Electronic Medical Records and Diabetes Care Improvement

Are we waiting for Godot?

We have been waiting for electronic medical records (EMRs) to improve chronic disease care for a long time (1). Availability of sophisticated EMR systems has enticed an increasing number of health plans and medical groups to invest resources in such systems. Many EMR systems are able to improve documentation of care, communication of clinical information across sites, and measurement of productivity and variation in care (2). Inpatient EMR systems have led to improvements in care in some clinical domains (3). However, the potential impact of outpatient EMR use on quality of chronic disease care has not been fully realized.

In this issue of *Diabetes Care*, Meigs et al. (4) report on a randomized trial designed to assess the impact of a web-based EMR system on quality of diabetes care at an outpatient teaching practice. Physicians using the EMR ordered significantly more A1C and LDL cholesterol tests in patients with diabetes. However, increased test frequency did not translate into better A1C or LDL levels in the patients of physicians with access to the EMRs compared with patients of physicians without access to the EMRs. The authors conclude that EMR use leads to better quality of diabetes care, because more A1C and LDL tests were ordered.

While it is encouraging that EMR use led to increased frequency of testing, it is disappointing that key care outcomes such as A1C and LDL levels did not improve. Another recent controlled study of the impact of an EMR system on outpatient diabetes outcomes also found increased rates of test ordering but no improvement in metabolic parameters such as A1C, lipids, or blood pressure levels (5). In another setting, median A1C levels improved from 8.3 to 6.9% from 1994 to 2000, while A1C test rates oscillated between 80 and 90% each year (6,7). Data from these studies suggest that

A1C or LDL test rates are not significant predictors of A1C or LDL control rates.

The tenuous relationship between frequency of testing and level of A1C and LDL values suggests that measuring test frequency may not be a clinically meaningful measure of diabetes care quality. Test ordering can be increased by very simple changes in office systems, such as the use of standing orders, while successful improvements in A1C or lipid control require more sophisticated office system changes coupled with coordinated efforts to activate patients and change provider behavior (7). In an era of limited resources, quality improvement initiatives that are designed to increase frequency of testing may distract or displace more important efforts designed to achieve better A1C or lipid control. However, if emphasis is placed on increasing the proportion of patients who reach important A1C or lipid goals, an increase in test rates is assured by assigning patients with no test to the "not at goal" group.

The results obtained by Meigs et al. (4) and Montori et al. (5) reflect the limitations of the information systems they evaluated. In both cases, the EMR system provided prompts to physicians identifying that an A1C test was due, a reminder of evidence-based goals, and classification of whether the patient was at goal or not. Although the information is customized to the patient, the degree of customization is low. While this systematic approach to care represents an important advance, it falls far short of providing the level of customized decision support needed to systematically intensify therapy in patients who have not yet reached their clinical goals.

In theory, detailed clinical decision support could be provided efficiently and effectively using electronic data management systems. However, in practice, progress has been agonizingly slow. Substantial data demonstrate that lack of appropriate initiation and titration of lipid

or glycemic control drugs is a major obstacle to achieving A1C or lipid control (8,9). Yet, although clinical decision support has been reported in a small number of studies related to other chronic diseases (10,11), it has not been fully developed for the complex care decisions needed to manage glucose control in type 2 diabetes.

How much longer must we wait? If electronic information systems are to successfully improve diabetes care in a meaningful way, they must go beyond reminders to physicians that tests are due or patients are not yet at their clinical goals. We need to develop and evaluate information systems that suggest specific clinical interventions that might be considered for a particular patient at a particular point in time. For example, consider a 72-year-old patient with diabetes and a creatinine of 0.9 mg/dl, as well as no congestive heart failure, liver, or lung disease with an A1C of 8.2% on maximally effective dose of a sulfonylurea. The EMRs may apply decision rules from guidelines such as Staged Diabetes Management (12) and suggest that this patient is an ideal candidate for metformin (13), suggest what the initial dose might be, and perhaps indicate that there is not much point in waiting longer before initiating therapy, if the patient is willing (14,15).

Meanwhile, while such systems await full development and evaluation, recent reports of impressive improvements in metabolic control of diabetes in primary care settings did not use sophisticated electronic information systems as a central component of the improvement strategy (7,16–19). Key elements of the diabetes care improvement process, such as identifying those with diabetes, monitoring their clinical status, and prioritizing patients, can be done without full EMR support (20,21) Most of these very successful practices had not fully actualized the potential for visit planning or active patient outreach that is possible with EMR systems. Further improvement may

be possible, but meanwhile, let us take practical steps toward the important goal of diabetes care improvement, using tools, however imperfect, that are now available.

There is currently great pressure on medical groups and health plans to invest in EMR systems. The administrative, scheduling, accounting, and management advantages these systems offer are formidable. However, the EMR system installed in my office this year has very limited clinical decision support capability, and its potential use as a powerful tool for visit planning or active outreach to patients has not yet been operationalized. Will it make me a better doctor? So far, the answer is no.

But I am intrigued by the possibilities. The day will come, technology permitting, when most clinicians will have a powerful tool for quality improvement in their hands. We will learn to use it, like we learned to use Dr. Larry Weed's problem-oriented medical record. Perhaps we will see the day when these tools become our friends, increase our productivity, and help us improve the quality of our care. It remains to be seen how soon affordable EMR systems that meet these challenges will become available. We wait, in hope.

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References

1. Sandiford P, Annett H, Cibulskis R: What can information systems do for primary health care? An international perspective. *Soc Sci Med* 34:1077–1087, 1992
2. Brailer DJ: Management of knowledge in the modern health care delivery system. *J Qual Improv* 25:6–19, 1999
3. Bates DW, Leape LL, Cullen DJ, Laird N, Petersen LA, Teich JM, Burdick E, Hickey M, Kleefield S, Shea B, Vander Vliet M, Seger DL: Effect of computerized physician order entry and a team intervention on prevention of serious medication errors. *JAMA* 280:1311–1316, 1998
4. Meigs JB, Cagliero E, Dubey A, Murphy-Sheehy P, Gildesgame C, Chueh H, Barry MJ, Singer DE, Nathan DM: A controlled trial of web-based diabetes disease management: the MGH Diabetes Primary Care Improvement Project. *Diabetes Care* 26:750–757, 2003
5. Montori VM, Dinneen SF, Gorman CA, Zimmerman BR, Rizza RA, Bjornsen SS, Green EM, Bryant SC, Smith SA, the Translation Project Investigator Group: The impact of planned care and a diabetes electronic management system on community-based diabetes care: the Mayo Health System Diabetes Translation Project. *Diabetes Care* 25:1952–1957, 2002
6. O'Connor PJ, Rush WA, Peterson J, Morben P, Cherney L, Keogh C, Lasch S: Continuous quality improvement can improve glycemic control for HMO patients with diabetes. *Arch Fam Med* 5:502–506, 1996
7. Sperl-Hillen J, O'Connor PJ, Carlson RR, Lawson TB, Halstenson C, Crowson T, Wuorenma J: Improving diabetes care in a large health care system: an enhanced primary care approach. *Jt Comm J Qual Improv* 26:615–622, 2000
8. Primatesta P, Poulter NR: Lipid concentrations and the use of lipid lowering drugs: evidence from a national cross sectional survey. *BMJ* 321:1322–1325, 2000
9. Ziemer DC, Miller CD, Doyle JP, Dunbar VG, Gallina DL, Code, CB, Branch WT Jr., Phillips LS: Differences in clinical decision-making underlie differences in diabetes control in a primary care site compared to a specialized diabetes clinic (Abstract). *Diabetes* 49 (Suppl. 1): A47, 2000
10. Hingorani AD, Vallance P: A simple computer program for guiding management of cardiovascular risk factors and prescribing. *BMJ* 318:101–105, 1999
11. Smellie WS, Lowrie R, Wilkinson E: A laboratory based intervention to improve appropriateness of lipid tests and audit cholesterol lowering in primary care. *BMJ* 323:1224–1227, 2001
12. Mazze R, Strock E, Simonson G, Bergenstal R, Etzwiler D: *Staged Diabetes Management Decision Paths*. 2nd ed. Minneapolis, MN, International Diabetes Center, 1998
13. UK Prospective Diabetes Study (UKPDS) Group: Effect of intensive blood-glucose control with metformin on complications in overweight patients with type 2 diabetes (UKPDS 34). *Lancet* 352:854–865, 1998
14. Avorn J: Improving drug use in elderly patients: getting to the next level. *JAMA* 286:2866–2868, 2001
15. Chertow GM, Lee J, Kuperman GJ, Burdick E, Horsky J, Seger DL, Lee R, Mekala A, Song J, Komaroff AL, Bates DW: Guided medication dosing for inpatients with renal insufficiency. *JAMA* 286:2839–2844, 2001
16. Aubert RE, Herman WH, Waters J, Moore W, Sutton D, Peterson BL, Bailey CM, Koplan JP: Nurse case management to improve glycemic control in diabetic patients in a health maintenance organization: a randomized, controlled trial. *Ann Intern Med* 129:605–612, 1998
17. Nyman MA, Murphy ME, Schryver PG, Naessens JM, Smith SA: Improving performance in diabetes care: a multicomponent intervention. *Eff Clin Pract* 3:205–212, 2000
18. Sidorov J, Gabbay R, Harris R, Shull RD, Girolami S, Tomcavage J, Starkey R, Hughes R: Disease management for diabetes mellitus: impact on hemoglobin A1C. *Am J Manag Care* 6:1217–1226, 2000
19. Sutherland JE, Hoehns JD, O'Donnell B, Wiblin RT: Diabetes management quality improvement in a family practice residency program. *J Am Board Fam Pract* 14:243–251, 2001
20. O'Connor PJ, Sperl-Hillen JM, Pronk NP, Murray T: Primary care clinic-based chronic disease care. *Dis Manage Health Outcomes* 9:691–698, 2001
21. Bodenheimer T, Wagner EH, Grumbach K: Improving primary care for patients with chronic illness. *JAMA* 288:1775–1779, 2002