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Maintaining Quality Improvements in CKD Care

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TWO YEARS AFTER A QUALITY IMPROVEMENT INTERVENTION FOR CHRONIC KIDNEY DISEASE CARE IN A PRIMARY CARE OFFICE

Were the Improvements Maintained?

A UNYNET study

***Running title*: Maintaining Quality Improvements in CKD Care**

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Abstract

Background: Implementation of evidence-based Kidney Disease Outcomes Quality Initiative guidelines is of increasing clinical importance. This study evaluates the long term impacts of a CKD quality improvement project.

Methods: Retrospective chart review performed at a family practice which completed a quality improvement project two years previously.

Results: N=195. CKD recognition decreased during the maintenance period from 70% to 60.8% (p=1.98), from a baseline of 38.1%. Anemia recognition declined 70% to 50% (p=.132), from a baseline of 35%. Evaluation for PTH, Vitamin D and phosphate decreased from 44% to 33% (p=.216), from a baseline of 4.8%. Referrals to nephrologists decreased from 77% to 61% (p=.369), from a baseline of 14%.

Discussion: The decrement in KDOQI guideline compliance during the maintenance period was not statistically significant, nor was there a return to baseline values. This suggests that the intervention provided the education and re-enforcement necessary to effect long term change.

Background

Chronic kidney disease (CKD) and end stage renal disease (ESRD) are steadily increasing in prevalence in the United States with more than 20 million Americans having substantial kidney impairment. Epidemiological studies estimate that by 2010 over 600,000 patients will have ESRD.[1] The aging population and the obesity epidemic, resulting in climbing rates of hypertension and diabetes, will continue to drive up these numbers.

Having CKD increases the likelihood of suffering a myocardial infarction and increases the risk for all cause mortality.[2] Early recognition, proper management, and early referral have the greatest effect on slowing the progression of CKD.[3] Evidence based guidelines recommend the following to effectively slow CKD progression: early disease recognition; optimizing management of hypertension, diabetes, anemia, dyslipidemia and abnormal bone mineral metabolism; discontinuation of nonsteroidal anti-inflammatory drugs (NSAIDS); and the use of aspirin along with angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs).

The development of the 2002 Kidney Disease Outcome Quality Initiative (KDOQI) chronic kidney disease definition and staging guidelines for CKD was a significant force in shifting attention toward early recognition and treatment of chronic kidney disease. However, implementation of these guidelines in current practice has remained a major challenge.[4] Physician lack of awareness of the guidelines has been demonstrated to be a significant barrier.[5] Two studies of primary care physician's (PCP)

practices have shown that a substantial number of physicians were unaware of the KDOQI guidelines.[5,6]

In light of the challenges of implementing these guidelines, the Upstate New York Practice based Research Network (UNYNET) Study performed a quality improvement (QI) intervention from April 2006 to August 2007.[7] The intervention utilized two practice enhancement assistants (PEAs) in the clinics who implemented a computer-guided point of care decision support system and provided reminders to physicians and staff. Academic detailing and audit and feedback of performance data were also part of this intervention. This resulted in significant improvements in the early recognition of CKD and anemia, as well as decreasing the use of potentially harmful medications, specifically NSAIDS and metformin. The other important finding was earlier referral to a Nephrologist. [7]

The RE-AIM framework, conceptualizes the public health impact of an intervention as a function of 5 factors: reach, efficacy, adoption, implementation and maintenance. The framework is compatible with a variety of diverse interventions, but has a central tenet that the ultimate impact of an intervention is due to its combined effects on the 5 evaluative dimensions.[8] While there are numerous studies of community based and public health interventions, the “maintenance” component is often not examined. However, Glasgow and colleagues stress that at the community level, maintenance research is needed to document the extent to which innovations become a relatively stable, enduring part of the behavioral repertoire of an individual, organization or community.[8]

To our knowledge this is the first study to test the maintenance of these evidence based CKD guidelines in a PCP office following quality improvement (QI) intervention. A literature search of Medline using the keywords “quality improvement”, “maintenance” and “KDOQI” yielded no follow up studies involving medical practices. The majority of studies which evaluated the maintenance of effect following an intervention were dietary in nature.[9] Of note, a review of 31 nursing intervention studies from 2001-2006 were analyzed using the RE-AIM evaluation model. However they found it was not possible to consider the RE-AIM dimensions of adaptation, implementation and maintenance because relevant data were not provided. [10]

In light of the lack of research regarding the maintenance aspect of the RE-AIM framework for evaluation of interventions, coupled with the growing importance of CKD recognition and management this follow up study of the UNYNET quality improvement intervention was undertaken. The article presents the maintenance data from two years after the intervention was completed at an underserved urban minority practice site.

Methods

Setting

This follow up of a QI intervention was performed in an underserved family medicine practice. The site is a private practice providing comprehensive medical care to an underserved urban population with a high proportion of international refugees. The practice consists of 3 MDs and 3 nurse practitioners with over 5000 active medical

records. There is a fully implemented electronic medical record (EMR) system where laboratory data is scanned into the system.

The original QI intervention took place from April 2006 to August 2007 and involved two practice enhancement assistants (PEAs) who provided assistance to the practicing physicians and implemented computer-guided support systems. The follow up took place in August and September 2009.

The State University of New York at Buffalo Health Sciences Institutional Review Board granted human subjects approval for the study.

Case Finding

The initial chart audit selected patients with a diagnosis of chronic kidney disease, diabetes mellitus and/or hypertension to identify patients with a GFR <50 mL/min/1.73m^2. This cut off was utilized in light of the large proportion of minority patients at the practice combined with the lack of racial identification in patient charts. This maximum value ensured that all patients included in the study had stage three CKD or higher. All patients with a GFR <50 mL/min/1.73m^2 were included, regardless of diagnosis or disease severity.

Patients who met inclusion criteria underwent chart review, which included collection of data from the conclusion of the intervention and then two years later. The QI intervention ended in August 2007, and any data between February 2007 and February 2008 were labeled as “post intervention”. Data from August 2008 to August 2009 was labeled as “maintenance”. In cases where patients had numerous

measurements of a data point, the point closest to August 2007 and August 2009 were recorded.

Analysis

The clinical elements included in the study were based on the KDOQI guidelines. They included current GFR; current Hba1c; current hemoglobin; lipid panel; body mass index; blood pressure; medications associated with treatment of CKD; microalbumin: creatinine ratio; and bone mineral laboratory tests of phosphorous, intact parathyroid hormone, and 25-OH vitamin D levels, all of which are associated with complications of CKD. This data was entered directly into the Statistical Package for the Social Sciences software (SPSS 11.5, Chicago, IL) for analysis. Descriptive statistics were performed on laboratory values, medication management, and disease recognition. Independent sample t tests were conducted on dichotomous variables (eg, current medications and current diagnoses) comparing post intervention rates to rates during follow up two years later. Paired sample *t* tests were conducted on GFR level to test for any significant change.

In order to portray the effect of the intervention coupled with any changes which may occurred during the maintenance period, data collected during the original QI intervention study was obtained. Data from the original intervention collected from February 2006 to January 2007 and was labeled as “baseline”. The original QI intervention study cut-off GFR value of GFR <50 mL/min/1.73m^2 was used for the “baseline” data. In cases where patients had numerous measurements of a data point, the point closest to February 2006 was recorded.

Results

A total of 195 patients met inclusion criteria. During the baseline period 63 patients met inclusion criteria, 74 patients met inclusion criteria during the post intervention time frame, and 97 patient met inclusion criteria during the follow-up time frame. Characteristics of the 3 timeframes are summarized in Table 1.

The results of the study are summarized in Table 2. From the post intervention to maintenance, CKD recognition, defined as a diagnosis of CKD documented on either the billing information, problem list or within the progress notes decreased slightly from 70.3% to 60.8% (P= .198). This was following a significant (P<.001) increase in CKD recognition from 38.1% during the QI intervention. Recognition of anemia, defined as having a hemoglobin <12mg/dl for either women or men, also declined in absolute percentage points during the maintenance period from 70.0% to 50.0% but this change was not statistically significant (P=.132). However, this was in light of a significant increase (P<0.05) in anemia recognition during the intervention, from a baseline of 35.3%.

The use of aspirin and ACE inhibitors/ARBs showed incrementally small increases but these changes were not statistically significant. NSAID usage showed essentially no change during the intervention or maintenance periods, 19.0% at baseline, 18.9% after intervention and 19.6% after the maintenance period.

From the post intervention to maintenance, laboratory evaluation for CKD complications reflected in bone mineralization laboratory values, defined as the practitioner ordering a phosphate, PTH or Vitamin D level, decreased in absolute percentage from 43.8% to 33.3%. However, this decline noted during the maintenance period was not statistically significant (P=.216). This was following a significant (<.001) increase in practitioners ordering bone mineralization studies during the intervention, from 4.8% at baseline to 43.8% after the intervention.

Referral to a nephrologist if glomerular filtration rate was less than 30mL/min/1.73m^2, followed a similar trend, with a decrease in absolute percentage from post intervention to maintenance, from 76.9% to 61.1% but the change was not statistically significant (p=.369). However from baseline to post intervention referral to a nephrologist when patients had a GFR <30mL/min/1.73m^2 increased from 14.3% to 76.9%, a statistically significant change (p=.005).

Discussion

Our findings showed a decrement in compliance with KDOQI guidelines during the maintenance period. However the decline was not statistically significant nor was there a return to baseline values. This demonstrates that there is an erosion in gains when the support of the practice enhancement assistants (PEAs) as well as the computer-guided support systems was removed from the practice. It is noteworthy that the maintenance values remained well above the baseline values in a number of measures. Of particular note is the increased early referral to Nephrologists showing

greater recognition and treatment of the disease, as this has been shown to improve outcomes.[3]

During the original intervention clinicians reported a greater awareness of the KDOQI guidelines while seeing their patients. They also expressed a greater understanding of the importance of the guidelines. There were some long-term benefits that were maintained suggesting that the intervention provided the education and re-enforcement necessary to effect long-term change in clinical practice.

It must also be noted that while physician awareness regarding CKD diagnosis and treatment guidelines may have experienced some erosion during the maintenance period there are various other factors which may have modified the response. For example, primary care physicians are continually confronted with limited time to deliver appropriate and recommended treatment for numerous chronic diseases, in addition to providing preventive care and diagnosing new problems. [11-14] Also, due to the overlap between cardiovascular disease, diabetes mellitus and chronic kidney disease, it is possible that physicians prioritize the care for cardiovascular disease and diabetes without realizing the underlying pathophysiologic link between these diseases. [15]

The importance of this research is partially founded in its uniqueness as there are few maintenance studies that have been done. According to the RE-AIM framework, maintenance research is needed to document the extent to which policies are enforced over time. Glasgow and colleagues emphasize that evaluation of the maintenance period following an intervention allows measurement of the extent to which changes

become a relatively stable, enduring part of the behavioral repertoire of an organization.[8]

Limitations

This study has a number of limitations including the small sample size and the use of only one outpatient office. The use of the baseline data which was collected by a different research assistant may have resulted in some differences in data collection, although attempts were made to correct for these discrepancies. Larger and more geographically and economically diverse studies are needed in order to confirm these initial findings. In addition, more research regarding the maintenance period following interventions need to be done, especially in primary care practice based research.

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Table 1. Study Population

	Baseline (N/%)	After Intervention (N/%)	Follow up (N/%)
Total N	63	74	97
GFR (mean[SD])	49.41/16.12	39.36/8.58	35.10/11.04
Dialysis/Transplant	____	3/ 4.2%	6/ 6.2%
Diabetes Mellitus Diagnosis	35/55.6%	38/51.4%	53/ 54.6%
Hypertension Diagnosis	62/98.4%	70/95.9%	92/94.8%
Body Mass Index (mean[SD])	33.1/10.5	33.2/ 9.41	33.4/ 9/57

Table 2. Summary of Results After Intervention and at Follow up

	Baseline (N/%)	After Intervention (N/%)	P	Follow up (N/%)	P
CKD diagnosis	24/38.1%	52/70.3%	.000	59/60.8%	.198
Anemia diagnosis	6/ 35.3%	14/70.0%	.035	14/50.0%	.132
Aspirin Use	18/ 28.6%	32/43.2%	0.74	55/56.7%	0.820
Metformin use	4/ 4.8%	7/9.5%	.284	12/12.4%	.358
NSAID use	12/19.0%	14/18.9%	.985	19/19.6%	.913
ACE inhibitor/ARB use	34/54.0%	50/67.6%	.107	62/63.9%	.686
Systolic BP <130	20/32.8%	33/ 45.2%	.143	34/36.2%	.242
Diastolic BP<80	24/39.3%	34/46.6%	.404	36/38.3%	.285
HbA1c<7.0	15/40.5%	17/44.7%	.718	24/47.1%	.394
HbA1c checked in Diabetics	33/94.3%	37/97.4%	.514	49/92.5%	.169
Hemoglobin checked	33/94.3%	37/97.4%	.514	49/92.5%	.169
LDL<100	18/43.9%	19/35.2%	.394	32/43.8%	.296
Checked LDL	44/69.8	56/75.7%	.447	73/75.3%	.920
Vitamin D, Phosphate, or Parathyroid Hormone checked	3/ 4.8%	32/43.8%	.000	33/33.3%	.216
Urine Microalbumin/Creatinine Checked	15/23.8%	25/34.2%	.182	27/27.6%	.658
Referral to nephrologist with GFR<30	1/14.3%	10/76.9%	.005	11/61.1%	.369

Figure 1. Change in performance (rounded to the nearest whole number) of implementing CKD evidence-based guidelines at baseline, following a one year quality improvement intervention and 2 years after the completion of the intervention. NSAID, nonsteroidal anti-inflammatory drug; ACE, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; Hb, hemoglobin; PTH, parathyroid hormone; Phos, phosphate; Vit D, vitamin D.