Impact of the Use of an Electronic Template on Clinicians Adherence to Follow Guidelines for Diabetes Care

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Summary

Introduction: Diabetes mellitus (DM) was the seventh leading cause of death in 2006. The number of patients is expected to double by 2050. Simple non-adherence to follow guidelines by physicians is a significant source of morbidity and mortality. Our goal was to study the impact of an electronic template on adherence to follow ADA guidelines for diabetes care by general internist.

Methods: We designed an electronic template based on the 8 point ADA guidelines for management of diabetes type 2 including: glycosylated hemoglobin (HgbA1c) assessment, blood pressure (BP), lipid control, smoking cessation counseling, diabetic foot exams, pneumococcal vaccination (PCV), renal assessment and annual retina exam.A randomly selected pre-intervention control group was compared after 6 months of template use to a randomly selected post-intervention group independent of age and sex variables. Same patients were not followed in the control and intervention group.

Results: Our intervention group consisted of 212 subjects, they were compared with a control group of 154. Significant improvements were detected in HbA1c testing (57.5% vs. 94.1%; p<0.001), BP control/intervention done (53.3% vs. 89.1%; p<0.001), low-density lipoprotein (LDL) control/intervention done (65.6% vs. 90.0%; p<0.001), compliance with diabetic foot exams (88.3% vs. 99.1%; p 0.001), compliance with annual eye exams (38.3% vs. 94.8%; p<0.001). Non-significant improvements were detected in smoking cessation counseling (97.3% vs 100%; p 0.578), renal assessment (92.8% to 92.9%; p 0.72). No pre intervention data on PCV was available, so no comparisons were done.

Conclusion: Utilization of a template in the EMR showed a significant improvement in diabetes care including HbA1c assessment, BP control, LDL control, foot examination, and annual eye examination. Use of templates in the EMR system showed increased adherence to guidelines by physicians, this might extrapolate to other chronic diseases.

Keywords

diabetes mellitus type II, electronic reminder, electronic medical record, ADA guidelines, randomized clinical trial

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1 Introduction

Diabetes Mellitus (DM) is one of the major health problems in the USA. DM was the seventh leading cause of death in 2006 [1, 2]. The number of patients is expected to double by 2050 [1, 2]. Prevention of long term complications depends on the provision of evidence based services in the entire spectrum of the disease. The American Diabetes Association (ADA) has proposed guidelines for comprehensive care of diabetic patients [3]. Successful implementation of these guidelines could potentially decrease long term complications of DM. Despite the existence of these guidelines, the adherence from physicians to follow them remains unacceptably low. Only 4 out of 10 US adults reported receiving multiple preventative services for diabetes [4]. As per CDC statistics for diabetics in

ADA Diabetes Care

1. HgbA1C checked with in 6 months if at target or 3 months if not in target: {YES/NO:55541}
2. BP<130/80 or interventions done: {YES/NO:55541}
3. LDL<100 or LDL<70 for pts with CAD: {YES/NO:55541}
4. Smoking cessation counseling done and documented in the EMR: {YES NO BR NO DEFAULT:65594}
5. Foot exam including pulses {YES/NO:55541}, ankle reflexes {YES/NO:55541} and sensation to monofilament {YES/NO:55541}
6. Pneumovax vaccine: {YES/NO:55541}
7. Albumin/creatinine ratio checked and ACE/ARB therapy if abnormal alb/cr ratio: {YES/NO:55541}
8. Annual Eye exam: {YES/NO:55541}

Figure 1: ADA guidelines based Diabetes Mellitus template.

2009, 62.7% had a dilated eye exam, 67.3% had foot exam, 69.2% had HbA1c checked twice a year, 49.5% had influenza vaccine and 43.0% had pneumococcal vaccine [5].

Physicians' have a poor compliance to standard guidelines for many chronic diseases [6, 7, 8, 9, 10]. Implementation and use of Electronic medical records (EMR) have shown an improvement in outcome of many chronic diseases [11, 12, 13, 14]. Electronics reminders have also shown to increase the rate of adult immunizations and various screening procedures [15, 16]. They have shown that EMR use can improve the clinician adherence to guidelines and documentation [17, 18, 19]. However, few of the previous studies have failed to show improvement in out come of care for diabetes [20]. To further clarify we developed in our EMR a phrase reminder for various clinical parameters based on ADA guidelines and assessed its impact of clinician's compliance which was approved by institutional review board.

2 Methods

The study was conducted at a community teaching hospital in South Florida. The clinic uses EPIC as the electronic medical record system. We designed a template based on ADA guidelines for standard management of DM including:

1. HbA1C assessment (to be checked every 3 months if not at goal or every 6 month if at goal),
2. BP control/intervention (goal <130/80),
3. Lipid control/intervention (Goal LDL<100 or <70 if coexisting coronary artery disease),
4. Smoking cessation counseling,
5. Annual foot exam done with check of pulses, monofilament and ankle reflexes,

Table 1: Pre intervention and post intervention comparison of various parameters for DM care.

	Pre Implementation n=154	**Post Implementation n=212**	**p value**
HbA1c checked in 3 months / 6 months if at target	57.5%	93.8%	<.001
BP <130/80 mmHg or Intervention	53.3%	89.1%	<.001
LDL at goal or Intervention	65.5%	90.0%	<.001
Annual Eye Exam	38.3%	94.8%	<.001
Annual Foot Exam	88.3%	99.1%	<.001
Nephrology Assessment	92.8%	92.9%	0.578
Smoking Assessment	97.3%	100.0%	0.718
Pneumococcal Vaccine		92.9%	

Table 2: Odds ratio and NNT for various parameters.

	Odds Ratio	**95% C.I.**	**NNT**
HbA1c checked in 3 months / 6 months if at target	12.3	6.3-24.3	3
BP <130/80 mmHg or Intervention	7.2	4.2-12.3	3
LDL at goal or Intervention	4.1	2.3-7.2	4
Annual Eye Exam	28.6	14.5-58.8	2
Annual Foot Exam	13.9	3.2-58.8	9
Nephrology Assessment	1.0	0.4-2.2	1000

6. Pneumonia vaccination,
7. Renal assessment (patient on Angiotensin converting enzyme inhibitors (ACE)/Angiotensin II receptor blocker (ARB) or microalbumin/cr ratio checked) and
8. Annual eye exam.

200 patients with DM irrespective of age or sex were randomly selected from the database of internal medicine clinic in November 2009. Patients with a diagnosis of Type 2 DM for at least 1 year and under follow-up with the same clinician were included in the study. Pre-intervention (control) data was collected for 154 patients as 46 patients were excluded due to loss of follow up or death. Patients with type 1 DM were also excluded. Then the electronic template was launched. The entire template could be brought up by using a dot phrase. DMTEMP in the clinic note. (Figure 1) Repeated reminders were sent to the staff physicians and residents by use of emails and announcements in the noon conference. Various reminders were also placed in the resident's room to use the template. The template was used by physicians and residents for 6 months after which post intervention (test group) data was collected for 212 patients in May 2010. The post intervention group was also selected irrespective of age or sex. Same patients were not followed in the control and intervention group.

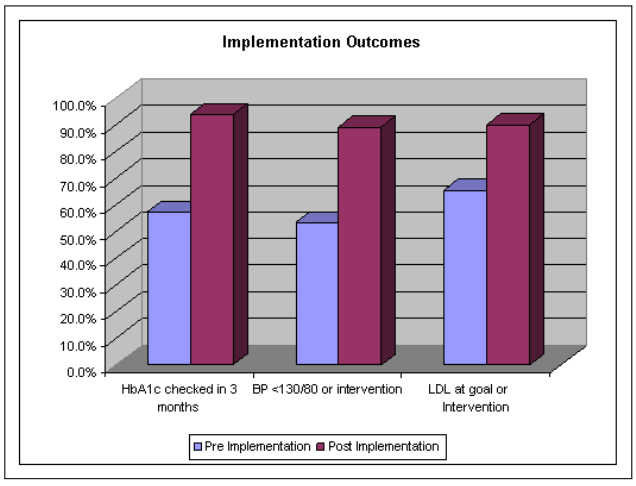

Figure 2: Bar graph for comparison of pre intervention and post intervention data.

The data was analyzed by a professional statistician using chi square method and statistical significance was set at p value less than 0.05.

3 Results

Baseline characteristics of 154 patients were collected in terms of all the parameters for DM treatment. These numbers for LDL screening, HbA1c control, eye exam, medical attention for nephropathy, smoking cessation and pneumococcal vaccine were well above the cut off set by National Committee for Quality Assurance (NCQA) for their certification in the diabetes care [18].

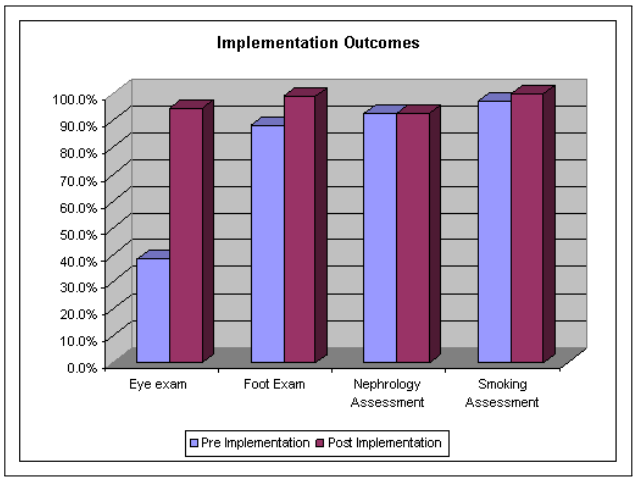

Figure 3: Bar graph for comparison of pre intervention and post intervention data.

For control of hyperlipidemia, in the control group, the LDL was at goal or checked and treated only in 65.6% which increased to 90.0 % showing an improvement of 25.4% [p<0.001, Odds ratio (OR) 4.1, Number needed to treat (NNT) = 3] in the post intervention group. For blood pressure control, in the control group, 53.3% had goal blood pressure or intervention done in the pre intervention group. It increased to 89.1% in the post intervention group with an improvement of 35.4% (p<0.001, OR 7.2, NNT = 3). For HbA1c check, in the control group, 57.5 % of patients had an HbA1c checked periodically in accordance with the guidelines. In the post intervention group, 94.1% of patients had their HbA1c checked and showed an improvement of 33.8% (p<0.001, OR 12.3, NNT = 3). For annual dilated eye exam, only 38.3% had documented eye exam in control group where as it improved to 94.8% in the post intervention group, improving by 56.5% (p<0.001, OR 28.6, NNT = 2). For annual foot examination, in the control group 88.3% had foot exam which improved to 99.1% in the post intervention group (p 0.001, OR 13.9, NNT = 9). For pneumonia vaccination, in the post intervention group about 92.9% received a pneumococcal vaccine. No pre intervention data was collected. 92.8% of patients had renal assessment in control group which improved to 92.9% showing an improvement of 0.1% (p=0.718, OR 1.0, NNT = 1000). Lastly, 97.3% of patient had smoking cessation counseling done in the control group where as 100% of patients received smoking cessation counseling in the post intervention group. Ex-smokers and nonsmokers were excluded from both groups. No additional data is available. Very low NNT obtained in our study for most of the interventions further stresses the effectiveness of this study (Figure 2 and 3).

4 Discussion

Our review of the literature reveals mixed results when studying the impact of the use of EMRs on quality of care [21, 22, 23]. Some studies have shown that the computerized system only improves the frequency of the tests without any improvement in clinical outcome [24]. We have data supporting that the use of clinical informatics to remind patients about scheduling tests and physician appointments lower LDL-cholesterol, blood pressure and HbA1c [13, 14, 25, 26, 27]. EMR use has also shown to improve the sensitivity of diagnosis for a few diseases and to identify the risk factor for post op lung injury [28, 29]. Our study showed remarkable results in improvement of adherence to the guidelines by the clinicians in diabetes care as recommended by the ADA. However, we believe that the duration of study was suboptimal to assess the impact on the clinical outcomes. Some of these numbers like, annual eye exam could be due to improved documentation rather than increased frequency of testing which we think is also important. The increased frequency of testing in compliance with the guidelines should improve the quality of care. The importance of such reminders is even more significant in today's era when many of these patients are seen by primary care physicians and they have many clinical co-morbidities which need to be addressed in a timely and efficient manner. A previous study showed that physicians prefer electronic reminder than paper chart [30].

5 Limitation

The study was a small single center trial. Secondly, there were different subjects studied during the pre and post intervention group. However, the aim of the study was to assess the adherence of clinicians follow standard guidelines regardless of patient's outcomes. Another limitation was that some of these patients were seen by an endocrinologist and they were not excluded from the study. The template was not entered into the patient's encounter automatically; it had to be entered by the clinicians which very likely affected their compliance on using it.

6 Conclusion

Utilization of a template in the EMR showed a statistically significant improvement in physicians' adherence to guidelines to treat Diabetes including checking HbA1c, LDL-cholesterol, BP, foot examination and annual eye examination. Implementing a reminder in the EMR improved quality of care for patients at no extra cost and minimal time. Further research is needed to elucidate the role of these interventions on clinical outcomes. These tools can add a valuable adjunct to the clinical decision making and patient management especially of chronic complicated diseases.

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