CME credits available for this article — see page 95.

ORIGINAL ARTICLE

A Quality-Improvement Project

Use of a Computerized Medical Database and Reminder Letters to Increase Preventive Care Use in Kaiser Permanente Patients

Cecily Y L Ling, MD
Eric Kajioka, MD
Van Luu, MD
Wipat Phanthawimol, MD
Hitoshi Honda, MD
Linda Kuribayashi, MD

Abstract

Context: Previous studies have suggested that preventive health care measures may be improved by proactive patient-reminder systems and use of electronic medical databases.

Objective: Our objective was to use Kaiser Permanente's (KP's) electronic medical databases to improve the preventive health care delivered to KP patients in Honolulu, HI.

Design: Patients not seen by their primary care physician in more than one year ("low-utilizing patients") and overdue for preventive health care services were identified using KP's electronic medical databases. These patients were then sent letters requesting that they obtain these services. Response rates and results of their screening tests were tracked.

Results: Of 309 letters sent, 84 (27.2%) patients responded. Of the 260 patients who were reminded of overdue immunizations (tetanus, pneumonia, influenza, or a combination of these), 51 (19.6%) came in to obtain them. Ten of the 37 (27.0%) women overdue for breast cancer screening came in for mammograms. Eleven of the 109 (10.1%) patients overdue for colorectal cancer screening completed fecal occult blood testing.

Conclusion: Outreach letters that target low-utilizing patients identified by an electronic medical database may be an efficient and cost-effective way of improving patient use rates of preventive health care.

Context

Preventive medicine is the forefront of medical care. It is cost-effective, improves morbidity, and reduces mortality. However, it is also often overlooked. A report of a study of 12 metropolitan areas published in 2003 noted that on average, US patients receive only 55% of recommended preventive care.[1] Since then, various strategies have been pursued to improve outreach to patients to address preventive-care deficiencies.

One example is the use of patient-reminder systems, such as phone calls or letters. These have been successfully used to improve preventive care such as vaccinations,[2–4] cancer screening,[5–12] smoking cessation,[13] and diabetes management.[14,15] However, although mass mailings or phone calls can target large volumes of patients, they are impersonal and cannot be tailored to address multiple deficits in preventive care without individual analysis of each patient's record, which would be time-consuming and impractical for a busy practice or large health maintenance organization to manage. Thus, generic patient-reminder systems can address preventive care only on a population level, not at the individual level.

Electronic medical records (EMR) have also been successfully implemented as another tool to improve preventive medicine.[16,17] By consolidating patient records into a single database, clinicians can easily access and reference infor-

Cecily Y L Ling, MD, is an Internal Medicine Physician at the Honolulu Medical Center in Honolulu, HI and an Assistant Clinical Professor at the University of Hawaii John A Burns School of Medicine. E-mail: cecily.y.ling@kp.org.
Eric Kajioka, MD, is a Fellow at the University of Colorado Medical School, Division of Infectious Diseases in Denver, CO. E-mail: eric.kajioka@ucdenver.edu.
Van Luu, MD, is a Hospitalist at Queen's Medical Center in Honolulu, HI. E-mail: van@hawaii.edu.
Wipat Phanthawimol, MD, is a Fellow at the University of Hawaii John A Burns School of Medicine, Department of Geriactric Medicine. E-mail: pwipat_md@hotmail.com.
Hitoshi Honda, MD, is a Fellow at the Washington University Medical School, Division of Infectious Diseases, St Louis, MO. E-mail: user101331@aol.com.
Linda Kuribayashi, MD, is an Internal Medicine Physician at the Honolulu Medical Center in Honolulu, HI. E-mail: linda.l.kuribayashi@kp.org.

mation about preventive care. This allows physicians to easily address patient deficiencies in preventive care with minimal effort. Other aspects of EMR, such as computerized reminders about preventive-care deficiencies have also been used to improve compliance with treatment plans.[18–22] Providing automatic reminders to clinicians immediately—while they are seeing each patient—allows them to address individual deficits. However, compliance with these reminders has been limited because of various barriers, including time constraints in busy clinics.[23–27] Additionally, deficits in preventive care are not usually addressed unless a patient sees his or her physician. Thus, EMR and computerized reminder systems are typically limited to addressing preventive care on an individual level and cannot efficiently address populations of patients with preventive-care deficiencies.

… the PMST allows physicians to address the health of their patients at both a population level and an individual level.[28]

In an effort to address preventive medicine at a population level while addressing each patient as an individual, a group of Kaiser Permanente (KP) physicians designed the Panel Management Support Tool (PMST). The PMST is a Web-based computerized member database designed to complement the existing KP EMR database (KP HealthConnect). By offering summary information for each primary care physician's (PCP's) panel of patients, it allows for specific targeting of defined subsets of patients in each panel. It can also identify specific deficits in preventive care for each individual patient. Used in a proactive manner, the PMST allows physicians to address the health of their patients at both a population level and an individual level.[28]

Objective

We sought to use the PMST to improve the level of preventive health care delivered to KP patients in Honolulu, HI.

Methods

Design Overview

Four internal medicine residents, under the supervision of a staff physician at the KP Honolulu clinic, piloted a quality-improvement project designed to use the PMST. Each resident analyzed their preceptor's panel with the PMST. Patients who had not been seen by their PCP in more than one year ("low-utilizing patients") were first identified. The patients were then screened by the PMST for overdue care on the basis of national recommendations for preventive health care services (eg, vaccinations, screening laboratory tests, cancer screening). Targeted patients were sent a personalized reminder letter requesting that they come in to receive overdue health care services. Patient responses were subsequently tracked to determine the efficacy of this strategy.

Setting and Participants

The project was conducted from September 2006 through March 2007. Panels for four KP internal medicine physicians, all based at the Honolulu clinic (an urban clinic), were used. Panel sizes ranged from 783 to 1799 patients, with a total of 5196 patients initially screened. (Range in panel sizes was due to clinic adjustments for practitioner employment level, from full time to half time.) Using the PMST, patient panels were divided by month of birth (September through December birthday months were randomly targeted), for ease of approach for initial screening, for a total of 1440 patients. Patients seen by a PCP within one year were then excluded. The PMST then identified 309 remaining patients who did not meet screening recommendations for hyperlipidemia, diabetes, kidney function, mammography, or fecal occult blood testing according to national guidelines, as well as recommended immunizations for tetanus, pneumonia, and/or influenza vaccination. These showed up as a "care gap" in the PMST.

No review by an institutional review board was done, because this study was an internal quality-improvement project.

Design

As mentioned, we first used the PMST to identify low-utilizing patients. Preventive services targeted included screening for cholesterol level and glucose level; kidney function testing; tetanus, pneumonia, and/or influenza vaccines; and mammograms and/or fecal occult blood testing.

We then did a brief chart review to exclude patients who had an upcoming medical appointment or who had been recently contacted to come in for health care. Letters were sent to the identified patients, notifying them of overdue services and requesting that they come in to obtain these services within the next month. Chart review and letter preparation took approximately four to five minutes per patient. A response period of three months was allowed, randomly chosen to show a temporal relationship between the outreach letters being sent out and the patients coming in for care.

Laboratory test results were communicated by letter or phone call, by the residents, under the supervi-

sion of a KP staff physician, to the patients who came in response to the outreach letters. Abnormal laboratory test values were defined as any test value outside of the normal value range. Educational booklets (about high cholesterol, prediabetes, etc) were sent to patients with abnormal test values. Medications were initiated and follow-up testing and referrals were recommended if deemed appropriate.

Patient responses were tracked as results were received. Patient encounters were documented in the KP medical database so that the primary care teams would be aware of the outreach efforts and could follow up regarding any test results.

Results

Patients' responses to the letters were tracked and examined in relation to age and sex (Table 1), type of care requested, and clinician panel size. Of those targeted patients, 160 of 309 (52%) were older than 50 years and 149 (48%) were younger, with the mean age being 49.2 years. The median age was 50 years (range, 22–90 years). Of the 309, 175 (57%) were women and 134 (43%) were men.

Of the identified patients, 128 were overdue for screening blood work, 260 for vaccines, and 122 for cancer screening (mammogram and/or fecal occult blood testing). Most patients were overdue for a combination of these. Of the 309 patients to whom letters were sent, 84 (27.2%) responded (Table 2): 42 came in for blood work, 51 came in to receive recommended vaccinations, and 21 completed requested breast cancer screening or initial colon cancer screening (not equal to 84 because some patients received more than one type of care). Of the 260 patients who were reminded of overdue immunizations (tetanus, pneumococcal, influenza, or a combination of these), 51 (19.6%) came in to have them completed. Ten of the 37 women (27.0%) overdue for breast cancer screening came in for mammograms, and 11 of the 109 patients (10.1%) overdue for colorectal cancer screening completed fecal occult blood testing.

Four different PCP panels, ranging from 783 to 1799 patients, were screened by the PMST. Response rates from each clinician ranged from 20.7% to 38.2% (Table 3).

Discussion

This quality-improvement project used the PMST to specifically target low-utilizing patients. By doing this, we focused preventive care on patients who might never have otherwise sought it. Using a reminder letter, we obtained an overall response rate of 27.2%, which is comparable to that of other studies using such letters (range, 19%–69%).[2–4,7,9,11,12,15,29,30]

Aside from providing the benefits of routine screening, outreach letters might also improve future medical care for low-utilizing patients. A meta-analysis by Cabana and Jee[31] of five studies examin-

Table 1. Response rates by age and sex

	Age ≥ 50 years	Age < 50 years	Women	Men
Total number of letters sent	160	149	175	134
Total number of responses	48	35	56	27
Percentage of responses of total sent	30	23	32	20

Table 2. Response rates by tests or treatments

Overdue care	Total number of tests/ vaccines ordered	Total responded (%)
Screening laboratory tests		
Lipid profile	120	40 (33.3)
Fasting glucose	36	27 (75)
Renal function	20	8 (40)
Immunizations		
Tetanus vaccine	240	45 (18.8)
Pneumococcal vaccine	31	4 (12.9)
Influenza vaccine	36	6 (16.7)
Cancer screening		
Mammography	37	10 (27.0)
Fecal occult blood testing	109	11 (10.1)

Table 3. Response rates by physician

Physician	Panel size	Number of letters sent[a]	Number of responses (%)
1	783	82	17 (20.7)
2	1799	89	34 (38.2)
3	1456	91	20 (22)
4	1169	47	13 (27.7)
Total	**5196**	**309**	**84 (27.2)**

[a]Letters sent between October and December 2006.

ing preventive care demonstrated improved outcomes for screening with sustained continuity of care. Thus, inducing low-utilizing patients to see their PCP again could potentially increase future compliance with preventive-care plans.

The PMST also identified patients who were arbitrarily assigned to a PCP's panel but had never seen their PCP before. A study by Zhu et al[32] showed that patients sent reminder letters for health screening who saw physicians new to them had odds ratios six- to eight-fold higher for obtaining health screenings than patients who did not see a physician. Therefore, targeting this population of patients could result in improved screening for preventive care.

The potential ease of use by medical support staff would also make preventive care efforts cost-effective and less dependant on the individual PCP.

The PMST screened multiple areas of preventive care, including screening laboratory tests, immunizations, and cancer screening. This allowed multiple deficiencies to be addressed in a single letter. A study by Burack et al[33] showed that the combination of reminders for Papanicolaou smears and mammograms had an independently better effect on cervical cancer screening than did a reminder for a Papanicolaou smear or a reminder for a mammogram alone.[33] Another study by Terrel-Perica et al[30] showed that patients who received a combination letter for both influenza and pneumococcal immunizations were more likely to receive simultaneous immunization than were patients who received a letter for only influenza vaccination or no letter at all. Thus, targeting multiple deficiencies in different areas of preventive medicine might have improved patients' motivation to address their preventive-care needs.

The PMST was used to screen the differently sized panels of four clinicians of various experience levels, with response rates of 20% to 38%. Although various studies have shown that clinician characteristics can be a barrier to certain types of preventive care,[34–36] these response rates demonstrate that different providers can use the PMST effectively for preventive care.

Finally, although resident physicians performed this project, the PMST is relatively simple to use. By delegating screening to medical support staff members, PCPs can address more preventive care needs. In a study by Denberg et al,[37] 93% of patients reported that they believed that PCP involvement in preventive health care is not always necessary, is inconvenient, or represents an unnecessary expense, and more than 70% said that they were open to a non-PCP-centered method of receiving preventive services. Our design was simple and easily reproducible and could easily be implemented by medical support staff.

Our results show that an EMR database program such as the PMST is a useful tool for increasing patient use of preventive health care. By specifically designing outreach letters for individual deficiencies in preventive care, clinicians can attempt to ensure adequate preventive-care measures for all of their patients, rather than only the patients who frequently come in to receive health care. The potential ease of use by medical support staff would also make preventive-care efforts cost effective and less dependant on the individual PCP. Thus, the PMST would allow PCPs to reach out to large populations of patients deficient in multiple aspects of preventive care with minimal cost and effort.

Future Directions

The protocol we used was simple enough to be carried out by medical support staff and would be easy to transition to a larger scale. This project could be expanded to include the entire Honolulu clinic or even the entire region. A larger, prospective, randomized study might be considered to further evaluate efficacy and outcomes.

In addition, a more detailed assessment of laboratory value or screening abnormalities might give further information about the effect of this type of proactive preventive care on patients. For example, a diagnosis of overt diabetes, instead of prediabetes, would likely have a much more significant effect on the projected morbidity and mortality of a low-utilizing patient. Similarly, benefits of renal function monitoring might have more of an effect in patients with a lower glomerular filtration rate than in those with healthier kidneys.

To further evaluate the effect of the outreach letters, simple follow-up surveys could be sent to the targeted patients to assess whether the letters influenced their health awareness, views of KP, or perception of their overall health.

Conclusion

Using an electronic medical database that can target low-utilizing patients and reminder letters may improve preventive health care offered to KP patients. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

Acknowledgment

Katharine O'Moore-Klopf, ELS, of KOK Edit provided editorial assistance.

References

1. McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. N Engl J Med 2003 Jun 26;348(26):2635–45.
2. McDowell I, Newell C, Rosser W. Comparison of three methods of recalling patients for influenza vaccination. CMAJ 1986 Nov 1;135(9):991–7.
3. Rosser WW, Hutchison BG, McDowell I, Newell C. Use of reminders to increase compliance with tetanus booster vaccination. CMAJ 1992 Mar 15;146(6):911–7.
4. Smith DM, Zhou XH, Weinberger M, Smith F, McDonald RC. Mailed reminders for area-wide influenza immunization: a randomized controlled trial. J Am Geriatr Soc 1999 Jan;47(1):1–5.
5. Denberg TD, Coombes JM, Byers TE, et al. Effect of a mailed brochure on appointment-keeping for screening colonoscopy: a randomized trial. Ann Intern Med 2006 Dec 19;145(12):895–900.
6. Dietrich AJ, Tobin JN, Cassells A, et al. Telephone care management to improve cancer screening among low-income women: a randomized, controlled trial. Ann Intern Med 2006 Apr 18;144(8):563–71.
7. Somkin CP, Hiatt RA, Hurley LB, Gruskin E, Ackerson L, Larson P. The effect of patient and provider reminders on mammography and Papanicolaou smear screening in a large health maintenance organization. Arch Intern Med 1997 Aug 11–25;157(15):1658–64.
8. Taplin SH, Anderman C, Grothaus L, Curry S, Montano D. Using physician correspondence and postcard reminders to promote mammography use. Am J Public Health 1994 Apr;84(4):571–4.
9. Valanis BG, Glasgow RE, Mullooly J, et al. Screening HMO women overdue for both mammograms and pap tests. Prev Med 2002 Jan;34(1):40–50.
10. Yabroff KR, Mangan P, Mandelblatt J. Effectiveness of interventions to increase Papanicolaou smear use. J Am Board Fam Pract 2003 May–Jun;16(3):188–203.
11. Shankaran V, McKoy JM, Dandade N, et al. Costs and cost-effectiveness of a low-intensity patient-directed intervention to promote colorectal cancer screening. J Clin Oncol 2007 Nov 20;25(33):5248–53.
12. Hardcastle JD, Farrands PA, Balfour TW, Chamberlain J, Amar SS, Sheldon MG. Controlled trial of faecal occult blood testing in the detection of colorectal cancer. Lancet 1983 July 2;2(8340):1–4.
13. Maglione M, Larson C, Giannotti T, Lapin P. Use of Medicare summary notice inserts to generate interest in the Medicare stop smoking program. Am J Health Promot 2007 May–Jun;21(5):422–5.
14. Lafata JE, Baker AM, Divine GW, McCarthy BD, Xi H. The use of computerized birthday greeting reminders in the management of diabetes. J Gen Intern Med 2002 Jul;17(7):521–30.
15. Prela CM, Smilie JG, McInerney MJ, Harwell TS, Helgerson SD. Direct mail intervention to increase retinal examination rates in Medicare beneficiaries with diabetes. Am J Med Qual 2000 Nov-Dec;15(6):257–62.
16. O'Connor PJ, Crain AL, Rush WA, Sperl-Hillen JM, Gutenkauf JJ, Duncan JE. Impact of an electronic medical record on diabetes quality of care. Ann Fam Med 2005 Jul–Aug;3(4):300–6.
17. Gill JM, Ewen E, Nsereko M. Impact of an electronic medical record on quality of care in a primary care office. Del Med J 2001 May;73(5):187–94.
18. Dexter PR, Perkins S, Overhage JM, Maharry K, Kohler RB, McDonald CJ. A computerized reminder system to increase the use of preventive care for hospitalized patients. N Engl J Med 2001 Sep 27;345(13):965–70.
19. Hunt DL, Haynes RB, Hanna SE, Smith K. Effects of computer-based clinical decision support systems on physician performance and patient outcomes: a systematic review. JAMA 1998 Oct 21;280(15):1339–46.
20. Ornstein SM, Garr DR, Jenkins RG, Rust PF, Arnon A. Computer-generated physician and patient reminders. Tools to improve population adherence to selected preventive services. J Fam Pract 1991 Jan;32(1):82–90.
21. Overhage JM, Tierney WM, McDonald CJ. Computer reminders to implement preventive care guidelines for hospitalized patients. Arch Intern Med 1996 Jul 22;156(14):1551–6.
22. Shea S, DuMouchel W, Bahamonde L. A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting. J Am Med Inform Assoc 1996 Nov–Dec;3(6):399–409.
23. Agrawal A, Mayo-Smith MF. Adherence to computerized clinical reminders in a large healthcare delivery network. Stud Health Technol Inform 2004;107(Pt 1):111–4.
24. Demakis JG, Beauchamp C, Cull WL, et al. Improving residents' compliance with standards of ambulatory care: results from the VA Cooperative Study on Computerized Reminders. JAMA 2000 Sep 20;284(11):1411–6.
25. Saleem JJ, Patterson ES, Militello L, Render ML, Orshansky G, Asch SM. Exploring barriers and facilitators to the use of computerized clinical reminders. J Am Med Inform Assoc 2005 Jul–Aug;12(4):438–47.
26. Yarnall KS, Rimer BK, Hynes D, et al. Computerized prompts for cancer screening in a community health center. J Am Board Fam Pract 1998 Mar-Apr;11(2):96–104.
27. Tape TG, Campbell JR. Computerized medical records and preventive health care: success depends on many factors. Am J Med 1993 Jun;94(6):619–25.
28. Livaudais G, Unitan R, Post J. Total Panel Ownership and the Panel Support Tool—"it's all about the relationship." Perm J 2006 Summer;10(2):72–9.
29. Rosser WW, McDowell I, Newell C. Use of reminders for preventive procedures in family medicine. CMAJ 1991 Oct 1;145(7):807–14.
30. Terrell-Perica SM, Effler PV, Houck PM, Lee L, Crosthwaite GH. The effect of a combined influenza/pneumococcal immunization reminder letter. Am J Prev Med 2001 Nov;21(4):256–60.

31. Cabana MD, Jee SH. Does continuity of care improve patient outcomes? J Fam Pract 2004 Dec;53(12):974–80.
32. Zhu J, Davis J, Taira DA, Yamashita M. The impact of seeing physicians new to a patient on the response to screening reminders. Med Care 2006 Oct;44(10):908–13.
33. Burack RC, Gimotty PA, Simon M, Moncrease A, Dews P. The effect of adding Pap smear information to a mammography reminder system in an HMO: results of randomized controlled trial. Prev Med 2003 May;36(5):547–54.
34. O'Malley AS, Beaton E, Yabroff KR, Abramson R, Mandelblatt J. Patient and provider barriers to colorectal cancer screening in the primary care safety-net. Prev Med 2004 Jul;39(1):56–63.
35. Dominick KL, Skinner CS, Bastian LA, Bosworth HB, Strigo TS, Rimer BK. Provider characteristics and mammography recommendation among women in their 40s and 50s. J Womens Health (Larchmt) 2003 Jan–Feb;12(1):61–71.
36. Anderson KK, Sebaldt RJ, Lohfeld L, et al. Practice and physician characteristics associated with influenza vaccination delivery rates following a patient reminder letter intervention. J Prim Prev 2008 Jan;29(1):93–7.
37. Denberg TD, Ross SE, Steiner JF. Patient acceptance of a novel preventive care delivery system. Prev Med 2007 Jun;44(6):543–6.

Modern Life

The overwhelming importance of preventive medicine, sanitation, and public health indicates that in modern life the medical profession is an organ differentiated by society for its own highest purposes, not a business to be exploited by individuals according to their own fancy.

— Medical education in the United States and Canada, *Abraham Flexner, 1866-1959, American Educator*