



System-level approaches to improving diabetes care: can asking simple questions improve exercise regimens for patients with diabetes?

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Physical activity is a cornerstone of the healthy lifestyle changes that most patients with Type 2 diabetes mellitus (DM2) must make to manage their condition [1,2]. Regular physical activity improves blood glucose control, blood pressure and quality of life, while lowering harmful cholesterol levels and decreasing cardiovascular events and mortality [1,3–5]. In a joint statement, the American Diabetes Association and American College of Sports Medicine recommend at least 150 min per week of moderate-to-vigorous physical activity (MVPA). MVPA should achieve approximately 40–60% of maximal aerobic capacity, which, for most people, is equivalent to brisk walking [1].

These recommendations, unfortunately, stand in stark contrast with the current reality in American society. Less than 10% of US adults achieve recommended levels of MVPA and over a third engage in no physical activity at all [6]. The twin epidemics of inactivity and overweight/obesity are directly responsible for over a fourth of US healthcare costs, a staggering US\$700 billion dollars per year [7,8]. If the *status quo* remains, over 40% of Americans will be obese and over 50% will have diabetes or prediabetes by the year 2020 [9].

How then, does a modern health system address the daunting task of promoting physical activity in this current culture? Many middle-aged and older adults engage with the primary care setting on a regular basis (between four and eight clinical encounters per year), making this environment poten-

tially highly suitable for implementing population-level programs focused on promoting physical activity [10,11]. Most primary care providers (PCPs), believing that physical activity is an important component of preventive health, report that they provide an integral role in engaging their patients to participate in regular exercise [12]. However, the lack of time and many competing demands during the typical primary care visit represent a significant barrier to adequately addressing physical inactivity. Moreover, despite the known importance of physical activity counseling in primary care, many providers still find it a challenge to provide detailed advice and less than a third of primary care visits include any exercise or lifestyle counseling at all [12–15].

As time constraints continue to tighten for most PCPs, new approaches are needed to help increase exercise levels in patients with diabetes. Clinicians and patients alike will need some assistance. With a prominent emphasis on and rewards provided for ‘meaningful use’ of electronic health records (EHRs) [16], health systems with robust EHRs can play an increasingly influential role in helping to address lack of physical activity. As these systems begin to share information across large populations, an electronic infrastructure is being developed to support clinicians and health systems interested in improving care. New approaches must now be developed and tested to leverage this electronic infrastructure.



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One innovative example of how health systems can play a significant role in improving exercise levels for large patient populations is the ‘Exercise as a Vital Sign’ (EVS) program implemented by Kaiser Permanente (KP), an integrated healthcare delivery organization serving a wide range of patients. Beginning in April 2010, this EVS program involved two key components. First, medical assistants (MAs) were trained in all practices to ask patients two simple questions about exercise (“how many days a week do you engage in moderate-to-vigorous physical activity?” and, “on average, how many minutes per day do you exercise at this level?”); guidelines were provided to help the MAs define MVPA for the patients. Second, in conjunction with this workflow change, the EHR was modified to include these two brief questions so that the data could be entered directly by the MA into the EHR in the vital signs section (next to weight and blood pressure), where it could be seen by the provider.

While the concept behind this EVS intervention may seem simple, implementation of the EVS program required strong leadership, local clinical champions, and buy-in by providers and staff. Training for the MAs and discussion of how to incorporate MVPA collection into daily workflow required significant initial time investment by all members of the care team [17]. Providers also received training in exercise counseling and access to referral resources, such as lifestyle coaches and online exercise guides.

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The EVS program was implemented in four of 11 medical centers across Kaiser Permanente Northern California (KPNC) between April 2010 and October 2011. To examine the clinical impact of implementing the EVS program, researchers conducted a quasi-experimental analysis to understand patient- and visit-level outcomes among practices with and without the EVS program [17]. Intervention arm patients saw their PCP at one of the four medical centers that had begun asking patients about MVPA and entering it into the chart, while control arm patients received their primary care at KPNC practices that had not yet implemented the EVS program.

In a longitudinal analysis of over 1.5 million visits by 696,267 adults to 1196 primary care providers, researchers used a difference-in-differences approach to

compare changes from baseline weight (for all patients) and HbA1c (for patients with diabetes) between study arms. Logistic regression was used to control for practice- and patient-level differences between study arms by including baseline patient demographic and comorbidity variables into the models.

Researchers found that simply asking all patients about their exercise resulted in a modest but statistically significant 12% relative increase in lifestyle referrals and discussions about physical activity, as gauged by physician documentation in the EHR [17]. This increased awareness and the subsequent interventions taken by PCPs and patients led to some clinically relevant results. Overall, overweight and obese patients attending PCPs at the four EVS medical centers lost more weight over the study period compared with patients in the 11 non-EVS medical centers (adjusted difference-in-differences 0.16 lbs; 95% CI: 0.10–0.21; $p < 0.001$). The same was true for those patients with DM2 who attended PCPs with the EVS system in place, showing favorable declines in HbA1c (0.1% relatively greater decrease among patients with HbA1c $>7.0\%$ at baseline; $p < 0.001$) [17].

Although these changes appear modest on an individual level, they represent averages for the entire population of eligible adults receiving care. For example, extrapolating these results to the entire KPNC population of overweight patients, full implementation of the EVS program would correspond to 46,065 lbs (23 tons) of additional weight loss. By raising self-reported exercise to the level of other vital signs, this program was able to increase awareness for both patients and providers. Simple programs such as this one can be used to help physicians more efficiently and effectively identify high-risk patients who may benefit from more intensive lifestyle interventions.

As health reform charges forward and more integrated health systems and accountable care organizations are created, it will be critical to understand how to most effectively use health information technology as a tool to improve health across populations. Systems level approaches, such as the EVS example described above, have the potential to have impacts across large patient populations, sometimes just by asking a few simple questions. When asked in the right context, at the right time, and on a consistent basis, simple questions regarding physical activity can lead to healthy changes for patients with DM2.

These findings show the power of ‘systems-level’ thinking. These new ways of collecting data, analyzing trends and implementing simple EHR-based interventions can potentially improve overall quality of care for populations of patients. Further innovations hold similar promise. For example, if certain patients are

identified as having low MVPA levels, can the system automatically refer them to more intensive lifestyle coaching? Can text messaging and email reminders be automatically implemented to assist clinicians and wellness coaches in reminding patients to engage in activity? By collecting these data, can the system provide alerts and 'critical values' within the EHR to all members of the care team in order to address these issues more consistently?

As new advances in technology emerge, such as noninvasive blood glucose monitoring [18] and pharmacogenetic profiling [19], an EHR infrastructure and corresponding clinical workflow to integrate these data will be required to support these technologies. New clinical data, including answers gathered systematically from simple questions to patients while they wait for their doctor to enter the exam room, offer the

opportunity for creating individualized care plans for patients with diabetes. The next great challenge in diabetes care will be implementing and optimizing these new systems-based approaches to data collection and management in a way that will free up time for doctors and patients to get back to the basics of diabetes care: time to talk.

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