

Electronic Health Risk Assessment Adoption in an Integrated Healthcare System

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Objectives: To examine uptake patterns of the electronic health risk assessment (eHRA) and compare characteristics of early adopters among adults in 1 healthcare system with those of the potentially eligible population.

Study Design: Retrospective cohort study (September 2006-March 2009).

Methods: We designed and implemented an integrated eHRA to improve individual health plan members' self-management of their health risks and chronic illness. We included individuals aged 21 to 85 years who had been enrolled at Group Health Cooperative for 12 or more months before September 2006, when the eHRA was first introduced. Study participants had to be registered users of the health plan's secure Web portal by March 2009 in order to complete the eHRA.

Results: A total of 332,381 adults were potentially eligible; of these 39.3% were eligible to complete the eHRA. One or more eHRAs were completed by 22.4% of registered Web portal users over the study period with slow but consistent uptake. Completers were more likely to be women, to be middle-aged (41-65 years), and to have had a recent well-care visit and fewer comorbid conditions.

Conclusions: Significant additional outreach, engagement strategies, and incentives are likely required by health systems to increase adoption and ongoing use of an eHRA among target populations. Future research on eHRA uptake in primary care should focus on whether the use of these tools leads to patient action and provider engagement that improve health outcomes in moderate-risk and high-risk individuals, as well as on modalities to reach broader audiences for higher completion rates.

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Unhealthy lifestyles have a substantial impact on the incidence of chronic conditions and impaired health outcomes for US residents.¹⁻⁶ Rising healthcare expenditures are associated with increasing chronic disease incidence and prevalence, as exemplified by the association of obesity and increased healthcare costs.⁷ Some of these conditions or complications can be prevented or averted by reducing behaviors that increase health risk such as the use of tobacco, poor diet, physical inactivity, and risky alcohol use.^{8,9} Healthcare providers, and the systems in which they work, are well positioned to systematically identify high-risk individuals and provide assistance for behavior change leading to improved health and reduced healthcare costs associated with the downstream chronic illness.¹⁰

Increasingly, innovative healthcare systems use population management strategies to identify at-risk individuals to provide behavioral interventions, self-management programs, and clinical interventions to reduce health risks. Helping people identify their risky behaviors can contribute to better health status when linked with targeted wellness programs.^{11,12} One approach that is gaining momentum has been for employers and healthcare organizations to administer health risk assessments (HRAs) to individuals, often electronically. The information collected is used to identify risk factors to provide tailored feedback and programs aimed at changing unhealthy behaviors and promoting evidence-based screening, immunization, and preventive medications.¹² Several systematic reviews on the effectiveness of HRAs concluded that when used alone, there was limited evidence on their effectiveness, with a broad range in evidence quality.¹³⁻¹⁵ However, the prevailing view is that HRAs, coupled with additional interventions including work-site health promotion activities and primary care interventions, have the potential to improve population health and to be a cost-effective mechanism for comprehensively and systematically improving health outcomes.¹²⁻¹⁵

New rules from the Centers for Medicare & Medicaid Services (CMS) call for the use of HRAs as a key part of the Medicare Annual Wellness Visit and require providers to use an HRA for prevention planning. Because of this rule, HRAs are likely to become much more common in clinical practice.¹⁶

Group Health Cooperative, an integrated health plan and delivery system based in Seattle, Washington, developed an interactive, online

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electronic HRA (eHRA) in September 2006.¹⁷ Through a secure member website (MyGroupHealth, www.ghc.org), the comprehensive risk assessment tool collects self-reported information from adult members of all ages and integrates it with laboratory and biometric data from their electronic medical records (EMRs). The eHRA was developed as a new feature of MyGroupHealth, the health system's full-featured secure patient Web portal designed to provide patients with access to personalized health information and a mechanism for communication with their clinical teams.¹⁸ Tailored feedback for behavior change, preventive services, and chemoprevention, as well as targeted referrals to wellness programs, are fed directly back to patients and their clinical teams after eHRA completion.

This study was designed (1) to examine the adoption of the eHRA and compare the characteristics of early eHRA adopters with those of the potentially eligible population and (2) to understand adoption trends in the setting of an integrated health system. Understanding the characteristics of early eHRA adopters is critical for downstream evaluation of the effectiveness of eHRAs on outcomes and for refining strategies to boost outreach and engagement for providers and healthcare systems to reach nonresponders.

METHODS

Study Design and Population

The retrospective cohort study was conducted at Group Health Cooperative between September 2006 and March 2009. Group Health is an integrated healthcare system that currently serves approximately 675,000 patients in Washington State. Approximately two-thirds of members receive primary and some specialty care in the 25 medical centers from a single large multispecialty physician group practice. The remaining "network" members receive their healthcare from contracted providers. All members have the opportunity, and are encouraged, to sign up for free access to the electronic patient portal,¹⁸ which is integrated with their EMR in the Group Health medical centers but not in the network.^{18,19} The Group Health Human Subjects Review Committee approved all study procedures.

Potentially eligible individuals were the 332,281 members aged 21 to 85 years who had been enrolled in one of Group Health's medical centers for at least 12 months before September 2006 (baseline). To complete the eHRA, members had to be registered with the secure patient Web portal¹⁸; 39.3%

(130,735) had registered access to the Web portal and were eligible to complete the eHRA by March 2009. Completers were defined as individuals who were registered to use the patient Web portal and who completed the eHRA anytime between September 2006 and March 2009; noncompleters were individuals who were registered to use the patient Web portal but who did not complete the eHRA by March 2009.

Study Variables

Group Health electronic enrollment and claims databases were used to collect demographic variables (age, sex), RxRisk comorbidity score,²⁰ well-care preventive visit in the year before baseline, duration of health plan enrollment before baseline, and disenrollment or death during the study period. Among individuals who completed at least 1 eHRA, we collected the first completion date and the total number completed. We used self-reported eHRA data to provide more detailed health information on completers.

Electronic Health Risk Assessment

The eHRA was designed to be completed in 15 to 20 minutes through the secure Web portal. The extensively branched algorithm presents questions on medical history and health-related behaviors, demographics, functional and self-reported health status, social and occupational history, medication use, and prior use of recommended preventive services (maximum number of questions was 163). After completion, members and their clinical teams receive personalized reports with tailored feedback on health status, risk estimations for cardiovascular and other chronic diseases, screening and immunization recommendations, and lifestyle behavior assessment and recommendations. Tailored educational material and Web links to specific resources (eg, tobacco cessation programs, lifestyle coaches) are also provided. A complex algorithm that accounts for the constellation of risk factors, demographics, medical history, and readiness to change is used to generate recommendations.¹⁷ Group Health's clinical guidelines,²¹ which are in large part based on the those of the US Preventive Services Task Force

Take-Away Points

- The demographic and health risk profile of early electronic health risk assessment (eHRA) adopters was primarily characterized by age (41-65 years), sex (women), recent well-care visit, and fewer comorbid conditions.
- Significant additional outreach and engagement strategies and incentives are likely required to increase eHRA adoption and use among target populations and may decrease demographic differences between early adopters and later adopters.
- Future research on uptake of risk assessment tools in primary care should also address whether their use leads to increased uptake of activities that improve health outcomes in moderate-risk and high-risk individuals.

recommendations, form the basis for many of the algorithms to provide recommendations about screening, immunization, chemoprevention, chronic disease management, and health behavior change.

Self-perceived health status, lifestyle risks, and chronic illness control (diabetes, hypertension, asthma, depression, heart failure) were assessed in the eHRA using standard approaches and measurement tools. Biometric data from the EMR (glycated hemoglobin and blood pressure) were prepopulated in the eHRA, but individuals had the ability to alter these imported numbers, so we refer to all these data as self-reported. Self-perceived health status was collected with a single question and rated as excellent, very good, good, fair, or poor.²²

Lifestyle factors included body mass index (kg/m²), physical activity, tobacco use, and alcohol use. The International Physical Activity Questionnaire was used to classify individuals as active, minimally active, or inactive.²³ No lifestyle changes were recommended for nonsmokers or ex-smokers who had quit during or before the past year, whereas change was recommended for current smokers. The Alcohol Use Disorders Identification Test²⁴ was used to identify individuals with possible alcohol abuse or dependence and those with risky drinking behaviors.^{25,26}

The eHRA also evaluates control of diabetes, depression, and hypertension among persons reporting having these conditions. Diabetes questions were presented to every member who reported a personal history of diabetes (except for gestational or secondary diabetes), and control was categorized using clinical laboratory data on glycated hemoglobin levels. Individuals who reported seeing a counselor or taking antidepressant medications completed the first 8 questions of the Patient Health Questionnaire 9 tool.²⁷

As a strategy to promote uptake, the eHRA was promoted to primary care providers as a tool to prepare for adult prevention visits. Rather than a typical paper questionnaire, patients were encouraged to complete the eHRA before a scheduled well visit. During the study period, all Group Health clinics were provided financial incentives to promote eHRA use. The 3 clinics with the highest response rates received a clinic-level cash reward for discretionary use. No financial incentives were offered by the health plan or the medical group to patients or individual providers to complete an eHRA.

Analysis

Individuals could have completed more than 1 eHRA in the study period; only the first completed questionnaire was included to compare completers with noncompleters. We characterized individuals who completed more than 1 HRA during the study period. Data from the 2007 Group Health Wellness Inventory²⁸ were used to compare the prevalences of health

conditions reported by the completers. The Wellness Inventory included a stratified random telephone survey of 590 adult Group Health members and obtained prevalence estimates on demographics, health conditions, and lifestyle risk factors. We used descriptive frequencies to compare completers with noncompleters on demographic and health services data with Pearson's χ^2 test for categorical variables and means and standard deviations for continuous variables using SPSS version 10.1 (SPSS Inc, Chicago, Illinois). Significance was defined as 2-sided $P < .05$.

RESULTS

Characteristics of the Study Population

Of the 332,381 adults potentially eligible for inclusion in the study based on age and duration of enrollment before implementation of the eHRA, 29,321 (8.8% of all potentially enrolled and eligible subjects and 22.4% of registered Web portal users) completed 1 or more eHRAs (Table 1). The average enrollment duration before the start of the study was 10.3 years (standard deviation = 6.77 years). During the study period, 16% of members disenrolled or died (only 8.1% of completers). Patient enrollment in the Web portal steadily increased between September 2006 (29.7% enrollment) and March 2009 (39.3% enrollment).

Comparison of Health Profile Completers and Noncompleters

The eHRA completers were more likely than noncompleters to be female (64.6% vs 56.9%), to be middle-aged (41-65 years, 64.3% vs 59.2%), and to have had a well-care visit (31.3% vs 27.7%). Based on comparisons from the Wellness Inventory, there was no difference between completers and Group Health members as a whole in health status, body mass index, physical activity, or diabetes; in contrast, completers were less likely to be current smokers (8.1% vs 15.7%²⁸), have depression (15.2% vs 23.1%²⁸), or have hypertension (17.8% vs 27.3%²⁸).

The majority of respondents indicated their health was good (37.0%), very good (39.3%), or excellent (13.1%) (Table 2). Approximately one-third of respondents fell into each body mass index category. One in 5 (21.8%) reported they were physically inactive. Fewer than 10% (8.1%) were current smokers or had a moderate (4.8%) or high (0.6%) Alcohol Use Disorders Identification Test score. Diabetes was reported by 7.6% of the respondents. Just over 15% reported being depressed; among these, 53.8% had mild, 24.5% moderate, and 21.0% severe depression. Hypertension was slightly more prevalent (17.8%), with 41.0% having poor control (>140/90 mm Hg or >130/80 mm Hg with diabetes).

Table 1. Characteristics of the Study Population

Characteristics	Potentially Eligible Cohort (n = 332,381 [100%])		Individuals Registered on Web Portal (n = 130,735 [39.3%])		eHRA Completers ^a (n = 29,321 [8.8%])	
	No.	%	No.	%	No.	%
Web-portal registered						
By September 2006	98,805	29.7	98,805	75.6	23,892	81.5
By December 2008	130,735	39.3	130,735	100.0	29,238	99.7
Group Health enrollment before baseline, y						
1-4.9	73,978	30.7	35,441	29.9	8240	28.9
5 -9.9	46,449	19.3	22,601	19.1	5358	18.8
10-14.9	29,987	12.5	13,584	11.5	3202	11.2
≥15	90,199	37.5	46,909	39.6	11,709	41.1
Missing	91,768		12,200		812	
Disenrolled or died during study	53,221	16.0	21,289	16.3	2375	8.1
Sex						
Male	150,139	45.2	54,114	41.4	10,386	35.4
Female	182,242	54.8	76,621	58.6	18,935	64.6
Age at baseline, y						
21-40	88,179	26.5	31,395	24.0	6728	22.9
41-65	188,851	56.8	78,885	60.3	18,844	64.3
66-85	55,351	16.7	20,455	15.6	3749	12.8
Completed eHRAs						
0	303,060	91.2	101,415	77.6	0	0.0
1	24,165	7.3	24,165	18.5	24,165	82.4
2	4136	1.2	4136	3.2	4136	14.1
>2	1020	0.3	1020	0.8	1020	3.5
Well-care visit 1 year before study entry						
Yes	85,840	25.8	37,246	28.5	9172	31.3
No	246,541	74.2	93,489	71.5	20,149	68.7
	Mean (SD)					
RxRisk comorbidity score²⁰	1868 (2181)		2068 (2283)		1963 (1975)	

eHRA indicates electronic health risk assessment; SD, standard deviation.
^aCompleters were individuals who had registered on the patient Web portal and who completed the eHRA anytime between September 2006 and March 2009.

Time to eHRA Completion

Among individuals who completed any eHRA during the study period, 17% had completed it within 3 months of its implementation, 34% within 9 months, and 66% within 15 months (Figure). A minority (17.6%) of completers completed 2 or more eHRAs.

DISCUSSION

The eHRA uptake rate was slow but reasonably constant over implementation and resulted in just over 20% of individuals with registered Web portal access completing the eHRA over a 31-month period (8.8% of all potentially

enrolled and eligible subjects). Understanding whether individuals who complete eHRAs are representative of underlying populations is relevant for several reasons. First, if eHRAs are to be used to characterize the health status of enrolled populations, it is important to understand how individuals who complete these assessments differ from those who do not; without this knowledge, health systems could make a biased assessment of the health status of their covered populations and could poorly target resources. Second, understanding selection factors for completion will be critical for assessing whether use of these tools leads to improved health outcomes and population health. Finally, characterizing individuals who do not complete these tools pro-

■ **Table 2.** Distribution of Health Characteristics From the eHRA Among Completers

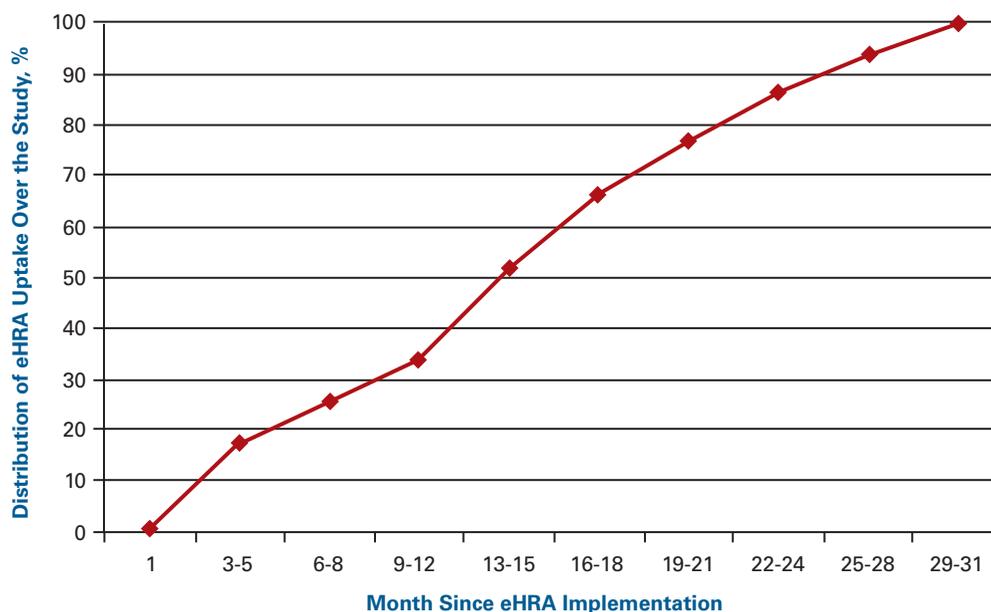
Self-Reported Health Characteristics From the eHRA	All Completers (N = 29,321)		Subsample	
	No.	%	No.	%
Self-reported health status				
Excellent	3855	13.1	—	—
Very good	11,520	39.3	—	—
Good	10,863	37.0	—	—
Fair	2736	9.3	—	—
Poor	345	1.2	—	—
Missing	2	0	—	—
Lifestyle risk assessment: BMI, kg/m²				
Normal weight (BMI <25)	9620	32.8	—	—
Overweight (BMI 25-30)	9851	33.6	—	—
Obese (BMI ≥30)	8936	30.5	—	—
Incomplete	914	3.1	—	—
Lifestyle risk assessment: physical activity²³				
Active/minimally active (category 2 or 3)	20,303	69.2	—	—
Inactive (category 1)	6400	21.8	—	—
Incomplete	2616	8.9	—	—
Missing	2	0	—	—
Lifestyle risk assessment: tobacco use				
Nonsmoker/ex-smoker	26,958	91.9	—	—
Current smoker	2363	8.1	—	—
Lifestyle risk assessment: alcohol use²⁴				
AUDIT score 0-7	27,756	94.7	—	—
AUDIT score 8-15	1395	4.8	—	—
AUDIT score ≥16	170	0.6	—	—
Chronic care impact: diabetes^{a,b}				
No current diabetes	27,104	92.4	—	—
Current diabetes	2217	7.6	2217	100
A1C <7.0%			1036	46.7
A1C 7.0%-9.0% + <2 risk factors ^b			508	22.9
A1C >9.0% or 7.0%-9.0% + >2 risk factors ^b			530	23.9
Incomplete control information			143	6.5
Chronic care impact: depression				
No current depression	24,874	84.8	—	—
Current depression	4447	15.2	4447	100
Mild (score 0-9)			2393	53.8
Moderate (score 10-14)			1090	24.5
Severe (score ≥15)			964	21.0
Chronic care impact: hypertension^a				
No current hypertension	24,107	82.2	—	—
Current hypertension	5214	17.8	5214	100
Controlled ≤140/90 mm Hg or ≤130/80 mm Hg with diabetes			3061	58.7
Uncontrolled >140/90 mm Hg or >130/80 mm Hg with diabetes			2136	41.0
Incomplete control information			17	0.3

A1C indicates glycated hemoglobin; AUDIT, Alcohol Use Disorders Identification Test; BMI, body mass index; eHRA electronic health risk assessment.

^aHypertension and A1C assessments were based on biometric data imported into the eHRA from the electronic record, but were modifiable by patients.

^bTotal cholesterol more than 250 mg/dL, high-density lipoprotein cholesterol less than 40 mg/dL, blood pressure more than 130/80 mm Hg, smoker, positive history of early coronary artery disease (father/brother aged <55 years or mother/sister aged <60 years), or positive urinary microalbumin.

■ **Figure.** Distribution of eHRA Uptake Among Completers by Months Since eHRA Implementation



eHRA indicates electronic health record assessment.

vides an opportunity for reaching broader audiences for higher completion rates.

Consistent with prior literature,²⁹ we found that women, middle-aged individuals, and individuals with recent well-care visits and fewer comorbid conditions were most likely to complete the assessment. Possible reasons for these findings are that younger people tend to be in good health and less concerned about their health status,³⁰ while older people may feel that significant improvements in health outcomes are not possible in the late stages of life.³¹ Or this finding may reflect patients' interest in properly managing their risk factors.³²

During the study period, Group Health members had to carry out a 2-step process to complete their eHRA: first they had to sign up to use the secure Web patient portal and then they had to sign onto the website to complete their questionnaire. Also at the time of this study, the eHRA was only available in English, potentially limiting access for those with other primary languages. The additional steps required to complete the eHRA could have further influenced the profile of completers, but appeared to have little association with who completed the eHRA among potentially eligible respondents. Despite these additional steps required to complete the eHRA, there were only a few notable differences in the prevalence of conditions and lifestyle risks between completers and Group Health members in general.²⁸

The eHRA represents an innovation in preventive care because it uses self-reported data on health risks and chronic condition management to provide recommendations that are shared with the patients and their providers and health-care teams by integrating information from the Web portal with the EMR. Paper HRAs or eHRAs can be used to assist with clinical management by providers and population management by medical groups and health plans; they also can be used by employers to improve population health. Risk stratification of populations requires comprehensive diagnostic information, which includes integrating information from diagnoses, laboratory values, pharmacy fills, and prior use patterns. For HRAs to improve population health, there needs to be broad uptake by patients to augment the medical record data with self-reported data and their use needs to be tied to patient and provider action that leads to improved outcomes.

Though eHRAs are not a new concept in clinical preventive care, their use has not taken root systematically in most healthcare systems. Health risk assessments have been used extensively by employers as part of worksite wellness programs to promote health risk reductions among employees. The Community Preventive Services Task Force endorses the use of eHRAs as part of these programs.^{15,33} In 2012, as part of new guidance regarding the requirements for annual wellness visits,¹⁶ the CMS has stipulated that a comprehensive HRA should be offered as a routine part of

covered annual wellness visits for all Medicare beneficiaries. However, little is known about the characteristics of people who voluntarily complete these assessments and how they differ from the characteristics of people who do not. It is an important priority to evaluate the types of additional training and resources that are needed by healthcare teams and systems to use HRAs to improve patient outcomes needs. Another high priority is to examine whether HRAs can provide actionable information for healthcare teams to improve health outcomes through patient action and provider engagement.

Financial incentives have been shown to improve uptake of risk assessment tools in worksite settings, but far less is known about the role of incentives in delivery systems.³⁴ We found the clinics with the highest response rates used direct outreach from the physician's office (telephone or e-mail) to patients, requesting completion of the eHRA as part of clinical care and population management. Most of the individuals completed their first eHRA in the fourth quarter of 2006 and the third quarter of 2007, as the result of special promotions by Group Health Cooperative. The first peak (3-5 months after implementation) corresponded to the introduction of the Health Profile Questionnaire within Group Health staff. The second peak (13-15 months) corresponded to a clinic-level contest giving extra incentives for completing questionnaires. While these types of incentives may increase uptake, it is unknown whether increasing uptake alone will lead to improved receipt of preventive services and improved overall outcomes.

CONCLUSION

Significant additional outreach, engagement strategies, and incentives are likely required by health systems to increase adoption and ongoing use of an eHRA among target populations. Among patients in an integrated health system, the demographic and health risk profile of early eHRA adopters (completers) was primarily characterized by age and sex, a recent well-care visit, and fewer comorbid conditions. These types of risk assessment tools have the potential to address and integrate the interests of patients and other stakeholders, including employers, clinical teams, and health plans, as long as they can provide actionable information for patients and healthcare teams with linkages to effective programs to mitigate health risks. Future research on the uptake of risk assessment tools in primary care should also address whether the use of these tools leads to increased uptake of activities that improve health outcomes in moderate-risk and high-risk individuals.

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REFERENCES

1. Powers KA, Rehrig ST, Jones DB. Financial impact of obesity and bariatric surgery. *Med Clin North Am.* 2007;91(3):321-338, ix.
2. Maciejewski ML, Smith VA, Livingston EH, et al. Health care utilization and expenditure changes associated with bariatric surgery. *Med Care.* 2010;48(11):989-998.
3. Daviglius ML, Liu K, Yan LL, et al. Relation of body mass index in young adulthood and middle age to Medicare expenditures in older age. *JAMA.* 2004;292(22):2743-2749.
4. Pan SY, DesMeules M. Energy intake, physical activity, energy balance, and cancer: epidemiologic evidence. *Methods Mol Biol.* 2009;472:191-215.
5. Pronk NP, Goodman MJ, O'Connor PJ, Martinson BC. Relationship between modifiable health risks and short-term health care charges. *JAMA.* 1999;282(23):2235-2239.
6. Centers for Disease Control and Prevention. Chronic diseases and health promotion. <http://www.cdc.gov/chronicdisease/overview/index.htm#1>. Updated August 13, 2012. Accessed August 28, 2012.
7. Cawley J, Meyerhoefer C. The medical care costs of obesity: an instrumental variables approach. *J Health Econ.* 2012;31(1):219-230.
8. American Diabetes Association, National Institute of Diabetes, Digestive and Kidney Diseases. The prevention or delay of type 2 diabetes [published correction appears in *Diabetes Care.* 2002;25(5):947]. *Diabetes Care.* 2002;25(4):742-749.
9. Vila PM, Booske BC, Wegner MV, Remington PL. Preventable causes of death in Wisconsin, 2004. *WMJ.* 2007;106(7):373-379.
10. Clark CM, Fradkin JE, Hiss RG, Lorenz RA, Vinicor F, Warren-Boulton E. Promoting early diagnosis and treatment of type 2 diabetes: the National Diabetes Education Program. *JAMA.* 2000;284(3):363-365.
11. Mayo Clinic Health Solutions. Mayo Clinic Health Assessment: Overview. <http://www.mayoclinichealthsolutions.com/products/Health-Assessment.cfm>. Published 2010. Accessed October 1, 2011.
12. RAND Corporation. *Evidence Report and Evidence-Based Recommendations: Health Risk Appraisals and Medicare.* http://www.rand.org/pubs/reprints/2007/RAND_RP1225.pdf. Published 2003. Accessed October 1, 2011.
13. Rubenstein L, Shekelle PG, Tucker JS, et al. *Health Risk Appraisals and Medicare.* Evidence Report prepared for the US Department of Health and Human Services. Baltimore, MD: Centers for Medicare & Medicaid Services; 2003. Contract 500-98-0281.
14. Anderson DR, Stauffer MJ. The impact of worksite-based health risk appraisal on health-related outcomes: a review of the literature. *Am J Health Promot.* 1996;10(6):499-508.
15. Soler RE, Leeks KD, Razi S, et al; Task Force on Community Preventive Services. A systematic review of selected interventions for worksite health promotion: the assessment of health risks with feedback. *Am J Prev Med.* 2010;38(2)(suppl):S237-S262.

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16. Centers for Medicare & Medicaid Services. Medicare Program; Payment Policies Under the Physician Fee Schedule and Other Revisions to Part B for CY 2012. Report CMS-1524-P. Department of Health and Human Services. Washington, DC. http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/ERxIncentive/downloads/2012_NPRM_PFS_Proposed_Rule508.pdf. Published July 19, 2011. Accessed August 28, 2012.
17. Nelson EC, Hvitfeldt H, Reid R, et al. Using Patient-Reported Information to Improve Health Outcomes and Health Care Value: Case Studies from Dartmouth, Karolinska, and Group Health. Lebanon, NH: The Dartmouth Institute for Health Policy and Clinical Practice, Dartmouth-Hitchcock, Group Health Research Institute, Karolinska Institute; 2012.
18. Group Health Cooperative. Group Health website. <http://www.ghc.org/>. Published 2012. Accessed June 1, 2012.
19. Ralston JD, Carrell D, Reid R, Anderson M, Moran M, Hereford J. Patient web services integrated with a shared medical record: patient use and satisfaction. *J Am Med Inform Assoc*. 2007;14(6):798-806.
20. Fishman PA, Goodman MJ, Hornbrook MC, Meenan RT, Bachman DJ, O'Keeffe Rosetti MC. Risk adjustment using automated ambulatory pharmacy data: the RxRisk model. *Med Care*. 2003;41(1):84-99.
21. Group Health Cooperative. Group Health Clinical Guidelines. <http://www.ghc.org/healthAndWellness/?item=/common/healthAndWellness/careDecisions/yourCare/guidelines.html>. Published 2012. Accessed July 11, 2012.
22. McDowell I. Single item health indicators. In: *Measuring Health: A Guide to Rating Scales and Questionnaires*. 3rd ed. New York, NY: Oxford University Press; 2006:578-587.
23. International Physical Activity Questionnaire. International Physical Activity Questionnaire website. <https://sites.google.com/site/theipaq/home>. Published 2011. Accessed October 1, 2011.
24. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. *AUDIT: The Alcohol Use Disorders Identification Test*. Geneva, Switzerland: World Health Organization, Department of Mental Health and Substance Dependence; 2001.
25. Bohn MJ, Babor TF, Kranzler HR. The Alcohol Use Disorders Identification Test (AUDIT): validation of a screening instrument for use in medical settings. *J Stud Alcohol*. 1995;56(4):423-432.
26. World Health Organization. Global Status Report on Alcohol and Health. http://www.who.int/substance_abuse/publications/global_alcohol_report/en/index.html. Published 2011. Accessed July 11, 2012.
27. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16(9):606-613.
28. Reid RJ. The Group Health Wellness Initiative: a Final Report to the Group Health Community Foundation. Seattle, WA: Group Health Cooperative Center for Health Studies; 2007.
29. Bower JA, Saadat MA, Whitten C. Effect of liking, information and consumer characteristics on purchase intention and willingness to pay more for a fat spread with a proven health benefit. *Food Qual Prefer*. 2003;14:65-74.
30. Pollay RW. Targeting youth and concerned smokers: evidence from Canadian tobacco industry documents. *Tob Control*. 2000;9(2):136-147.
31. Phillips EM, Schneider JC, Mercer GR. Motivating elders to initiate and maintain exercise. *Arch Phys Med Rehabil*. 2004;85(7)(suppl 3): S52-S57.
32. Lindsey E. Health within illness: experiences of chronically ill/disabled people. *J Adv Nurs*. 1996;24(3):465-472.
33. Guide to Community Preventive Services. Assessment of Health Risks With Feedback to Change Employees' Health. <http://www.thecommunityguide.org/worksites/ahrf.html>. Last updated December 3, 2011. Accessed July 11, 2012.
34. Galbraith J. *Designing the Innovating Organization*. Los Angeles, CA: Center for Effective Organizations; 1999. ■