Grant Final Report

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A Risk-Based Approach to Improving Management of Chronic Kidney Disease

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Principal Investigator:
Thomas D. Sequist MD, MPH

Team Members:
David W. Bates, MD
E. John Orav, PhD
Brad Denker, MD
John Forman, MD
Lisa Newmark, BS
Amy Marston, BA

Performing Organization:
Brigham and Women's Hospital

Federal Project Officer:
Vera Rosenthal

Submitted to:
The Agency for Healthcare Research and Quality (AHRQ)
U.S. Department of Health and Human Services
540 Gaither Road
Rockville, MD 20850
www.ahrq.gov

Abstract

Purpose: The overall goal of this study was to implement a program to improve the quality of chronic kidney disease (CKD) care using disease registries and decision support tools within an advanced electronic health record.

Scope: We conducted a randomized trial of 9,502 primary care patients with CKD within a multispecialty integrated group practice cared for by 158 primary care physicians.

Methods: Primary care physicians were randomly assigned to receive a set of electronic alerts that recommended risk-appropriate care for patients with CKD. Intervention physicians were also given the option to enroll patients in a self-management support program consisting of quarterly tailored mailings. The primary outcomes included 1) visit to a nephrologist (high risk patients), 2) initiation of an ACE inhibitor (high and low risk patients), and 3) performance of annual urine protein screening (low risk patients).

Results: Intervention physicians enrolled 22% of their patients in the educational mailing program. High risk patients of intervention physicians were more likely to be evaluated by a nephrologist compared to high risk patients of control physicians (43% vs. 33%, $p<0.001$). This effect was particularly pronounced among patients that received the educational mailings, and those with increasing number of primary care visits. Use of ACE inhibitors was not increased among either high or low risk patients, though use was increased among patients that received educational mailings. Low risk patients of intervention physicians were more likely to receive annual urine protein screening compared to patients of control physicians (46% vs. 23%, $p<0.001$).

Key Words: chronic kidney disease; electronic health record; EHR; quality improvement

Final Report

Purpose

With a randomized, controlled study design we implemented and evaluated an intervention to improve the treatment of primary care patients with chronic kidney disease in a large, integrated health care delivery system. The study had the following specific aims:

Aim 1: To use computerized clinical information systems to identify baseline predictors of appropriate evaluation and treatment of Stages 3 and 4 chronic kidney disease, including patient characteristics and nephrology involvement

Aim 2: To assess whether quality of care for stage 3 chronic kidney disease can be substantially improved over 18 months by:

- Point of care electronic alerts to primary care physicians recommending risk-appropriate care; and
- Quarterly mailings to patients providing self-management support materials, including tailored recommendations based on personalized data from an electronic disease registry.

Aim 3: To assess utilization of the intervention components and primary care physician attitudes towards both chronic kidney disease management and electronic reminder systems.

Scope

Chronic kidney disease affects over 25 million Americans, or an estimated 13% of the adult population. Effective management of earlier stage chronic kidney disease is needed to reduce the high mortality rates and extensive costs associated with progression to more advanced kidney failure. Primary care represents the front line in the early identification and management of chronic kidney disease. Existing clinical practice guidelines promote monitoring for progressive kidney disease, as well as aggressive management of cardiovascular risk and the complications of metabolic bone disease and anemia. Unfortunately, chronic kidney disease remains a frequently unrecognized condition, both by primary care physicians and their patients. In contrast, nephrologists are more likely to identify chronic kidney disease and intervene to prevent disease complications, ultimately resulting in improved patient survival.

Our project team risk-stratified a large patient population with chronic kidney disease and identified significant gaps in quality of care. A successful program to address these gaps in care needs to increase disease awareness among primary care physicians and their patients, as well as facilitate earlier involvement of nephrology when appropriate. Electronic health records offer an ideal opportunity to achieve these goals because of their ability to calculate estimates of renal

function, deliver patient-specific electronic decision support, and facilitate the creation of electronic disease registries for population-level monitoring and patient outreach.
Our study was conducted at Harvard Vanguard Medical Associates (HVMA), a multi-specialty group practice in eastern Massachusetts which has over 150 primary care physicians that care for approximately 300,000 patients across 15 ambulatory health centers. All adults 30 years and older with chronic kidney disease based on estimated glomerular filtration rate (eGFR) were eligible for inclusion in the study. Since 1997, clinical practices within HVMA have used a common electronic health record (Epic Systems, www.epicsystems.com) that includes clinical notes, diagnostic codes, procedure codes, and laboratory results. The electronic record allows computerized ordering of tests; as well as supports electronic entry of referrals to specialists. We chose to limit our intervention to patients with Stage 3 chronic kidney disease to focus on a large population where risk-stratification is essential to the efficient use of resources to achieve optimal health outcomes. Our study occurred over an 18 month period from July 2011 to January 2013.

Methods

Identification of Study Subjects

During the first six months of the project period, we developed an algorithm to identify patients with chronic kidney disease based on their historic laboratory results (estimated glomerular filtration rate, eGFR). This involved using variations on the NIH-definition of "at least 2 separate eGFR readings below 60, separated by 90 days". We found that this definition lacked specificity in many cases, in particular regarding the fluctuations in eGFR over a several year time period. Many patients would meet the definition of chronic kidney disease based on historic eGFR readings, however would have subsequent eGFR results that were above 60, creating confusion among clinicians as to their diagnosis. We also struggled with the definition of high risk versus low risk patients with chronic kidney disease. Our initial definition placed all patients with an eGFR less than 45 into the high risk group. However, many patients had values of eGFR less than 45, however would then have a repeat above 45, leading to lack of clarity as to whether they were high risk or not.

We ultimately defined our patient population as follows:

1) Identify all adults (>18 years old) with at least one face-to-face encounter with a primary care physician at HVMA in the last 2 years;

2) Select patients with at least 2 separate eGFR readings less than 60, separated by 90 days, and occurring at some time over the prior 5 years;

3) Exclude any patients with a most recent eGFR above 60;

4) Identify high risk patients as:

    a) Presence of diabetes.

b) Presence of proteinuria.

c) Presence of at least one eGFR less than 45 in the prior 5 years.

We further limited eligibility for the randomized intervention (Aim 2) to those patients with eGFR of at least 30 --- or Stage 3 chronic kidney disease (excluding Stage 4 and 5 disease). Dr. Sequist and members of the research team worked with the clinical leadership across HVMA to obtain widespread acceptance of these definitions prior to implementation of the intervention.

Data Sources

We collected data via a combination of patient and physician surveys, and electronic medical record extracts. We conducted two separate physician surveys, at baseline prior to the randomized intervention, and at follow up following the completion of the randomized intervention. Both surveys were implemented via an initial paper mailing, followed by a reminder email to non-responders, and a final paper mailing at 4 weeks. The baseline physician survey response rate was 81%, and the follow up survey response rate was 75%.

The baseline physician survey was designed to assess perceptions of the management of chronic kidney disease. Using a 4-point ordinal scale from 'very comfortable' to 'very uncomfortable', physicians reported their comfort with managing various aspects of chronic kidney disease, including proteinuria, anemia, metabolic bone disease and hypertension. Physicians also reported on their patterns of using the electronic health record and perceptions of the effect of electronic decision support tools and patient self-management support programs.

We also surveyed physicians following completion of the randomized intervention to assess again perceptions of managing various aspects of chronic kidney disease. In addition, physicians reported on the frequency and comfort level with which they inform patients of a new diagnosis of chronic kidney disease. Finally, intervention physicians reported on their perceptions of the impact on quality of chronic kidney disease care ('very effective', 'somewhat effective', 'not effective') of the decision support tool, patient mailings, and collaboration with nephrology.

We only surveyed patients of physicians in the intervention group as the patient surveys were designed to assess impressions of the effectiveness of the educational mailings. We surveyed patients approximately 1 week following the receipt of their first outreach mailing ("baseline"), and again 1 week following receipt of their final outreach mailing ("follow up"). Both surveys were implemented as a one-time paper mailing, with no follow up for non-responders. The baseline patient survey response rate was 27% and the follow up patient survey response rate was also 27%.

We collected all other clinical data from the electronic medical record. This included our primary outcomes of an office visit to a nephrologist within the prior 12 months (high risk patients), use of ACE-inhibitors or angiotension receptor blockers (ARBs) for those with hypertension or microalbuminuria (high risk and low risk patients), and presence of a urine protein test within the prior 12 months (low risk patients).

Electronic Decision Support Intervention

Primary care physicians, nurse practitioners, and physician assistants were randomized to receive point-of-care alerts within the electronic health record during office visits for patients

with Stage 3 chronic kidney disease. We enrolled 158 primary care physicians practicing across 15 health centers within HVMA during the study period. We enrolled 9,502 patients meeting the definition of Stage 3 chronic kidney disease as defined above.

We developed a set of electronic alerts based on automated assessment of the presence of Stage 3 chronic kidney disease. This assessment was done at the start of the intervention, and we identified new patients on a monthly basis throughout the intervention period. This process required analysis of historic eGFR values, as well as assessing the presence of diabetes and proteinuria using data from the electronic problem list, encounter diagnoses, and laboratory results.

We stratified patients according to their risk status as defined above into 'high risk' and 'low risk'. We developed a set of 3 electronic alerts that were present in both a passive and active form within each patient's electronic chart. The active alert displayed when physicians accessed the electronic ordering module of the patient chart, and required acknowledgement from physicians to proceed. Physicians could view the passive alert at any point during an encounter within the electronic visit summary screen. Immediately prior to the intervention, we educated clinicians in both the intervention and control groups regarding the use of these reminders via a one-hour presentation at each center.

During office visits for 'high risk' patients, physicians received two alerts: one alert recommending referral to a nephrologist if such a visit had not occurred in the prior 12 months, and a second alert recommending prescription of an ACE inhibitor or ARB if the patient also had hypertension or proteinuria and was not being treated with such a medication. During office visits for 'low risk patients', physicians received two alerts: one alert recommending performance of urine microalbumin testing (and other annual screening labs including eGFR, hemogram, parathyroid hormone, calcium, vitamin D, LDL cholesterol and phosphorous) if one had not been performed in the prior 12 months, and a second alert also recommending prescription of an ACE inhibitor or ARB if appropriate. All alerts facilitated one-click ordering of the recommended treatment, including referrals to nephrology, prescription of medications, and ordering of laboratory tests.

The electronic alerts also recommended to physicians to enroll their patients in the educational outreach mailing program (see Appendix for example mailing). With one-click ordering, physicians could indicate to our research team that the patient should begin receiving the mailings, which were then delivered on a quarterly basis for the remainder of the 18 month intervention. For those physicians that did not choose to enroll their patients in the mailing program electronically during an office visit, we conducted monthly outreach via inter-office mail that provided physicians with lists of their eligible patients to enroll in the mailing program (for whom they had an office visit in the prior month). Physicians responded to these paper mailings to either opt their patients in or out of the mailing program.

Randomized Intervention

The intervention was randomized at the individual clinician level. Within each health center, we paired clinicians based on number of patients with chronic kidney disease, and then randomly assigned one clinician in each pair to receive electronic reminders. The trial ran for 18 months to ensure sufficient time for exposure to the intervention components for both patients and physicians.

Limitations

While our study benefits from the rigorous design and evaluation, the findings should be interpreted in the context of some limitations. First, we conducted this evaluation in a somewhat unique integrated care setting using an advanced electronic health record, and so our findings may not generalize to other settings. However, as incentives are increasingly used to promote adoption of electronic health records, our findings have more generalized applicability. Second, we could not rigorously assess the impact of the intervention on patient understanding of chronic kidney disease as we did not survey the control group patients. The primary reason for this was that these patients were very likely not aware of their diagnosis of chronic kidney disease, and thus a survey would have been inappropriate.

Results

Aim 1: To use computerized clinical information systems to identify baseline predictors of appropriate evaluation and treatment of Stages 3 and 4 chronic kidney disease, including patient characteristics and nephrology involvement.

We evaluated the quality of care in 4 primary domains, including 1) monitoring stage of CKD, 2) cardiovascular risk management, 3) metabolic bone disease and anemia monitoring, and 4) drug safety. All measures were assessed in the year following July 1, 2008 to allow a minimum of one year following the initial diagnosis of CKD prior to assessing clinical performance.

Monitoring of disease stage was assessed as annual testing for eGFR and urine protein. Cardiovascular risk management was evaluated as annual monitoring of LDL cholesterol, appropriate use of ACE-inhibitors/angiotensin receptor blockers (ARB), appropriate use of lipid-lowering therapy (statins), and achieving an LDL cholesterol <100 mg/dL and blood pressure <130/80 mmHg. Appropriate use of ACE inhibitor/ARB use was defined as a prescription within the last 12 months for patients with hypertension, diabetes, urine protein/creatinine ratio > 0.15, or a spot urine albumin/creatinine ratio > 30 mcg/mg, and no documented drug allergy. Appropriate use of statins was defined as a prescription within the last 12 months for patients with an LDL cholesterol >100 mg/dL and no documented drug allergy.

Prevention of metabolic bone disease was assessed as annual testing for calcium, phosphorous, parathyroid hormone (PTH), and 25-hydroxyvitamin D. Anemia monitoring was assessed as annual monitoring of hemoglobin. Drug safety was examined via electronic prescription rates of potentially inappropriate medications within the prior 12 months, including non-steroidal anti-inflammatory drugs (NSAIDs), glyburide, metformin, nitrofurantoin, terbinafine (eGFR<50), alendronate (eGFR<35), ibandronate (eGFR<30), and risedronate (eGFR<35). These drugs were identified based on expert consensus and review of the medical literature.

We collected patient level sociodemographic features including age, sex, race, and insurance status from the electronic health record. We assessed comorbid conditions including diabetes, hypertension, and coronary artery disease. Diabetes was defined as the presence of either a diagnosis of diabetes on the electronic problem list, or at least 3 encounter diagnoses in the prior

24 months, or a hemoglobin A1c result >7%. Hypertension was defined as a diagnosis on the electronic problem list or at least three encounter diagnoses in the prior 24 months. Coronary artery disease was defined based on diagnoses codes according to Healthcare Effectiveness Data and Information Set (HEDIS) criteria.

We defined primary care physician (PCP) recognition of CKD as documentation of a CKD diagnosis on the electronic problem list. We defined the degree of nephrology involvement as 1) active co-management (nephrology visit within the prior 12 months), 2) past nephrology care (nephrology visit more than 12 months prior), or 3) no prior nephrology visits.

We identified 11,774 patients with stage 3 (97%) or stage 4 (3%) CKD. Coexisting diabetes (29%) and hypertension (66%) were common. Nearly one-half (46%) of patients were defined as high risk for mortality based on the presence of diabetes, proteinuria, or eGFR<45. Only 24% of patients with CKD had their condition documented on the problem list, and only 10% were actively co-managed with nephrology within the prior 12 months.

The majority of patients received annual monitoring of eGFR, though less than one-third (30%) received annual urine protein testing. Three-quarters of patients were receiving appropriate ACE-I/ARB therapy and had annual LDL cholesterol testing, although the proportions of patients with good blood pressure control and LDL cholesterol control were lower. Among patients with diabetes, 53% achieved ideal hemoglobin A1c control. Performance measures for metabolic bone disease management were met in fewer than 50% of patients. Over one-quarter (26%) of patients were prescribed a potentially harmful medication in the last 12 months, with metformin most commonly prescribed.

Performance rates were significantly higher among high risk compared to low risk patients for all measures except annual hemoglobin testing (76.0% versus 77.0%, p=0.38) and annual vitamin D measurement, which was significantly lower for high risk patients (17.8% versus 21.2%, p<0.01). High risk patients were more likely to be prescribed inappropriate medications (41.7% versus 13.1%, p<0.01), which was driven by the use of metformin and glyburide in high risk diabetic patients. There was no difference in rates of inappropriate medications between high risk patients without diabetes and low risk patients (13.8% vs. 14.0%, p=0.88).

Younger, black, and female patients were all less likely to achieve targeted levels of LDL cholesterol and blood pressure control. Uninsured patients demonstrated lower rates than insured patients for kidney disease monitoring and three of the five measures of cardiovascular risk management. Patients with co-existing diabetes, hypertension, or coronary artery disease were significantly more likely than those without to receive adequate kidney disease monitoring and cardiovascular management.

Patient features significantly associated with increased PCP recognition of CKD included black race (odds ratio [OR] 2.71, 95% confidence interval [CI] 2.2-3.3), male gender (OR 2.42, 95% CI 2.2-2.7), presence of hypertension (OR 1.53, 95% CI 1.3-1.7), and high risk status (OR 8.11, 95% CI 7.2-9.1). Predictors of active nephrology co-management within the prior 12 months included age less than 65 years (OR 1.97, 95% CI 1.5-2.5), male gender (OR 1.45, 95% CI 1.2-1.7), presence of hypertension (OR 2.05, 95% CI 1.7-2.5), high risk status (OR 4.58, 95% CI 3.7-5.7) and primary care recognition of CKD (OR 12.18, 95% CI 10.2-14.6).

Primary care physician recognition and nephrology involvement were both associated with increased kidney disease monitoring, monitoring for metabolic bone disease and anemia, and improved drug safety. Active co-management by nephrology within the prior 12 months was more consistently associated with improved CKD care compared to past nephrology involvement (< 12 months). Primary care physician recognition and active nephrology co- management were

associated with increased ACE-I/ARB use. Neither increased physician recognition nor active nephrology co-management was associated with improved blood pressure or cholesterol control.

Aim 2: To assess whether quality of care for stage 3 chronic kidney disease can be substantially improved over 18 months by electronic alerts to physicians and quarterly mailings to patients.

We randomized 158 primary care clinicians caring for 9,502 adult patients with CKD. There were 4,741 high risk patients and 4,761 low risk patients. Intervention physicians enrolled 1,054 patients into the patient mailing program (22% of all intervention patients).

Among high risk patients with chronic kidney disease, patients in the intervention arm were significantly more likely to have an office visit with a nephrologist within the prior 12 months compared to control arm patients (43% vs. 33%, $p<0.001$). This effect was more pronounced among patients that received the mailings, where 64% had an office visit with a nephrologist within the prior 12 months. In post-hoc analyses, we noted that the effect was also strongest among patients with more than 3 visits to the primary care physician during the study period (51% vs. 39%, $p<0.001$), compared to those with 1-3 visits (38% vs. 29%, $p<0.001$), and those patients with no visits to the primary care physicians (14% vs. 18%, $p=0.31$).

We did not note any difference in rates of prescribing an ACE-I or ARB between intervention and control patients in either the high risk patient group (74% vs. 76%, $p=0.19$) or the low risk patient group (60% vs. 61%, $p=0.91$). However, there was an increase in use of ACE-I or ARB between intervention patients that received the mailings compared to control group patients both in the high risk group (83% vs. 75%, $p=0.002$) and the low risk group (71% vs. 61%, $p=0.01$). There was no difference in prescribing rates based on the number of visits to a primary care physician during the study period.

Among low risk patients with chronic kidney disease, patients in the intervention arm were significantly more likely than those in the control arm to have received urine microalbumin testing in the prior 12 months (43% vs. 20%, $p<0.001$). This effect was more pronounced among patients that received the mailings, where 55% received urine microalbumin testing. In post-hoc analyses, we also noted that the effect was strongest among patients with more than 3 primary care visits during the study period (52% vs. 25%, $p<0.001$), compared to those with 1-3 visits (42% vs. 18%, $p<0.001$), and those with no primary care visits (15% vs. 10%, $p=0.27$).

We also analyzed rates of annual testing among low risk patients for other markers of chronic kidney disease. We found no difference between intervention and control patients in rates of testing annual eGFR (88% vs. 86%, $p=0.14$), hemoglobin (64% vs. 63%, $p=0.74$), LDL cholesterol (74% vs. 71%, $p=0.19$), and calcium (61% vs. 56%, $p=0.09$). There were increases in the intervention arm compared to the control arm for annual testing of Vitamin D (31% vs. 24%, $p=0.02$), phosphorous (21% vs. 12%, $p<0.001$), and parathyroid hormone (21% vs. 13%, $p<0.001$).

The results of our patient surveys regarding the educational mailings highlighted several important aspects of CKD management and our intervention. First, only 53% of patients reported being told by a doctor of their kidney disease at baseline, and this rose to only 57% at the conclusion of the study. Perhaps as a result of this phenomenon, at study conclusion only 59% ‘strongly’ or ‘somewhat’ agreed with the statement that they have a diagnosis of CKD, while 17% ‘strongly’ or ‘somewhat’ disagreed. Regarding the educational mailings, 88% reported that the mailings ‘definitely’ or ‘somewhat’ gave them choices to think about to treat

their CKD, 78% felt the mailings helped them set specific goals for CKD treatment, 74% felt the mailings helped them establish a treatment plan for CKD, and 73% felt the mailings helped them understand their medications for CKD. Comparing responses at baseline to follow-up, we found increases in the proportion of patients reporting that they received clear instructions from their doctors on how to manage CKD (62% vs. 68%), that their doctor worked with them to set personal goals for managing CKD (56% vs. 62%), and that their doctor seemed up to date and informed about the CKD care they received from other providers (28% vs. 38%). Overall, there was an increase in the proportion of patients rating their overall CKD care as 'excellent' or 'very good' from baseline to follow up (65% vs. 71%).

Aim 3: To assess the relationship between utilization of the intervention components and primary care physician attitudes towards both chronic kidney disease management and electronic reminder systems.

At baseline among control physicians, a higher percentage of physicians reported being 'very comfortable' with managing hypertension (84%) compared to metabolic bone disease (5%), anemia (9%), and proteinuria (16%) among their patients with CKD. The same patterns were present among intervention physicians. At follow-up, intervention physicians were somewhat more likely than control physicians to report that they inform their patients of a diagnosis of CKD once they recognize it is present (85% vs. 80%); and a higher percentage of intervention physicians compared to control physicians reported feeling comfortable establishing a diagnosis of CKD using a threshold eGFR of <60 (56% vs. 43%).

Intervention physicians were generally supportive of the intervention based on the follow up survey responses. Nearly two thirds (63%) reported that they 'usually' or 'always' agreed with our algorithm to identify their patients with CKD, and only 2% reported they 'rarely' agreed. Nearly three quarters (73%) reported that our electronic reminders were 'somewhat' or 'very' effective at improving the quality of care for CKD among their patients, 79% reported the patient mailings were 'somewhat' or 'very effective', and 90% reported that collaborating with Nephrology was 'somewhat' or 'very effective' at improving quality of care for their patients with CKD. Overall, there was an increase from baseline to follow up in the proportion of intervention physicians reporting that they were 'very satisfied' with the quality of care their patients with CKD received (25% vs. 58%).

Discussion/ Conclusions/ Significance

In a large cohort of primary care patients with Stage 3 chronic kidney disease, we demonstrated substantial gaps in both quality and safety, with many patients not receiving the recommended monitoring exams, medications, or specialist evaluation. Our CKD quality improvement program consisted of electronic decision support combined with patient self-management support tools delivered over an 18 month period. We found that our program significantly improved quality of care for both high risk and low risk patients with chronic kidney disease – increasing the collaborative care with nephrologists, improving disease monitoring through appropriate laboratory testing, and in some cases, increasing use of appropriate medications. The program was well received by primary care physicians, and patients responded very positively to the educational mailings.

To our knowledge, this is the largest quality improvement program related to chronic kidney disease in primary care. Chronic kidney disease remains a highly prevalent condition and carries significant morbidity and mortality. Our data suggest that there are significant gaps in quality of care for this condition, but that an innovative intervention combining electronic decision support and patient outreach can produce substantial gains in quality of care.

While we had significant success with this program, it is important to note that we did not impact prescribing of ACE-I and ARB medications among all patients – and we also did not improve levels of blood pressure control (analyses not shown) for these patients. This suggests that changing process measures for CKD care is more straightforward than improving outcomes measures. We will need to seek even more innovative solutions to drive improvement in important clinical outcomes include blood pressure control and ultimately cardiovascular events.

Implications

Electronic health records are increasingly promoted as an important tool to support quality improvement. Our data highlight that while decision support tools such as those advocated by the CMS Meaningful Use metrics are important --- even greater gains are possible through the innovative use of data registries and patient engagement. Future work should really explore how health IT and electronic health records can be used to further collaboration between patients, primary care physicians, and specialist physicians as part of a complete care plan.

List of Publications and Products

The following manuscripts of the study findings have been prepared:

Allen AS, Forman JP, Orav EJ, Bates DW, Denker BM, Sequist TD. Primary Care Management of Chronic Kidney Disease. *J Gen Intern Med* 2010. 26(4); 386-392.

Sequist TD, Orav EJ, Forman JP, Bates DW, Denker BM. Patient and Physician Tools to Improve Chronic Kidney Disease Care: A Randomized, Controlled Trial. Manuscript in preparation.

Appendix A: Resources

Harvard Vanguard Medical Associates
Atrius Health

March 18, 2011

Robert Forty
100 Main Street
Apt 1
Quincy, MA 02152

Dear Mr. Forty,

I am writing to you with important updates about your *chronic kidney disease*. This is based on the most up to date information from your medical chart here at Harvard Vanguard. I have included information on:

- Your level of kidney disease
- Your blood pressure
- Your recent blood and urine tests for kidney disease

We have made recommendations specifically for you based on this information. This includes ways to keep your kidneys healthy, including what tests and treatments you may need.

Please do not hesitate to contact me with any questions.

Sincerely,

MYCHART, MD

How well are your kidneys working?

Explaining Your Kidney Test Results

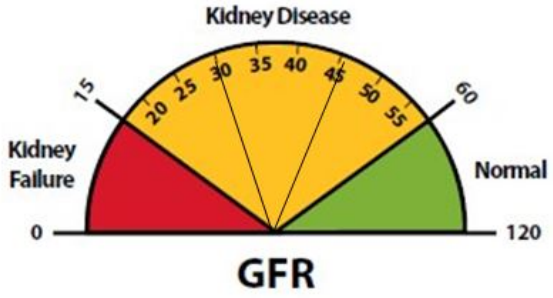
Your GFR Results

Your **most recent** GFR result was:

- 41 on 6/3/2010

Your **lowest** GFR result was:

- 40 on 2/17/2009



What is GFR ("glomerular filtration rate")?

GFR measures how well your kidneys clear waste and extra water from the body. *The goal is to keep the GFR from going lower.*

- A GFR of 60 or higher is in the normal range
- A GFR below 60 may mean kidney disease
- A GFR of 15 or lower may mean kidney failure

An important point about your GFR:

Your GFR can go up and down, sometimes going up into the normal range. Please look at both your lowest GFR and your most recent GFR.

What Are My Personal Risks For Kidney Failure?

- Diabetes: It is very important to control your blood sugar to protect the kidneys. Your most recent Hemoglobin A1c result was 6.2 on 6/3/2010.
- High blood pressure
- Low GFR (less than 45)

Based on your risks above, you should see a kidney specialist (nephrologist) at least once per year. Our records show that you have not yet had a visit with a kidney specialist. Please call 781-306-5300 to schedule this appointment.

How can I protect my kidneys?

Goal #1: Keep your blood pressure as low as possible.

Goal #2: Treat kidneys with special blood pressure medicines (called "ACE" or "ARB" medicines) to keep protein from leaking into the urine.

Goal #3: Avoid using medicines that harm the kidneys, especially "NSAIDS" (Motrin, Advil, Ibuprofen, Naprosyn, Aleve).

Blood Pressure

Why is blood pressure so important?

High blood pressure can damage blood vessels in the body. If the blood vessels in the kidney are damaged, they may not be able to filter wastes out of your body.

Your last blood pressure on 6/3/2010 was 142/76.

- This is above your goal for blood pressure. The goal is less than 130/80 ("130 over 80").
- Please review the information in this mailing to bring down your blood pressure.

Urine Protein

What is urine protein?

Protein (also called "albumin") is normally found in the blood. A healthy kidney does not let protein pass into the urine. A damaged kidney lets some protein pass into the urine. The less protein in your urine, the better!

Your last urine protein (albumin) result on 6/3/2010 was 22.1.

- Your last result is up to date.
- Your urine protein level is normal.

Medication

You are being prescribed an "ACE" or "ARB" medication.

- This medicine is called Lisinopril Oral and is very important for your kidneys.

What Other Tests Do I Need for Kidney Disease?

These tests should all be checked at least once per year:

Test Performed	Your recent results are…		The goal is…	Your last result is…
"Bad" (LDL) cholesterol	121 *6/9/2009*	132 *6/3/2010*	Less than 100	High
Hemoglobin (blood count)	15.4 *6/9/2009*	14.9 *6/3/2010*	Higher than 10.0	Normal
Calcium	9.1 6/9/2009	9.9 6/3/2010	Between 8.4 and 9.5	High
Vitamin D			Between 30 and 100	No result available
Parathyroid hormone			Between 35 and 70	No result available
Phosphorous			Less than 4.6	No result available

What Medicines Am I Taking For My Kidney Disease?

Medication Name	This medicine is for…
Lisinopril 5 mg Tab protein	A special blood pressure pill that also treats urine
Hydrochlorothiazide 25 mg Tab	Blood pressure
Simvastatin 20 mg Tab	Cholesterol

What should I do next?

- Your blood pressure is high. Please look in the brochure for more advice.
- You are overdue for these lab tests, please contact my office to have them done:
  - Vitamin D
  - Parathyroid hormone
  - Phosphorous
- Please call me to talk about these lab results:
  - "Bad" (LDL) cholesterol
  - Calcium
- Schedule an appointment with a kidney specialist by calling 781-306-530