Extent and Impact of Diabetes Flow Sheet Use in Delaware Primary Care Physicians' Offices

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INTRODUCTION

Appropriate care by a primary care physician, coupled with educated self-management by the patient, can greatly reduce rates of complications and mortality among persons with diabetes. Heart disease, kidney conditions, retinopathy, skin and foot problems, and nerve damage all can result from improperly controlled blood sugar. Primary care physicians are responsible for ordering lab work and other exams, as well as conducting patient education on a regular basis, all of which can help patients control their blood sugar and improve their outcomes.

In 2001, the Medical Society of Delaware (MSD), under contract with the Delaware Health Care Commission (HCC), developed a uniform practice guideline (UPG) for the treatment of diabetes in the physician office. The UPG includes such quantifiable measures of appropriate care as timely hemoglobin A1C (HbA1c) and lipid lab work, foot exams, eye exams, and urinalyses. MSD and DHSS have disseminated the UPG through a variety of means, including direct mailings and availability on the Web. In addition, diabetes UPGs are available from other sources such as the American Diabetes Association. The labs and exams noted on the UPGs are highly correlated with good diabetes control.

Included in the documentation of the MSD's diabetes UPG is a flow sheet where physicians can note dates and results of office exams and lab work. Consequently, having a flow sheet, either from MSD or another source, located in a patient's chart, can serve as a quantifiable proxy for guideline utilization.

To gauge whether there is a correlation between diabetes flow sheet utilization and high quality care, Quality Insights of Delaware (QID) designed a study to examine care processes and outcomes in a sample of diabetic patients in Delaware. The patients in the study were characterized by: (1) their doctor's involvement in a QID-led intervention, and (2) whether there was a recently updated diabetes flow sheet in their chart.

The general mandate of QID as a Medicare quality improvement organization (QIO) affords us access to the charts of a select group of 21 physician offices who have volunteered to be involved in quality improvement projects with our staff, specifically focusing on diabetes in the current QIO contract. The participating offices were provided with feedback about their baseline rates of compliance with appropriate diabetes care and received information and support for quality improvement, through regular interactions with QID staff. After approximately 18 months, their diabetes care rates were re-measured. The patients of these 21 offices form a natural "intervention group" for our study, complemented by a "control group" of patients whose doctors were not in this select group. Within these two groups, the patients were further characterized by whether there was a diabetes flow sheet in their chart that had been updated within 24 months of their last visit or lab result.

We hypothesized that patients of doctors in the intervention group would have higher rates of flow sheet use, as the MSD diabetes UPG was in the packet of materials provided by QID; more timely labs and exams; and better outcomes. Our expectation was that patients whose charts contained recently updated flow sheets, in either the control or intervention group, would have labs and exams in line with

high standards of diabetes care. Although the study design is not a 2x2 in the strictest sense, since flow sheet use was not fully known from the outset, we viewed the two groupings of patients as intersecting, and hypothesized as follows:

	Flow sheet user	Flow sheet non-user
Intervention Group	BEST care	VERY GOOD care
Control Group	VERY GOOD care	Care COULD BE IMPROVED

The study was conducted in two data collection phases. Phase 1 was a phone survey to ascertain flow sheet usage among the primary care physicians of Delaware. Phase 2 involved chart abstraction of process and outcomes measures of appropriate diabetes care from physician offices, selected partially on the basis of Phase 1 responses.

These two intertwined studies were designed to build upon research by Dr. Jim Gill of Christiana Care Health Services and of the MSD. In an earlier research effort shortly after UPG dissemination, Dr. Gill undertook a mail survey assessing physicians' awareness and use of the Medical Society's UPG. The 65 completed surveys indicated that 57% of respondents were using either the MSD UPG or another diabetes guideline. Our Phase 1 survey had certain similarities; however, we only targeted primary care physicians (as opposed to the endocrinologists, pediatricians and others included in the Gill survey). In addition, the QID survey was conducted on the phone rather than by mail and targeted the office manager rather than the physician him- or herself. Our expectation was that we could have a high response rate with a relatively low resource outlay, but might have to sacrifice some accuracy using a proxy respondent. The high response rate was important to plan for Phase 2.

A second project undertaken by Dr. Gill[1] bore similarities to our Phase 2 in that it involved chart abstraction. The study sought to compare process and outcome indicators of diabetes care pre- and post-UPG dissemination, as well as to correlate care indicators with flow sheet use. The results indicated that there was little change in diabetes care after the UPG was disseminated, but that there was some evidence that flow sheets were associated with improved quality of care. While there are certain similarities in the methodology, as well as in the data points collected, this study had a larger sample with more flow sheet users. Thus, we were able to make more robust correlations among the data. This study did not involve a pre/post study design.

METHODS

Phase 1: Phone Survey

We selected physicians with the specialties of internal medicine and family practice from an internally maintained Access database of physicians in Delaware. Two hundred seventy-nine (279) practices (both group and solo) were identified, for a total of 492 doctors. This number included the 21 intervention practices (79 doctors) that volunteered to participate in the diabetes quality improvement task of the QIO contract. Practices were assigned random numbers and sequentially assigned to each of three nurses available for survey administration. The nurses were trained to administer a very brief phone survey to the practice or office manager. The questions on the survey were as follows:

[1] Gill, James M; DiPrinzio, Marie J. The Medical Society of Delaware's Uniform Clinical Guidelines for Diabetes: Did They Have a Positive Impact on Quality of Diabetes Care. *Del Med Jrl*, March 2004, Vol 76 No 3.

(1) Do the physicians in your practice use a paper chart or a computerized one?
(2) Do the charts/electronic paper records of diabetic patients include a flow sheet, template, or checklist for their care?
(3) What are the names of the physicians in your practice who currently use a flow sheet, template, or checklist for their diabetic patients? And which physicians don't use one?

Responses were noted on a spreadsheet and data-entered into Excel for import into SAS.

Phase 2: Chart Abstraction

As a control group for the 21 intervention practices, QID's medical director recruited 27 primary care physicians (falling just shy of the goal of 30) to participate in the chart abstraction phase of the project. The 27 physicians were an approximately half and half mix of flow sheet users and non-users, as identified by the Phase 1 phone survey results. While the QIO quality improvement intervention was offered to all members of a practice, by necessity the control group was recruited on the level of the individual physician.

Each of the 48 participating offices was required to send a list of all of their adult diabetic patients, so that 40 might be randomly selected for chart abstraction. Three nurses used an identical data collection tool to collect data from the first 30 useable charts off the random list, for both the intervention and control groups. A HIPAA waiver of authorization was obtained from the Privacy Board of DHSS so that the control group charts could be abstracted. Patients were excluded if upon examination of their chart they did not have a diabetes diagnosis, they were new to the practice, newly diagnosed with diabetes, an endocrinologist was primarily responsible for the patient's diabetes care, and/or there were no recent visits recorded.

The nurse-abstractors collected data regarding demographics, medication usage, laboratory work, foot and eye exams, whether a flow sheet was being used in the chart and when the flow sheet was last updated. A "reporting year" (or for some measures, two years) was created for each patient consisting of the year (or two) prior to the last notation in the chart, be it an office visit or documentation of a lab result or other exam. The abstractors and clerical staff entered the data into Access, for import into SAS for analysis. Logistic regressions producing odds ratios (OR) with 95% confidence intervals were computed to determine statistical significance, controlling for the effect of the physician office.

RESULTS

Phone survey results

We received 336 valid responses to the phone survey, for a response rate of 91.6% using the CASRO (Council of American Survey Research Organizations) calculation. Approximately one-third of the physicians contacted were found to be specialists, hospitalists, or retired, among other reasons for ineligibility for the survey.

Office managers reported that 37.8% of the physicians used a flow sheet for diabetes care. Female physicians were reported to be significantly more likely to use flow sheets than males (53.1% vs.

32.1%, p<0.001). Family practice physicians were reported to be slightly more likely to use them than were internal medicine specialists (41.9% vs. 32.6%, n.s.).

Chart abstraction results

Charts were abstracted at 48 physician offices, for a total of 1,390 charts. The number of charts per office ranged from 20 to 30, with 83% of the offices attaining the goal of 30 charts. Smaller practices with fewer than 30 diabetics generally accounted for the shortfall.

Table 1
Number and distribution of abstracted charts

	Overall	Group 1 (intervention)	Group 2 (control)
N	1,390	630	760
# doctors	118	79	39
# offices	48	21	27
% offices in New Castle County	60.4%	61.9%	59.3%

The intervention group included a significantly lower ratio of charts to doctors: 8.0 charts per doctor as compared to 19.5 per doctor for the control group. This was attributable to the difference in recruitment methods whereby the intervention group was recruited at the practice level and the control group was recruited at the physician level. There were approximately equal proportions of offices located in New Castle County in each group, generally reflecting the distribution of the population in Delaware.

Table 2
Demographics of the patients (n=1,390) whose charts were abstracted

	Overall	Group 1 (intervention)	Group 2 (control)	Statistically significant difference
Average age (years)	67.1	73.3	62.0	Yes
% male	47.0%	41.3%	51.8%	Yes
% white	79.1%	74.3%	83.9%	Yes. Note: data missing for 37% of records.

Intervention group patients were significantly older and less likely to be male, as by definition (their double-duty in the QIO contract work as well as in this study) they were an entirely Medicare-insured population. By contrast, the control group was split between Medicare recipients and persons with

private and other forms of insurance. Intervention group patients also had a significantly larger non-white population, although race data were not available on 31% of the intervention group and 41% of the control group patients.

Flow sheet use in charts

Overall flow sheet use, 35.6%, was very similar to the 37.8% found in the phone survey although the level of analysis is different (charts vs. doctors). In comparing the results from the two data collection phases, we found that we had Phase 1 (phone survey) data for 77 of the 118 Phase 2 (chart abstraction) physicians. Missing data were due to inaccuracies in the sampling frame, with numerous doctors entering or leaving practices since our physician database was last updated. The results of the comparison were as follows: 75% of the doctors identified by their office manager as flow sheet users did in fact use a flow sheet in at least one chart. For the 25% typified as non-users by their office managers, 51% did not use a flow sheet in a single chart while 22% had a flow sheet in every chart.

Unfortunately the *type* of flow sheet was not captured in the data collection tool. Anecdotal reports from the nurse abstractors suggest that, while some of the flow sheets found in charts were provided by the Medical Society of Delaware, most were from the American Diabetes Association, the Delaware Diabetes Coalition, or a checklist designed by the office itself.

Table 3
Percent of doctors (n=118) using flow sheets (f/s)

	All charts contain f/s	Some charts contain f/s	No charts contain f/s
F/s ever used	22.9%	39.0%	38.1%
F/s used in last 24 months	16.1%	28.8%	55.1%
F/s used in last 12 months	15.3%	22.9%	61.9%

Although we had envisioned a dichotomy between flow sheet use and non-use for any given doctor in the phone survey, the reality was slightly more complicated and gave credence to the decision to analyze the data at the individual chart level. Regardless of whether flow sheet use was defined in an open-ended or time-limited way, **there was a distinct group of physicians, ranging from 22.9% to 39.0% of the total, who used flow sheets on some but not all of their charts**.

Table 4
Comparison of the intervention and control groups in their flow sheet (f/s) use (n=1,390 charts)

	Overall	Group 1 (intervention)	Group 2 (control)	Statistically significant difference
% ever use f/s	35.6%	42.5%	30.1%	Yes
% use f/s in last 24 months	26.5%	29.5%	24.0%	n.s.
% use f/s in last 12 months	22.2%	21.9%	22.5%	n.s.
Avg. # months to most recent f/s use	11.0	14.6	6.2	Yes

Overall, flow sheets were found in 35.6% of the charts abstracted. Intervention group charts were significantly more likely to contain a flow sheet than were control group charts. **However, they were significantly less likely to have been used recently, with an average of 14.6 months to last use as compared to 6.2 months to last use for the control group charts**. Because all of the process measures on the chart abstraction tool fall within a 2 year time period, it is appropriate to look at flow sheet use in the past 12-24 months; in these timeframes, the rates of use were considerably lower than the "ever use" figure, but more similar between the groups. Examining *only* those charts containing a flow sheet, 71.8% of the flow sheets in intervention group charts were used in the last 24 months, while 93.3% of the flow sheets in control group charts were used in the last 24 months.

Diabetes measures

Receiving the intervention and using a flow sheet had a marked effect on several of the diabetes care indicators, as is evident from Tables 5-7. In addition to frequencies, odds ratios (OR) for the impact of group membership regardless of flow sheet use, and the impact of flow sheet use regardless of group membership, in both cases controlling for physician office, are given along with their 95% confidence intervals. The odds ratio compares the odds of an event occurring to the odds of the event not occurring.

Of the three medication usage measures, shown in Table 5 below, only the aspirin measure shows a significant difference between groups, with patients whose doctors are in the intervention group being 1.6 times or 60% more likely to take aspirin. Flow sheet patients were slightly more likely to receive appropriate hypertension treatment and slightly less likely to use routine insulin.

Table 5
Comparison of medication use in flow sheet (f/s) and intervention/control groups; "OR" means "Odds Ratio," 95% confidence interval in parentheses

	Group 1 (intervention)		Group 2 (control)		Significance Testing	
Measure	**F/s***	**No f/s***	**F/s***	**No f/s***	**OR Group 1 vs. Group 2 (95% CI)**	**OR f/s vs. no f/s (95% CI)**
N	186	444	182	578		
% currently taking aspirin	55.9	52.7	40.9	40.9	1.6 (1.1, 2.4)	n.s.
% with history of hypertension, taking ACE or ARB	55.9	52.5	53.3	48.6	n.s.	n.s.
% with routine insulin use	18.5	25.1	19.9	22.1	n.s.	n.s.

*used in last 24 months

Table 6
Comparison of process measures in flow sheet (f/s) and intervention/control groups

	Group 1 (intervention)		Group 2 (control)		Significance Testing	
Measure	**F/s***	**No f/s***	**F/s***	**No f/s***	**OR Group 1 vs. Group 2 (95% CI)**	**OR f/s vs. no f/s (95% CI)**
N	186	444	182	578		
% with blood pressure taken in last 1 yr	100.0	98.7	100.0	99.1	n.s.	n.s.
% with HbA1c test in last 6 months	79.6	72.8	80.8	72.7	n.s.	n.s.
% with HbA1c test in last 1 year	94.6	87.4	92.9	85.6	n.s.	2.8 (1.5, 5.2)
% with lipid profile in last 2 years	95.7	91.7	94.5	90.3	n.s.	1.9 (1.2, 3.0)
% with test for microalbuminuria in last 2 years	59.1	40.7	56.0	47.8	n.s.	1.5 (1.1, 2.2)
% with test for proteinuria in last 2 years	44.3	49.6	55.0	49.9	n.s.	n.s.
% with foot exam in last 1 year	74.7	52.9	64.3	38.2	n.s.	1.9 (1.5, 3.6)
% with eye exam in last 1 year	31.7	26.6	35.2	27.2	n.s.	1.4 (1.03, 1.9)
% with eye exam in last 2 years	42.5	36.3	46.2	35.8	n.s.	1.6 (1.1, 2.1)

*used in last 24 months

For the process measures, as shown in Table 6, above, rates were high, at or approaching 100%, regardless of group membership or flow sheet use, for blood pressure measurement, HbA1c in the last year, and lipid profile in the last 2 years. Other tests were somewhat less likely to have been performed in the appropriate time frame, such as urinalysis and eye exams.

There were several striking findings of a significantly increased rate of appropriate lab/exam use by the patients with more recently updated flow sheets in their charts, as shown in Table 6, and Graphs 1 and 2. **Patients with flow sheets used in the last 24 months in their charts were approximately one-and-a-half to 3 times more likely to have key tests done, including HbA1c, lipid profile, microalbuminuria, foot exam, and eye exam than were patients either without flow sheets or where the flow sheet was not updated within the last 24 months**. HbA1c test in the last year was the most highly correlated with flow sheet use of the measures, with patients with more recently updated flow sheets 2.8 times more likely to have received a test in the past year. Having a doctor in the intervention group, however, had a limited correlation in quality of diabetes care. Proteinuria testing was the only lab/exam not correlated with group membership or flow sheet use, aside from blood pressure measurement with its almost 100% compliance across the board.

Table 7
Comparison of outcome measures (for those in whom test was performed) in flow sheet (f/s) and intervention/control groups

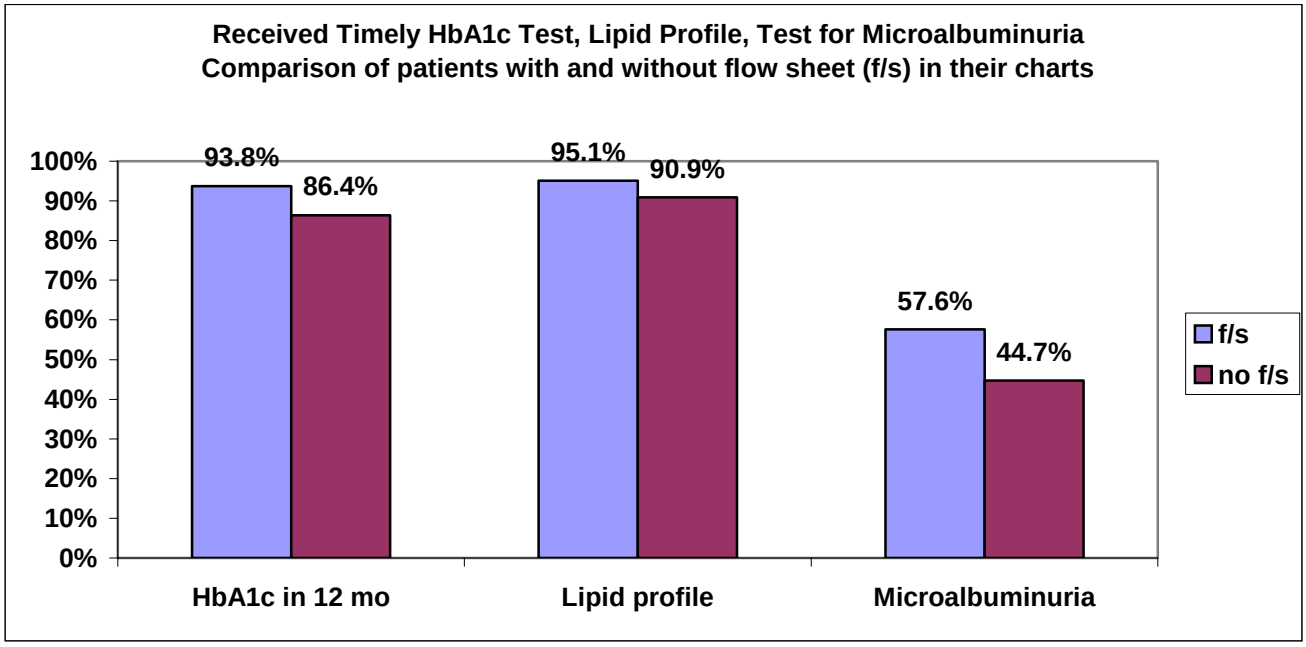
	Group 1 (intervention)		Group 2 (control)		Significance Testing	
Measure	**F/s***	**No f/s***	**F/s***	**No f/s***	**OR Group 1 vs. Group 2 (95% CI)**	**OR f/s vs. no f/s (95% CI)**
N	186	444	182	578		
% with blood pressure > 130/80 (hypertension)	16.7	13.7	13.7	16.6	n.s.	n.s.
% with most recent HbA1c > 7.0 (suboptimal control)	34.4	34.2	37.4	36.7	n.s.	n.s.
% with positive microalbuminuria	48.6	55.3	32.7	43.7	1.7 (1.2, 2.4)	0.7 (0.5, 0.96)
% with positive proteinuria	17.1	28.0	30.0	20.6	n.s.	n.s.

*used in last 24 months

HbA1c levels considered to be above the optimal range were reported in approximately a third of the patients whose charts were examined. Fewer patients of intervention group doctors had elevated HbA1c and proteinuria results. However, they had slightly higher blood pressure and were significantly more likely to have a positive result on the microalbuminuria test (if tested). Patients with recently updated flow sheets in their charts were 30% less likely to have a positive microalbuminuria test than were patients without recently updated flow sheets.

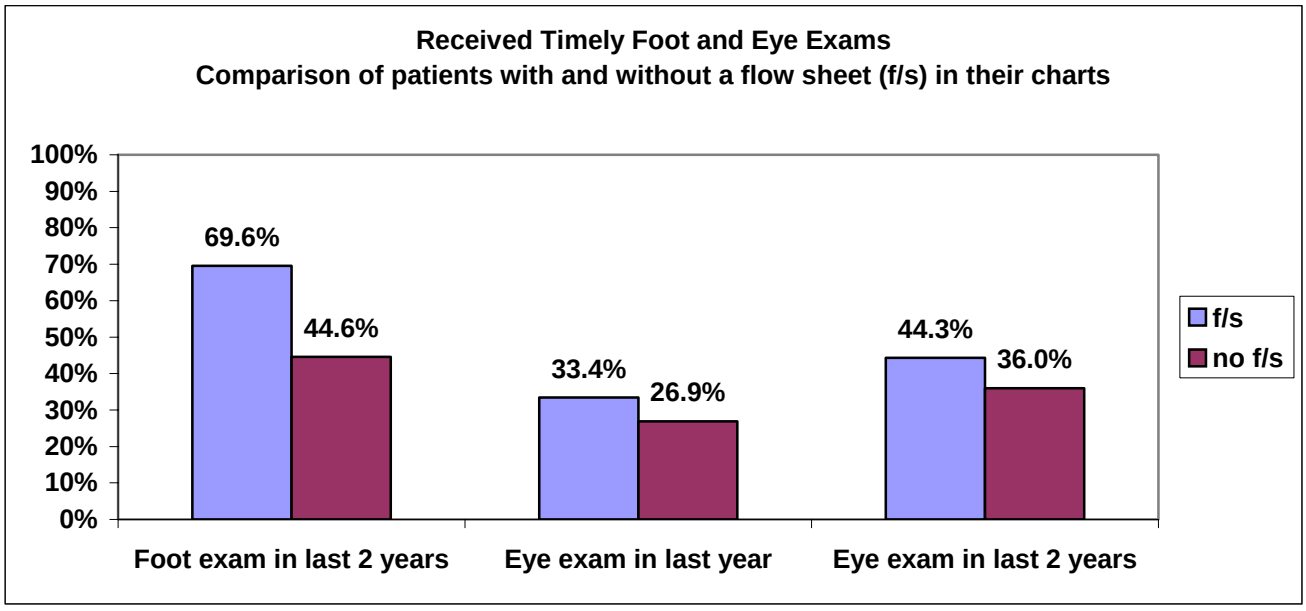
The following figures graphically display the impact of flow sheet use. All of the examples shown are statistically significant, with *p* values shown.

Figure 1



Statistical significance: HbA1c: p=0.0008; Lipid profile: p=0.009; Microalbuminuria: p=0.013

Figure 2



Statistical significance: Foot exam: p<0.0001; Eye 1 year: p=0.03; Eye 2 year: p=0.005

DISCUSSION

The results of the foregoing study indicate that a flow sheet can be a valuable tool in diabetes care quality improvement. **Patients with recently updated flow sheets in their charts were significantly more likely to have received important tests in a timely manner, as is compatible with diabetes clinical practice guidelines**. It cannot be ascertained from this study whether having a flow sheet in the chart was responsible for reminding the doctor to order certain tests, or merely that a certain level of organization prevailed in the office in general. It does suggest, however, that there may be a valuable role for flow sheets in the charts of **all** diabetic patients, both for the purpose of documenting past lab values and exam results, and reminding the doctor to order and/or perform upcoming labs and exams.

Given the correlation between flow sheet use and good diabetes care, it would likely be worthwhile to improve dissemination of the UPG and provide increased educational opportunities geared to increasing UPG use. Such efforts need to be ongoing to avoid the gradual tapering of use, as is seen in the fact that flow sheet use dropped from 35.6% of charts for "ever use" to 26.5% in the last 24 months, down to 22.2% in the last 12 months.

Another goal of flow sheet promotion is to ensure UPG use in the charts of ***all*** diabetic patients. It was a noteworthy finding that a subgroup of physicians uses flow sheets only in some diabetic charts. It raises the question as to whether they or their office staff apply unstated criteria to including a flow sheet in a given chart. This is an issue that may warrant further study.

Our expectations of the study, as depicted in the matrix at the top of page 2, were partially met. Flow sheet use had the effect on care quality that we had hoped; it was generally correlated with very good diabetes patient care. Disappointingly, however, the intervention played a limited role in super-adding quality to the flow sheet patients' care. None of the timeliness measures of appropriate lab work and exams were significantly correlated with intervention group membership, such that intervention group flow sheet users generally resembled all flow sheet users and intervention group non-users resembled all non-users.

Nevertheless, the intervention did serve the function of getting flow sheets into more charts, looking at the "ever use" measure, Table 3, page 6, which translated into better care. Perhaps this is an indication that a pared-down version of the intervention, focusing more tightly on flow sheet use, would be more effective in improving diabetes care quality.

Recommendations

1. Provide a flow sheet-focused version of the existing intervention to ALL primary care physicians in Delaware, emphasizing the importance of using a flow sheet in every diabetic chart. This may require a new approach to promoting UPG and flow sheet use, enlisting the appropriate professional medical associations, payers, and consumers in an ongoing promotional effort.[2]

[2] Case studies of community coalitions are now being reported; see *Addressing Chronic Conditions Through Community Coalitions: A Formative Evaluation of Taking on Diabetes,* just released by The Commonwealth Fund, http://www.cmwf.org/publications/publications_show.htm?doc_id=239779

2. Repeat UPG/flow sheet use promotion on an ongoing basis to minimize the tapering of its use.

3. Periodically re-evaluate the utilization patterns and impact of flow sheet use on diabetes care measures, based on such promotional efforts.

Limitations of the study

1. Did not systematically capture the type of flow sheet used, although all of them generally captured same or similar data.

2. The intervention and control group populations were rather dissimilar in their demographics; may have introduced biasing variables.

3. Did not perform an inter-rater reliability check for chart abstraction, although abstractors have strong inter-rater reliability for ongoing QIO chart abstraction.

4. The database of primary care physicians needs to be updated; may not have contacted full universe of such physicians in Delaware.