. Public Health Educ.* 36(1), 113–126 (2009).
- 28 Brown SA, Garcia AA, Kouzekanani K, Hanis CL. Culturally competent diabetes self-management education for Mexican Americans: the Starr County border health initiative. *Diabetes Care* 25(2), 259–268 (2002).
- 29 Corkery E, Palmer C, Foley ME, Schechter CB, Frisher L, Roman SH. Effect of a bicultural community health worker on completion of diabetes education in a Hispanic population. *Diabetes Care* 20(3), 254–257 (1997).
- 30 Palmas W, Findley SE, Mejia M *et al.* Results of the northern Manhattan diabetes community outreach project: a randomized trial studying a community health worker intervention to improve diabetes care in Hispanic adults. *Diabetes Care* 37(4), 963–969 (2014).
- 31 Pérez-Escamilla R, Damio G, Chhabra J *et al.* Impact of a community health workers-led structured program on blood glucose control among Latinos with Type 2 diabetes: the DIALBEST trial. *Diabetes Care* 38(2), 197–205 (2015).
- 32 Balcazar HG, de Heer H, Rosenthal L *et al.* A Promotores de Salud intervention to reduce cardiovascular disease risk in a high-risk Hispanic border population, 2005–2008. *Prev. Chronic Dis.* 7(2), A28 (2010).
- 33 Brownstein JN, Bone LR, Dennison CR, Hill MN, Kim MT, Levine DM. Community health workers as interventionists in the prevention and control of heart disease and stroke. *Am. J. Prev. Med.* 29(5 Suppl. 1), 128–133 (2005).
- 34 Medina B, Soto Mas F. Promotores de Salud: educating Hispanic communities on heart-healthy living. *Am. J. Health Educ.* 38(4), 194–202 (2007). <http://works.bepress.com/francisco>
- 35 Lujan J, Ostwald SK, Ortiz M. Promotora diabetes intervention for Mexican Americans. *Diabetes Educ.* 33(4), 660–670 (2007).
- 36 Ingram M, Torres E, Redondo F, Bradford G, Wang C, O’Toole ML. The impact of promotoras on social support and glycemic control among members of a farmworker community on the US-Mexico border. *Diabetes Educ.* 33(Suppl. 6), 172S–178S (2007).
- 37 Joshu CE, Rangel L, Garcia O, Brownson CA, O’Toole ML. Integration of a promotora-led self-management program into a system of care. *Diabetes Educ.* 33(Suppl.6), 151S–158S (2007).
- 38 *Policy Evidence Assessment Report: Community Health Worker Policy Components.* Department of Health and Human Services, Centers for Disease Control and Prevention, GA, USA (2014). www.cdc.gov/dhdsp/pubs/docs/chw
- 39 Brown HS, Wilson KJ, Pagan JA *et al.* Cost-effectiveness analysis of a community health worker intervention for low-income Hispanic adults with diabetes. *Prev. Chronic Dis.* 99, 120074 (2012). www.cdc.gov/pcd/issues/2012/12_0074.htm
- 40 Johnson D, Saavedra P, Sun E *et al.* Community health workers and medicaid managed care in New Mexico. *J. Community Health* 37(3), 563–571 (2012).

- 41 Rosenthal EL, Brownstein JN, Rush CH *et al.* Community health workers: part of the solution. *Health Aff. Proj. Hope* 29(7), 1338–1342 (2010).
- 42 *Support for Community Health Workers to Increase Health Access and to Reduce Health Inequities.* American Public Health Association, Washington, DC, USA (2009). www.apha.org/policies-and-advocacy
- 43 *Targeting Medicaid Super-Utilizers to Decrease Costs and Improve Quality.* Department of Health and Human Services, Centers for Medicare and Human Services, CA, USA (2013). <http://medicaid.gov/federal-policy>
- 44 Rhodes SD, Foley KL, Zometa CS, Bloom FR. Lay health advisor interventions among Hispanics/Latinos: a qualitative systematic review. *Am. J. Prev. Med.* 33(5), 418–427 (2007).
- 45 What are patient navigators? National Cancer Institute (2012). <http://crchd.cancer.gov/pnp/what-are.html>
- 46 Harold P. Freeman Patient Navigation Institute. Our model. <http://www.hpfreemanpni.org/our-model/>
- 47 Dudley DJ, Drake J, Quinlan J *et al.* Beneficial effects of a combined navigator/promotora approach for Hispanic women diagnosed with breast abnormalities. *Cancer Epidemiol. Biomarkers Prev.* 21(10), 1639–1644 (2012).
- 48 Dale J, Caramlau IO, Lindenmeyer A, Williams SM. Peer support telephone calls for improving health. *Cochrane Database Syst. Rev.* 4, CD006903 (2008).
- 49 Brownson CA, Heisler M. The role of peer support in diabetes care and self-management. *Patient* 2(1), 5–17 (2009).
- 50 Costa BM, Fitzgerald KJ, Jones KM, Dunning Am T. Effectiveness of IT-based diabetes management interventions: a review of the literature. *BMC Fam. Pract.* 10, 72 (2009).
- 51 Livingston G, Parker K, Fox S. Latinos online, 2006–2008: narrowing the gap. Pew Hispanic Center (2009). <http://pewhispanic.org/files/reports/119.pdf>
- 52 Lopez L, Grant RW. Closing the gap: eliminating health care disparities among Latinos with diabetes using health information technology tools and patient navigators. *J. Diabetes Sci. Technol.* 6(1), 169–176 (2012).
- 53 Pew Research Center. Pew Research Center's Internet & American Life Project. Internet Use Over Time (2009). <http://www.pewinternet.org/data-trend>
- 54 Shea S, Weinstock RS, Teresi JA *et al.* A randomized trial comparing telemedicine case management with usual care in older, ethnically diverse, medically underserved patients with diabetes mellitus: 5 year results of the IDEATel study. *J. Am. Med. Inform. Assoc.* 16(4), 446–456 (2009).
- 55 Lyles CR, Sarkar U. Health literacy, vulnerable patients, and health information technology use: where do we go from here? *J. Gen. Intern. Med.* 30(3), 271–272 (2015).
- 56 Levy H, Janke AT, Langa KM. Health literacy and the digital divide among older americans. *J. Gen. Intern. Med.* 30(3), 284–289 (2015).
- 57 Heisler M, Choi H, Palmisano G *et al.* Comparison of community health worker-led diabetes medication decision-making support for low-income Latino and African American adults with diabetes using e-health tools versus print materials: a randomized, controlled trial. *Ann. Intern. Med.* 161(10 Suppl.), S13–S22 (2014).
- 58 Krishna S, Boren SA, Balas EA. Healthcare via cell phones: a systematic review. *Telemed. J. E. Health* 15(3), 231–240 (2009).
- 59 Blumberg S, Luke J. *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, July–December 2010.* National Center for Health Statistics (2011). www.cdc.gov/nchs/data/nhis/earlyrelease