Einstein Montefiore | Center for Continuing Medical Education

Educational Grant Application

Designing an Electronic Medical Recorded-based Clinical Decision Support Tool To Improve CVD Screening in Rheumatoid Arthritis Patients

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Table of Contents

C1. OVERALL GOALS

The overall goals of the proposed multidisciplinary project are to develop, implement, test, and disseminate a collaborative, physician-driven Electronic Medical Record (EMR)-based clinical decision support tool to aid in the management of cardiovascular disease (CVD) risks in rheumatoid arthritis (RA) patients.

KEY OBJECTIVES

1. To use the Montefiore Medical Center (MMC) electronic medical record (EMR) system to develop an integrated clinical decision support tool to: (1) notify primary care and specialty providers if CVD risk assessment has not been performed for a patient with RA; (2) document patient's CVD risks/risk scores; (3) alert providers when a patient is at increased CVD risk, to promote collaboration and expedite RA patient care; and (4) support initiation of appropriate CVD risk reduction, lifestyle interventions and/or patient education.

2. To evaluate the impact of the EMR-based tool described in Key Objective 1 on CVD screening and management of patients with RA.

3. To present data gathered from fulfillment of Key Objectives 1 and 2, demonstrating the benefits of EMR based-treatment in reducing CVD risk in RA patients, to other health care providers and health systems in New York state and nationwide via presentations at national meetings, manuscript publication, web presentations and a CME activity.

C2. TECHNICAL APPROACH

C2a. Current Assessment of need in target area

Despite tremendous advances in the treatment of RA in recent years, RA is associated with significantly higher mortality rates compared with the general population. CVD is the leading cause of death among individuals with RA (as stated in the Request for Proposal [RFP]). The risk of CV events in individuals with RA is comparable to that of patients with type 2 diabetes mellitus (T2DM), and similar to the risks of CV events in individuals without RA who are up to 10 years older [1 and RFP]. In 2010, the European League Against Rheumatism (EULAR) published evidence based recommendations for CVD risk management in RA [1]. The EULAR guidelines recommended annual CV risk assessment for all RA patients in accordance with national guidelines. However, CVD risks are not being assessed frequently and systematically in RA patients [RFP].

CVD is the leading cause of death in New York State (NYS) and nationwide, and accounts for almost 40% of all deaths in the US annually. Age-adjusted CVD mortality rates are even higher in NYS than in the US. In 2008, a greater number of women died from CVD than men, partly because of the larger number of women in older age groups. Black adults have higher premature mortality rates (death between ages 35 and 74) than white adults for all reported categories of CVD in NYS.
(http://www.health.ny.gov/diseases/cardiovascular/heart_disease/docs/cvd_mortality.pdf, http://www.health.ny.gov/statistics/chac/mortality/corhd.htm).

In Bronx, New York, where Montefiore Medical Center (MMC) is located, CVD-related mortality rates are among the highest in NYS. MMC is a large urban tertiary care center in the Bronx that provides care to a largely minority patient population. Furthermore, since RA affects mostly women, RA patients followed at MMC are mostly women, and are predominantly Hispanic and African-American. This makes MMC an ideal setting in which to create a system to improve CV risk evaluation in RA patients.

We identified all patients with ICD9 diagnoses of RA (714.0, 714.2) followed between August 2011 and August 2012 at MMC and the University Hospital for the Albert Einstein College of Medicine, also located in the Bronx. Patients were identified from the Montefiore electronic record (EMR) system using Clinical Looking Glass (CLG), a software application developed at MMC, which allows clinicians and researchers to identify populations of interest, laboratory data, medications, and demographics from the MMC database [2]. We identified 1218 patients who were seen by over 365 providers (both specialists and general practitioners), with a total of 5704 outpatient visits between 8/8/11 and 8/8/12. The mean age (SD) was 58(15) years, 86% were women, 41% were African-American, and 53% Hispanic. Eighty five percent had a documented body mass index (BMI) (61% with BMI$\geq$ 30 kg/m^2) within the previous year, 23% were screened for type II diabetes (T2DM) (26% had abnormal blood glucose), 65% screened for hypertension (55% had elevated blood pressure), and < 30% were screened for lipids (over 55% had abnormal lipid profiles).

Since the aggressive management of modifiable CVD risk factors is standard practice in the care of T2DM patients, we chose to obtain their records from CLG over the same time period and use these data as a control. Multiple practice-wide initiatives at MMC (non-EMR based) to improve CVD screening and prevention in T2DM (for example, check lists and individual physician reports) are already in place. We identified 34182 T2DM patients (ICD9 250.*, excluding ICD9 codes for type 1 diabetes) seen at Montefiore outpatient clinics. Mean age (SD) was 61(14) years, 60% were women, 46% were African-American, 45% Hispanic. Among these T2DM patients, 94% had a documented BMI (56% had BMI>30 kg/m2), 83% were screened for

HTN (25% had elevated blood pressure), and 65% were screened for lipids (42% had abnormal lipids). The comparisons of screening rates and percentage of patients with abnormal lipids, blood pressure and BMI are shown in Table 1.

These numbers demonstrate that significant improvements in EMR-based screening for modifiable risk factors can be made, and makes a clear case for the need to improve cardiovascular screening and prevention in RA.

Table 1. Frequency of screening and abnormal values of lipids, hypertension and BMI among RA and T2DM patients at MMC

	RA, n=1218		DM, n=34182	
	% screened	% abnormal	% screened	% abnormal
BMI	85	61	94	56
Blood pressure	65	55	83	25
Lipids	30	55	65	42

Based on our literature review, there are 2 important considerations related to barriers to care:

1. Collaborative approach between different disciplines is the most effective approach for taking care of complex patients with chronic conditions [3, 4]
2. Patient involvement and education are important in implementing successful interventions [4]

In the planning stages of this project we conducted interviews with a focus group at Montefiore consisting of 3 rheumatologists, 1 cardiologist, 2 primary care providers, 1 endocrinologist, and 1 diabetic nurse practitioner to identify potential barriers to providing CVD care and management in RA patients, and to determine if similar EMR interventions have been designed at Montefiore. While we identified barriers that were similar to those mentioned in the RFP, they differed among different providers and specialists. While rheumatologists were aware of the cardiovascular risks, they felt that the CVD risks should be assessed and managed by the primary care providers. The possible barriers they cited included lack of time, lack of familiarity with the guidelines for lipid screening, blood pressure and diabetes management, difficulty monitoring therapy not related to rheumatologic diseases and not being comfortable managing non-rheumatologic issues. As a result, the rheumatologists were reluctant to initiate screening, since they would not be able to manage these diagnoses. The non-rheumatologist practitioners mentioned lack of awareness of the fact that RA patients are at an increased CVD risk, and that

since RA patients are seen much more frequently by rheumatologists, the patients sometimes consider rheumatologists to be their primary care providers. All of the healthcare providers cited lack of time and readily available resources to provide patient counseling, and agreed that an EMR-based tool would provide a collaborative environment to screen and manage CVD risks more efficiently and effectively by various providers. All of the providers also agreed that this EMR based intervention could be used for other rheumatologic and non-rheumatologic diseases associated with increased CVD risk. All of the providers agreed that while variables like BMI, smoking and hypertension (HTN) are recorded during every visit, and sometimes twice a day if patients visit 2 different providers on the same day (as these variables are recorded during each visit), variables like lipid screening are not frequently performed, and overall risks are not assessed routinely.

Furthermore, based on the results of our focus group discussion, and based on our literature review, traditional models of physician education are based on the assumption that physicians can "self-diagnose" gaps in their knowledge and practice. However, if physicians are not aware of the importance of CVD screening in RA patients, they will not seek out educational opportunities [5].

As most MMC providers are using the EMR system for patient care, our plan is to modify the current EMR interfaces by creating and implementing an electronic prompt to inform physicians of increased risk of CVD in RA. This prompt will provide the option to easily obtain best practice information in screening and management of CVD risk in RA patients. We will monitor the results of this educational intervention by determining the number of RA patients who received appropriate CVD screening and management after implementing the EMR decision support tool, and compare these data to the number of RA patients who receive appropriate screening and management of CVD risks prior to implementation of the EMR- based support tool.

While Montefiore's EMR system is relatively new, a disease activity score form was developed for the EMR system to calculate DAS28 (a mathematical formula that included counting tender and swollen joints, as well as the log function of the erythrocyte sedimentations rate, and Patient Global Assessment measures), a common measure of disease activity in RA that is used to make clinical decisions, including treatment adjustments and changes. Prior to the implementation of the form in November 2011, physicians were not calculating these scores, and mostly going by their clinical impression to make therapeutic decisions. Since this form was implemented, 424 RA patients had a DAS28 calculated with 736 DAS28 scores recorded overall. Similarly, after the Meaningful Use Initiative was implemented and BMI, HTN, and

smoking history became available in the EMR, compliance with the meaningful use requirement increased to almost 100%.

Therefore, this proposed intervention will benefit physicians by providing them with an EMR based tool to aid in efficiently identifying and managing modifiable CVD risks in RA patients, and educating patients about their CVD risks. It will further benefit patients with rheumatoid arthritis by providing physicians with education (an internal CME activity available for selection in the EMR system if desired) about the increased risk of CVD in RA patients, and prompt them to seek further educational opportunities.

Primary target audience

Our primary target audience includes MMC physicians and medical care providers (NPs, PAs) in Rheumatology, Internal Medicine, Cardiology, and Family Practice who provide care to patients with RA. Both providers and RA patients at MMC will benefit directly from the project outcomes.

Our secondary target audience, healthcare providers at non-MMC institutions and medical practices, will benefit from the dissemination phase of this project. It is expected that providers seeing RA patients will benefit from the ability to modify their practices and increase their screening and management of CVD risk in RA patients.

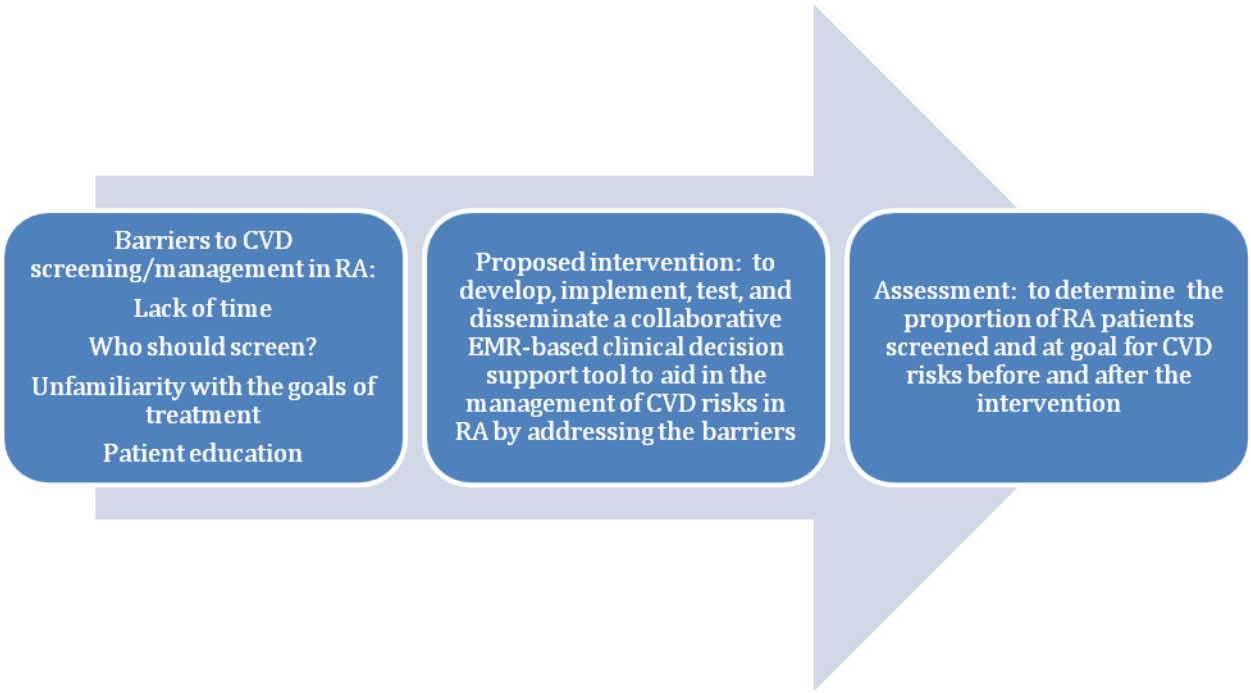
C2b. Intervention Design and Methods

Designing an EMR based intervention (illustrated in Figure 1) will address several barriers to screening for CVD in RA patients by providers at MMC:

1. Raise awareness: This intervention will make the providers aware that there is a lack of awareness of the increased risk for CVD in RA patients. The first screen will notify providers that RA patients are at an increased risk for CVD, and provide them with a reference to the current EULAR recommendations.
2. Time Management: The intervention will save providers' time by providing an efficient way to retrieve existing information, display all of the measures that are already available for the patient and list those components that still need to be measured. Risk scores will be calculated automatically.
3. Clarify roles and responsibilities: The EMR tool will allow all of the providers who take care of the patient to contribute as much or as little as the can/have time to do.

4. Patient education: Providers will be able to print information for the patients about specific risk factors from the EMR program.
5. Raise awareness of goals for lipids, blood pressure and blood glucose: All of the goals will be displayed on the form.

Figure 1. EMR-based decision support tool that will address barriers to CVD screening



Currently at MMC, there are several screening tools already in use within the EMR for cardiologists and for primary care providers. However, there are no data on how these forms improved screening. Furthermore, these forms include some information that is not relevant to RA, but can be easily adapted for assessing CVD risk in RA. For example, risk scores for RA need to be calculated differently, using a factor of 1.5 for RA patients with bad prognostic factors and/or long disease duration. That these tools exist shows that it is feasible to create a form for CVD screening in RA. By basing our program on these tools, we will be able to develop our screening tool in an expedient manner.

C2c. Evaluation Design

We will assess the effect of the EMR based prompt to evaluate CVD risk in RA patients by comparing baseline (pre-study) and post-study frequencies of outcome variables. The EMR based prompt (model shown in Figure 2) will be designed to:

- Prompt the physicians when CVD risk assessment in RA patients they are seeing has not been performed
- Alert them to use a form developed in the EMR system, to document a patient's CVD risks/risk scores
- Alert providers when a RA patient is at risk for CVD
- Provide an educational option detailing best-practices in screening and management of RA patients at risk for CVD
- Provide them with the ability to print and/or download educational information for their patient

The study will include all patients with ICD9 diagnoses of RA seen at Montefiore outpatient facilities. Other known co-morbid conditions, including known T2DM, HTN and CVD will be documented and adjusted for in the model. Data from patients with T2DM and without RA seen in Montefiore outpatient facilities over the same time period will be monitored as a control for the effectiveness of managing the same modifiable risk factors with EMR screening.

The following outcome variables will be recorded at the beginning and end of the study for each patient:

1. Documentation of CVD risk scores – Framingham risk score (FRS) calculated using total cholesterol/HDL, modified by a factor of 1.5 for RA patients with at least one of the following: RA duration of more than 10 years; RF or anti-CCP positivity; presence of extra-articular manifestations;
2. Documentation of BMI/BMI at goal (see below)
3. Documentation of HbA1c/HbA1c at goal
4. Documentation of blood pressure/Blood pressure at goal
5. Documentation of lipid profile (and the individual components: total cholesterol, low density lipoprotein (LDL), high density lipoprotein (HLD), and triglycerides (TG)/Lipid profile at goal
6. Documentation of smoking status
7. Number of patient information brochures printed about each of the following topics: Exercise/diet to maintain weight; blood pressure; blood glucose; management of

dyslipidemia for patients with appropriate diagnoses; and smoking cessation for smokers

Metrics used for needs assessment

Definitions for CVD endpoints are as follows (these definitions were based on the current guidelines and are similar to what was used in a recent article by Chung et al. [1, 8]):

HTN: systolic ≥ 140 mmHg, diastolic ≥ 90mmHg; Initiation or adjustment of antihypertensive medications; Controlled Blood Pressure (Based on current AHA criteria) [9]; 10 year FRS <10%, target BP is < 140/90; 10 year FRS ≥ 10%, target BP is < 130/80; Controlled LDL Cholesterol <=100 mg/dL for 10-year FRS <=20% or a CHD equivalent disease; <=130 mg/dL for those with 2 risk factors and 10-year FRS of 10 to 20%; and <=160 mg/dL for those with 0 to 1 risk factor and 10-year FRS <10% [10].

T2DM is defined as the presence of any of the following: fasting glucose >=126 mg/dL or HbA1c> 6.0; self-reported previous diagnosis of T2DM; current use of insulin; and/or current use of oral hypoglycemic agents. Controlled T2DM will be defined as normal fasting glucose (<=110 mg/dL) [11].

Smoking is defined as self-reported current smoking with a cumulative history of more than 100 cigarettes.

Elevated BMI is defined as follows: Overweight, ≥26 and <30 kg/m2; Obese ≥ 30 kg/m2 [12].

Data sources

Our data sources for this study are the Montefiore EMR database and CLG analysis software.

Data collection and analysis

We will explore the association between RA and 2 main sets of outcomes: (1) the number (percentage) of RA patients with documented modifiable traditional CVD risk factors as defined above (within each category) and the number (percentage) of RA patients with all of the traditional CVD risk factors documented; (2) the number (percentage) of RA patients who achieved CVD risk management goals. The analysis for pre- and post- evaluation will be very similar (but more in depth) to the data analysis for the preliminary data described above.

Statistical analysis will be performed using the STATA 11.0 software package (StataCorp, College Station, Texas, USA). The student's t-test (or its non-parametric alternative, Wilcoxon rank sum

test) will be used to evaluate the differences between distributions of continuous variables, and chi-square (or Fisher's exact test when appropriate) to evaluate the association between categorical variables. Logistic regression models will be used to calculate odds ratios for each outcome variable, adjusted for demographic and socio-economic variables. All statistical tests will be calculated assuming a 5% 2-sided significance level. The Framingham CVD risk score will be modified by a factor of 1.5 for RA patients with a certain risk factor profile. Patients with moderate to severe Framingham scores may benefit from aspirin use for CVD prevention [13].

We will also compare rates of CVD screening and management before and after the implementation of the EMR decision support tool (Figure 2), adjusted for provider and type of practice (rheumatology, cardiology, general medicine). To account for potential confounders and external factors, we will perform 3 comparisons in the analysis of our data:

1. Outcomes for the RA patients will be compared before and after the intervention.
2. Screening rates for RA patients pre- and post- intervention will be compared to screening rates among T2DM patients at the same time period.
3. Finally, physicians will be assigned at random to one of two groups: one group will access a screen that would prompt them to the CVD screening forms, and the second group will not have access to the prompt. At the end of the study, CVD screening and management rates will be compared between the 2 groups of physicians.

Amount of change expected from the intervention

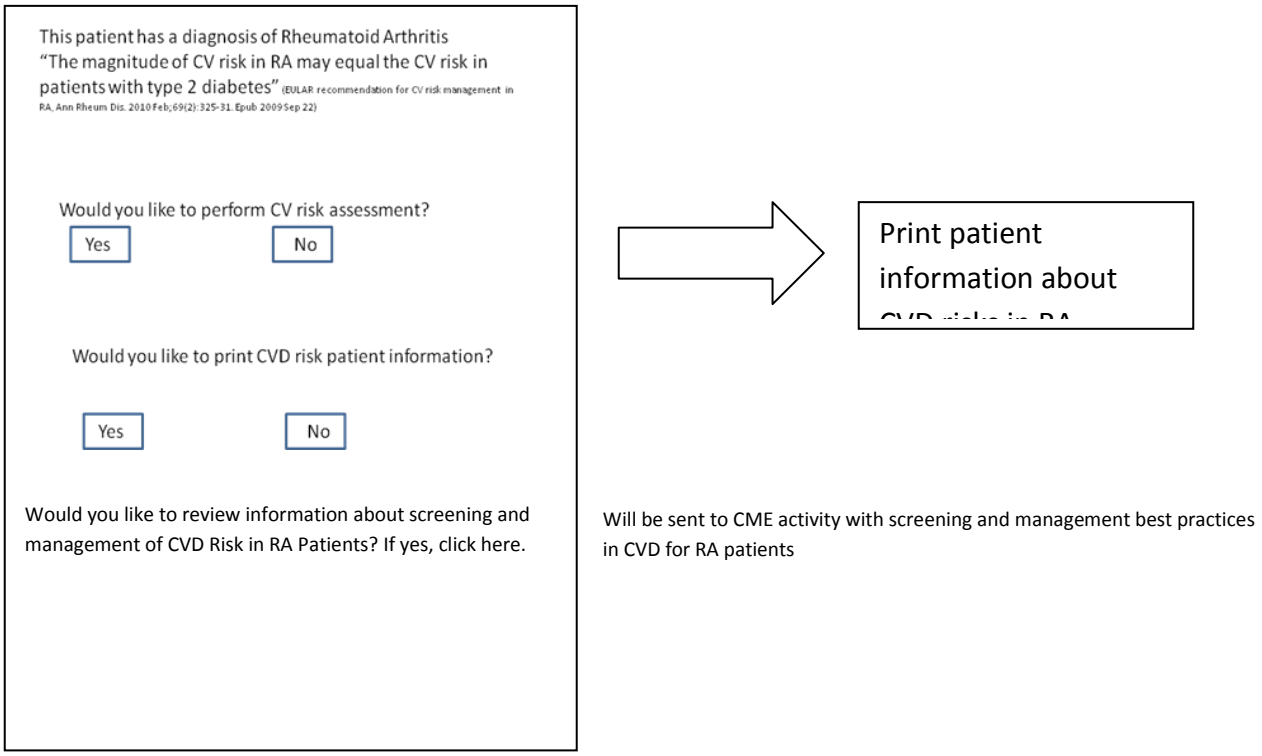
As this is a novel approach, there are no prior studies from which to draw any realistic estimates of change in the likelihood of physicians to screen for CVD risk in RA patients. However, based on our experience with the DAS28 scores, we expect at least a 30-50% increase in screening and 10-20% increase in management of CVD risks in RA patients. A recently published study evaluated the extent to which the use of a certified electronic health records system improved treatment outcomes in approximately 170,000 T2DM patients across 17 medical centers. Over the course of 1 year, several outcome measures reflected a significant increase in screening and disease management on the order of 10-20%. [7]

Determination of target audiences' engagement in the intervention

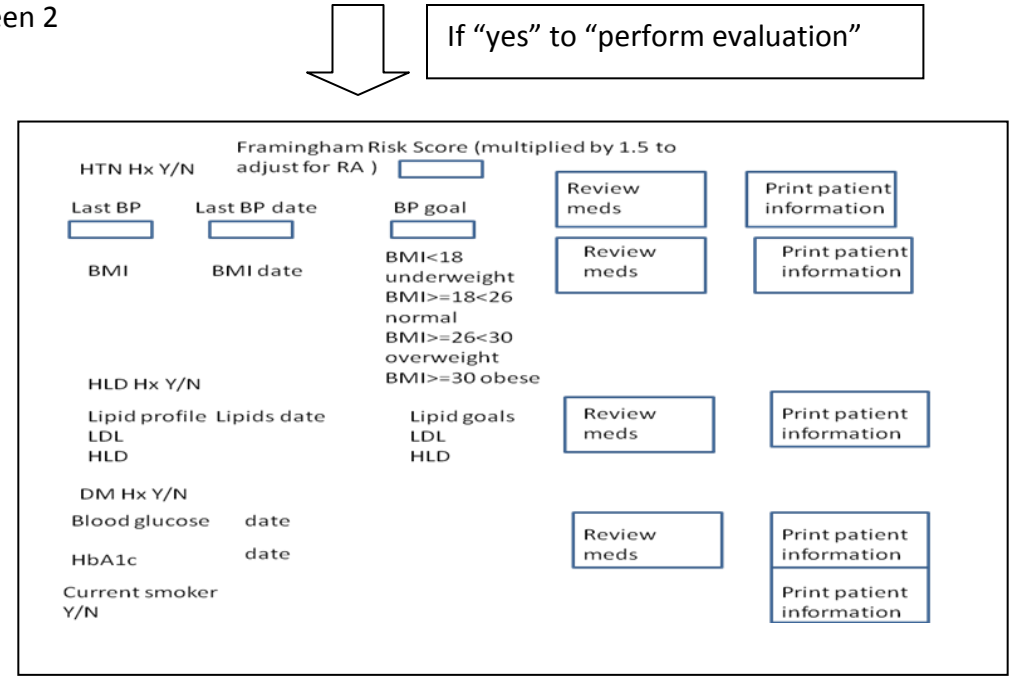
To determine the extent to which providers were engaged in the intervention, we will be able to monitor the number of physicians using the form through the MMC EMR system and its Clinical Looking Glass software package.

Figure 2. Proposed EMR form:

Screen 1



Screen 2



Plan for dissemination of project outcomes

At the conclusion of the study, we plan to submit abstracts and present posters describing the objective, design, and outcomes of the study at the annual meetings of organizations such as the American College of Rheumatology (ACR), American Academy of Family Physicians (AAFP) and the American College of Cardiology (ACC). We will also write and submit manuscripts to relevant peer-reviewed medical journals for publication.

The published results of the MMC study will be incorporated into a second CME activity, which will include downloadable and printable assessment forms and patient education handouts. Materials will promote the implementation of the study model into other EMR systems and practices outside of Montefiore. Those that participate in this post-study CME activity will be contacted directly to find out whether they modified their EMR System to incorporate the forms and alerts.

We will advertise the second CME activity in major publications that are sent to primary care physicians, cardiologists and rheumatologists and will apply to have the activity certified for "Prescribed Credit" by the AAFP. Once the activity is certified by the AAFP, they will offer it on the CME Center section of their website. We will further market the CME activity to hospitals in New York State via a brochure sent to the QI and technology departments in those hospitals. These strategies should broadly disseminate the outcomes and model to an appropriate audience.

C3. DETAILED WORK PLAN AND DELIVERABLES SCHEDULE

In the first half of 2013, we will collect baseline data from the MMC EMR database, ensure that the data from the patients to be included in the study have full documentation within the system, and perform analysis of the baseline data as described above. At the same time, the key staff will meet regularly to design the EMR decision support tool/intervention. We will prepare materials that providers can access from the EMR decision tool by incorporating patient information from AHA and the Arthritis Foundation. The resulting materials will comprise an internal CME activity for MMC providers. Providers will be informed by the designed intervention that if they access the materials (something that can be monitored via the EMR and CLG) they will receive CME credit.

In the second half of 2013 and we will implement the EMR based decision tool and notify MMC providers that it is available. Engagement in the intervention will be monitored through the first half of 2014. Data from the intervention, including the number of providers who accessed the

CVD screening/management guidelines and the effectiveness of the prompt will be collected, analyzed statistically and compiled through the end of 2014 and into 2015. Subsequently, the data will be prepared for presentation at medical meetings and publication in relevant peer reviewed medical journals. We expect to create an "external" CME activity based on our findings starting in the second half of 2014. This external CME activity will be disseminated through several major medical organizations throughout 2015.

Timeline

Activities	2013				2014		2015
Collect, clean-up, and analyze baseline data	X	X	X				
Design EMR decision support tool	X	X					
Adapt patient information for the existing materials from AHA and Arthritis Foundation	X	X					
Create information/CME activity for EMR users	X	X					
Implement the EMR form and notify providers			X				
Collect follow-up data				X	X		
Clean-up and analyze follow-up data						X	X
Prepare publications							X
Disseminate results and information to other hospitals, utilizing the external CME activity, to large outpatient health organizations, EMR companies (Aim 3)						X	X

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