HIMSS Davies Ambulatory Award Application

- **COVER PAGE --**

Applicant Organization: White River Family Practice (WRFP)
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Menu Item: **Clinical Dashboards and Analytics: Clinical Informatics/Business Informatics**
Specific NPSG and/or NPP goals addressed:

NPP:
- Improve health of the population.
- Remove waste and achieve effective, affordable care.

Executive Summary:

"When you change the way you look at things, the things you look at change."

White River Family Practice (WRFP), an ambulatory independent primary care practice in northern New England, installed an integrated electronic health record (EHR) in 2010. The practice implemented Clinical Decision Support and Practice Alerts to provide real-time dashboard displays of patients' health status. Graphing selected elements of the EHR's registry output over time produced practice-wide dashboards which have supported both clinical and practice management improvement projects. This case study details the steps taken to generate our dashboard leading to a number of significant improvements in patient care and practice management.

1. Background Knowledge and Local Problem with Intended Improvement

White River Family Practice (WRFP) provides primary care to approximately 10,000 residents of the surrounding communities in Vermont and adjacent New Hampshire. The practice is staffed with 6 family physicians, three mid-level practitioners, and a support staff of fourteen. Approximately 57% of our patients are insured by one of three major commercial carriers; Medicare covers about 17% of our patients while about 13% are on Medicaid. WRFP is a teaching site for students of the Geisel School of Medicine at Dartmouth and all six family physicians are faculty members there. The practice was founded in the late 1970's and as a "mature" family practice our patient population includes many older patients with multiple chronic health problems. Our mission is to "provide high quality, state-of-the-art primary medical care to our community of patients with compassion, professionalism, and excellent communication."

Prior to 2010, WRFP maintained patients' medical records on paper in conventional folders. Dividers segregated progress notes, laboratory, imaging, and other subsections. Each patient's chart was fronted with two sheets of heavy-bond paper containing dedicated boxes in which critical information (e.g., immunizations, allergies, medications, etc.) was manually entered. These introductory pages formed the "dashboard" of critical patient care information and should have received meticulous attention to data entry during patient encounters. Despite our best intentions however, these records proved inadequate: an audit of our patients disclosed that many patients were behind on routine immunizations – an item of healthcare which should have been apparent to us on first opening any patient's medical record.

Providers frequently were frustrated by an inability to access current imaging or laboratory information despite our staff's diligence in filing. Serial laboratory analyses or vital signs could not be presented to patients in graphical form and any "message" contained in an evolving trend was lost for want of a means to present the information during patient encounters.

In addition, WRFP had no systematic means to assess how entire populations of our patients were being managed with respect to national guideline-recommended care, either in health maintenance or management of chronic disease. The practice was unable to discern the impact of any initiative undertaken to improve care delivery without an audit of a sample of patient records.

WRFP committed to address these issues by implementing an integrated EHR. We expected the EHR would provide continuously updated and immediately available dashboards of clinical information when encountering any patient. Using registry output from the EHR, the practice would develop dashboards of care provided to entire populations of similar patients both in health maintenance and chronic disease management, and use these displays to monitor the effectiveness of any improvement project.

3. Design and Implementation

As WRFP considered the transition to an EHR, the practice qualified for a grant ($140,000) from the Vermont Information Technology Leaders (VITL). WRFP providers and staff identified essential and priority capabilities of any potential EHR, and the practice hosted product demonstrations from finalist vendors. Among factors influencing the selection process were ease

of data entry and the "look and feel" of the EHR display of patients' clinical information in the provision of clinical care. The selection committee also emphasized the need for a robust registry capability to support analysis and display of population health measures.

Preparing for implementation, we worked closely with our chosen vendor to map specific laboratory fields from our reference lab to the appropriate fields in the EHR. This challenging effort was considered a priority to ensure that patients' historic lab results would migrate correctly into their electronic records.

WRFP surveyed national and regional guidelines of recommended care for both health maintenance and management of chronic diseases prevalent among our patient population (e.g., diabetes, asthma, hypertension, etc.). From those sources, WRFP providers specified EHR practice alerts to display patients' care status with respect to adopted guidelines. In addition, the practice enabled the EHR's Clinical Decision Support System (CDSS) to create a dashboard display of critical patient care metrics, and linked relevant order sets within the program to facilitate taking action on any evident alert during a patient encounter. WRFP contracted for the services of two trainers from the vendor to be on site during the first two weeks of clinical use and several physician "super-users" developed training aids to assist clinicians in responding to displays of patient information in the course of clinical care.

4. How was Health IT Utilized?

Figure 1 below is an example of the dashboard display of patient care information available to the clinician during a patient encounter. The patient's problem list, medications, allergies, and immunizations (right chart panel) all update as care is provided during the encounter.

Fig. 1: Dashboard for a test patient's information visible in the "Progress Note" view.

Figure 2 below is an example of the dashboard of CDSS and Patient alerts immediately apparent to the clinician during a patient encounter. CDSS alerts are associated with linked order sets to facilitate action during the patient encounter and update or "clear" when the care is provided.
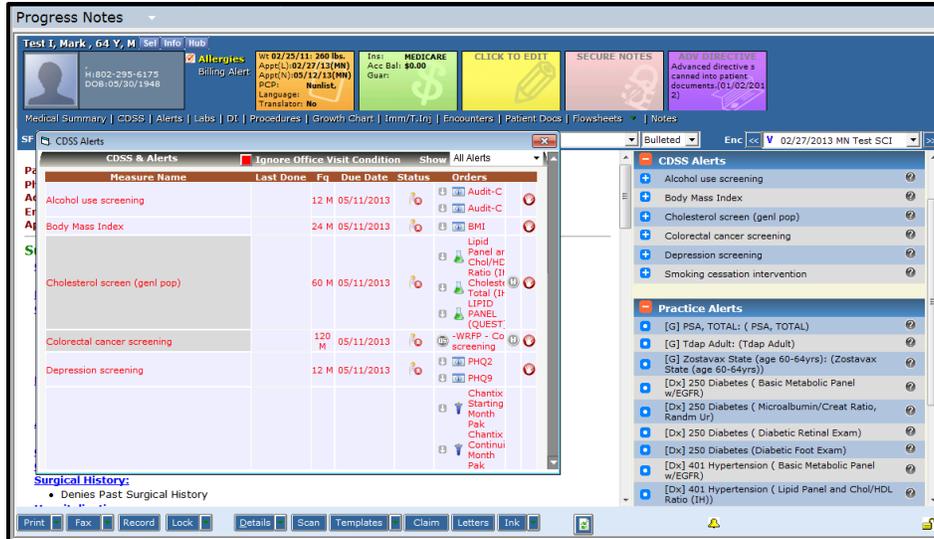
Fig. 2: A CDSS and Alert dashboard, populated by the EHR based on patient gender, age, diagnoses, prior care, and practice-configured alerts. Red Alerts turn green when satisfied.

5. Value Derived/Outcomes

With EHR implementation, the CDSS display was defined to be the dashboard of a patient's medical care. All clinicians' tablet-workstations were configured such that a patient's CDSS and practice alerts display is immediately visible during the encounter. Providing patient care in response to the alerts updates the patient's CDSS dashboard through linked order sets.

Within a patient encounter, the EHR enables graphical display of critical analyses. Presenting laboratory results trended over time (as in figure 3 below) during patient visits facilitates a discussion of chronic disease management.
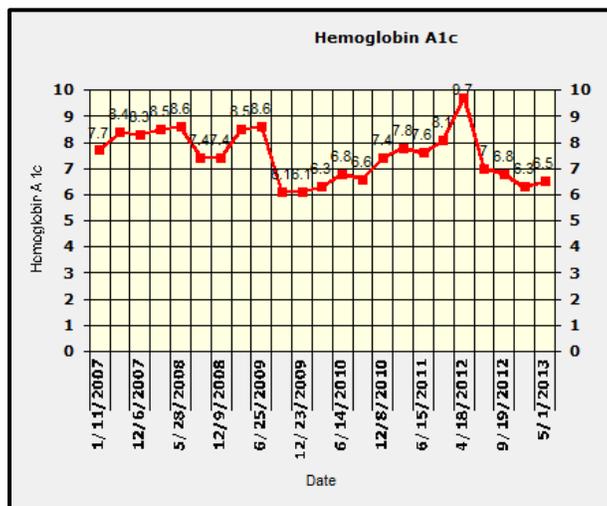

Fig. 3: Graph of serial glycosylated hemoglobin (HgbA1c) determinations to aid in provider-patient discussions of diabetes management during patient encounter.

To develop the dashboard of practice-wide care, the EHR registry was queried each week (month) for measures of interest. Figure 4 below shows the result of a sample registry query regarding antithrombotic use among patients with vascular disease or diabetes.

Fig. 4: Sample registry output. Of 194 patients seen in April, 2013, who had ischemic vascular disease or diabetes, 178 were taking an antithrombotic medication.

Registry output for each measure of interest was entered each week (month) in a developing Microsoft Excel spreadsheet database, a small example of which is copied in Figure 5 below.

WRFP	Antithrombic treatment (Vascular Disease or Diabetes)			Colorectal Cancer Screening			Breast Cancer Screening			Cervical Cancer Screening		
Date (ending)	N	D	%	N	D	%	N	D	%	N	D	%
baseline	313	426	73.5%	975	2555	38.2%	1090	2111	51.6%	290	2494	11.6%
1/6/13	39	43	90.7%	119	158	75.3%	90	126	71.4%	76	122	62.3%
1/13/13	60	64	93.8%	156	229	68.1%	127	186	68.3%	103	181	56.9%
1/20/13	43	51	84.3%	150	211	71.1%	105	159	66.0%	79	149	53.0%

Fig. 5: Sample portion of spreadsheet containing data for patients receiving the indicated care ("N") from among all relevant patients seen that week ("D").

WRFP enters this data into control charts to graphically display changes in the practice's performance regarding any particular measure of interest. These graphs and others form a portion of the dashboard of WRFP's performance regarding population care.

The practice uses a program in statistical process control (SPCXL, Sigmazone) to graph performance for our dashboard displays. (1) The program electronically generates our average performance (green line) with regard to the measure of interest and the upper and lower bounds of statistically significant difference in our performance (red lines). Each data point on each

1. Carey RG. Improving Healthcare With Control Charts: Basic and Advanced SPC Methods and Case Studies. Milwaukee, Wis:: ASQ Quality Press; 2003.

graph represents the per cent of eligible patients seen that week (or month, as appropriate) who received the indicated care element. The software also draws attention to any data point which varies significantly from the underlying trend ("special cause variation") by identifying that point in red font. Noting the date of any innovation undertaken to improve performance allows the developing control chart to identify whether that intervention has led to sustained improvement (or not) and informs ongoing PDSA efforts at the practice level.

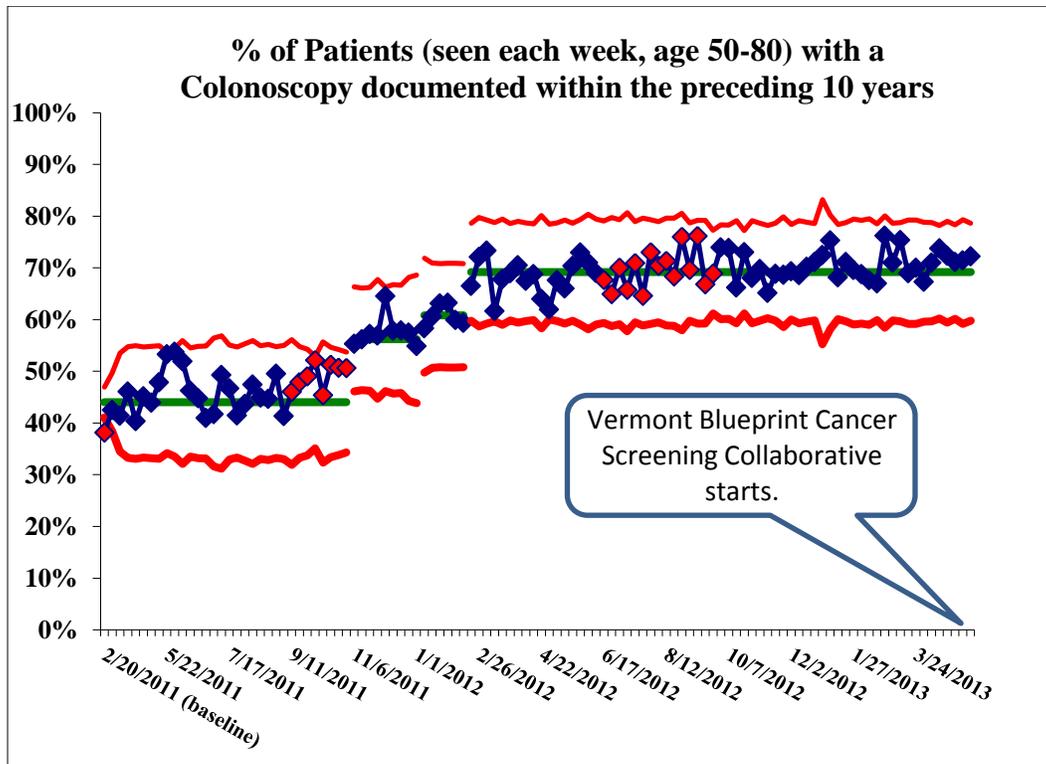 Sample dashboard displays of cancer screening among WRFP patient populations follow.

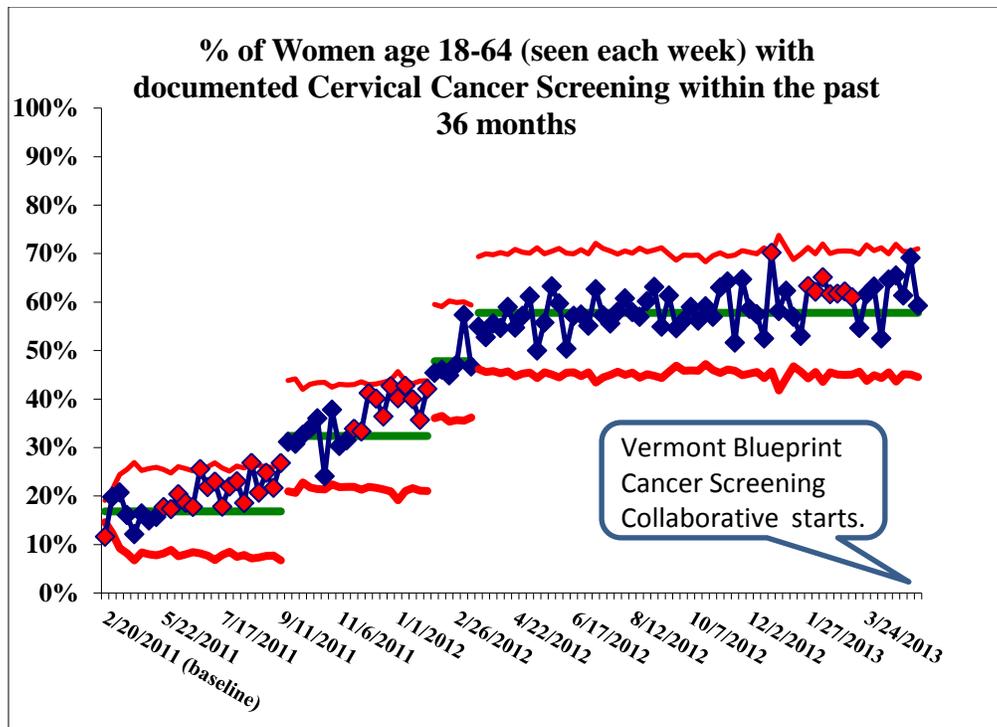Fig. 5: Colorectal cancer screening among WRFP patients seen each week.

Fig. 6: Cervical cancer screening among WRFP patients seen each week

6. Lessons Learned

- One significant challenge for a medical practice is to become a clinical microsystem, defined as "a small group of people who work together on a regular basis to provide care to discrete subpopulations of patients" and having "clinical and business aims, linked processes, a shared information environment, and [producing] performance outcomes." (2) Developing a shared responsibility among the entire office team for updating patients' medical care as displayed on individual patient records requires team-building and empowering staff through standing orders, office protocols, and periodic reinforcement.

- Developing a sense of practice-wide responsibility for the management of the healthcare of populations of patients – without adversely affecting quality one-on-one care - was a paradigm shift for our practice. Becoming aware of the proportion of patients who had not received guideline-recommended care (frequently for want of patients' presentation to the office or our recognition of need) facilitated WRFP's transformation to include population management.

- Responding to gaps or sub-optimal results evident on the dashboard requires prioritization of goals within the practice; every sub-optimal performance cannot be improved at once.

2. Nelson E.C. BPB, Godfrey M.M. Quality By Design: A Microsystems Approach. San Francisco: Jossey-Bass; 2007.

- Direct feedback to individuals is occasionally required if their performance is negatively impacting that of the practice as a whole. In that case, group discussion of graphs of individual provider performance as compared to our peers has motivated change.

- Most importantly, displaying measures of the particulars of important aspects of healthcare among patient populations is essential to becoming aware of gaps in performance, and that awareness is essential to formulating any intervention to improve. "When you change the way you look at things, the things you look at change."

7. Financial Considerations

Beyond the funding of our EHR itself (detailed in our Return on Investment case study), only a few hundred dollars were required to purchase SPC software. Significant physician time was required to learn statistical process control techniques as well as to train others in the office in software use and interpretation of results. In addition, maintenance of the growing database and office dashboards has required a few hours of physician time per week. In return, the practice more easily certified as a Patient Centered Medical Home, contributing to significant pay-for-performance funding from the Vermont Blueprint.