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The case studies to follow are four windows into our dynamic and leading-edge practice operating in Owensboro, Kentucky. Thanks to our adoption of health information technology, specifically our electronic health record system Praxis EMR, our clinic now provides world-class medical care to an underserved rural community well out of reach of major medical centers.

Since adopting our EHR in 2008, we have seen incredible improvements in the quality and impact of the care we provide to our patients. This year has been a watershed year for us, garnering Jeremy Bradley MD, PSC more recognition than any other year to date, and indeed more than we ever thought possible. This last year alone, we were:

- Honored by Bridges to Excellence (BTE) with three national awards, including Chronic Diabetes Management, Hypertension Management, and the Physician Office Systems Award, which recognizes leading-edge use of information systems in a clinical setting
- Became the first ambulatory clinic in the State of Kentucky to earn Patient Centered Medical Home (PCMH) status from the National Committee for Quality Assurance
- Rated a 5-Star Physician of Excellence by Health Grades in 2011 and 2012
- Reader's choice award winner for Best General Practitioner in our local newspaper
- Attested to Stage 1 Meaningful Use
- Increased patient intake by 28%
- Increased revenue by 45%
- Achieved EHR return on investment of over 200%

We hope our story will serve as a roadmap to clinics nationwide and inspire doctors to take steps to develop health information technology. With the right planning and guidance, and some good old-fashioned hard work, you too can transform your medical practice.

Healthcare IT offers endless opportunities to vastly improve the quality, efficiency, and profitability of your practice. Further, it makes practicing medicine more fulfilling than ever. It is our sincere hope that the ideas, steps and lessons learned in the case studies to follow will help you take your practice to a new level of medical quality and professional satisfaction. If we did it, then you can too!

Thank you,
Jeremy and Kerri Bradley

Case Study 1: Return On Investment

National Priorities Partnership Goals:

- Improve health of the population
- Ensure patients receive well-coordinated care across all providers, settings and levels of care
- Safety: improve liability and eliminate errors wherever and whenever possible
- Remove waste and achieve effective, affordable care

Thanks to the implementation of electronic health records, our clinic in rural Kentucky offers patient care that meets or exceeds that of most major medical centers in the nation. The implementation of Praxis EMR in our clinic has yielded an outstanding return on investment, both in terms of concrete financial gains and in unprecedented quality of care. Following a careful research process and a gradual implementation process, we moved from a completely paper-based office environment to a virtually paper-free office in less than six months. Our EHR has yielded us a 45% increase in income and a 277% return on investment. Further, the value of improvements made in quality of care, office efficiency, and staff and patient satisfaction are beyond estimation.

1. Background Knowledge

Dr. Jeremy Bradley's Family Practice clinic opened its doors in 2000 to meet the clinical needs of an underserved community in rural Kentucky. With a population of 50,000 and a surrounding area of 250,000, Daviess County is a federally designated primary care physician shortage location. Dr. Bradley, a native Kentuckian, established our clinic with the mission to deliver the high-quality, efficient, and affordable health care to this community.

Today, our clinic employs one physician, a nurse practitioner, and a physician assistant, and is co-owned by Dr. Bradley and his wife Kerri Bradley. 50% of patients are covered by private insurance, while 40% are Medicare beneficiaries, 8% are uninsured or pay privately, and 2% are on Medicaid. The clinic provides annual wellness exams to children and adults, along with customized chronic disease management, acute care services, radiology services, an in-house laboratory, EKGs, stress testing, PFTs, joint injections, and minor surgery procedures. Our clinic currently serves more than 9,000 active patients.

2. Local Problem and Intended Improvement

In 2008, Daviess County experienced a shortage of healthcare resources due to the retirement and relocation of several primary care physicians. As a result, patients were forced to travel outside of the area to seek basic clinical services. Dr. Bradley made the decision to increase the patient volume of our practice to meet the growing needs of the community. He knew that in order to serve more patients while maintaining quality of care and staff well-being, implementing an electronic health record was the next critical step.

In addition, our paper-based office was running the risk of becoming unsustainable. Our dictation-transcription workload was increasing exponentially, and the cost of transcription had increased dramatically as well: it was sometimes taking weeks to receive completed office notes. As a result, our office staff suffered a serious backlog in scheduling procedures, making referrals, and conducting authorizations with insurance companies. As in most paper-based offices, the time that clinical and office staff were wasting on inefficient paper-based tasks was sapping our limited resources and needed to be addressed immediately.

Nothing is more frustrating to a dedicated medical professional and devoted clinical team than having work held back due to delays in documentation. We knew that implementing an EHR in our office was the next necessary step to providing the quality of medicine we all feel so passionately about. As a medical clinic, and as community members, we wanted to rise to the challenge of health care needs in our county and begin accepting new patients, with the aim of increasing our active practice base from 7,000 to 9,000 patients.

We established three clinical objectives to measure success throughout the EHR implementation process: positive feedback from patients and staff; quality care measures from outside entities; and improved financial outcomes.

3. Design and implementation

Research: Our clinic was committed to conducting careful EHR research in order to find the best fit for our practice. We spent several months researching different EHRs, reading reviews, and speaking with other doctors. EHRs that were primarily designed for larger clinics were immediately excluded from our search, as were those that rated poorly on the AAFP's annual survey. This survey was a particularly important resource, as it is a large survey that collects feedback from doctors with similar clinical needs to ours. We demoed three finalists, and ultimately decided on Praxis EMR from Infor-med Corporation as our EHR of choice. The most important factors in our final decision were usability and customizability. Our chosen EHR was highly ranked in physician user satisfaction, as well as in technical support and training.

Even more importantly, Praxis EMR is not template-based. This allowed for limitless customization: we directly imported physician knowledge and adjusted the system to our unique office workflow. In particular, our EHR learns practice protocols written by the physician (e.g. certain regular tests for diabetic patients) and remembers them for all future cases. As will be seen in the case studies to follow, the possibilities of our EHR are endless. Building our own custom tools and practice advisories has been key to our success.

Purchase: Our EHR immediately put us in contact with the appropriate local hardware vendors, and we worked with them to purchase and install all of the necessary additional components. We contracted a local IT company to purchase the hardware and install an office network based on Praxis specifications. Our EHR's Implementation Department worked directly with our staff and the IT team to install the system in a matter of days.

Implementation: Our clinic developed a strategy of gradual and systematic implementation to minimize the "heartburn" of moving away from paper charting. We made sure to provide a lot of encouragement and support to employees, and to recognize the extra effort required to learn the new system. Dr. Bradley and Kerri were trained directly by our EHR's training team for two weeks, and then all staff began training.

Our staff began by entering a small number of encounters electronically each day, using just seven workstations. We scanned in patient charts the day before each patient's scheduled appointment. While we began with only 10-15 visits a day, we committed to using the EHR immediately for 100% of phone messages, appointments, and refills. In 6 weeks, we were documenting 100% of patient encounters electronically, and were back to seeing a full patient load.

We quickly moved on to interfacing Praxis with in-house equipment and laboratories. Further, as discussed in the following case studies, we gradually implemented networks with outside entities and wrote new practice advisories that allowed us to practice better preventative care. We committed to using our EHR for all of the "basics" as soon as possible, and then continually learned and developed new tools. This gradual process ensured that all staff members were comfortable and proficient in their existing responsibilities before moving on to new ones.

4. How was Health IT Utilized?

The office is now actively using the vast majority of our EHR's features, including:

- **Intra-office messaging (agents):** Praxis allows direct and instant communication between all personnel utilizing a system of alerts. These alerts keep messages from being lost, eliminate searching for charts, and allow for better handling of patient requests. Examples include healthcare maintenance reminders, lab and diagnostics reminders, imaging reminders, and office workflow reminders.
- **Fast Rx and ePrescribe**: Our automatic prescription and refill features save our staff hours a week in phone calls to pharmacies and consistently catalog all prescriptions. The system enables automated prescription management and alerts for all drug contraindications.
- **Automated forms**: These forms are automatically generated for office tasks too numerous to list, including sending referrals, excuse notes, and medication instructions.
- **Clinical Practice Guidelines** (see Case Studies 2 and 3): The Praxis EMR system has an incredible query and practice guideline generator. We have built custom practice advisories to manage all aspects and facets of patient conditions, eliminating medical error by virtually 100%.
- **Interfaces** (see Case Study 2): We interface with our billing company, internal and external labs, the local immunization registry, and the local hospital.
- **Automated coding and superbills:** Our EHR has automated CPT, ICD-9, and E&M Coding, which has eliminated under-billing and optimized Levels of Service.

5. Value Derived/Outcomes

During our planning process, we developed three key quality indicators: positive feedback from patients and staff, quality care measures from outside entities, and improved financial indicators. Our practice succeeded dramatically in these areas and more:

Patient and staff satisfaction: Our patients are very satisfied with our practice, and not one week goes by when we do not have someone's spouse, child, or friend calling to register as a new patient. Our increased office efficiency allows us to accept patients that would have otherwise been forced to travel to seek primary care. Within a year of implementation, we increased patient volume 28% from 7,000 to 9,000 patients. Even with an increase in patients, waiting room time and during-visit wait time has been reduced by over 80%.

We conducted a patient satisfaction survey before and after EHR implementation, and the results showed that our patients are very satisfied with all aspects of our practice, particularly in regards to receiving chart notes, prompt responses to phone messages, disease-specific material, referrals, and efficient scheduling (see Appendix 1b).

At first, our staff struggled with the concept of not having a paper chart in their hands. Now they can't and won't live without our EHR. As Stacy Logsdon RTRM says, "I don't know how we did it before Praxis!" Our EHR allows staff to do better work, and they truly feel more fulfilled. Implementing our EHR opened our eyes to office inefficiencies that we quickly and happily

eliminated. The office stress level has been greatly reduced: completed charts, patient referrals, preauthorization and refill requests are all automatically sent. Access to patient information is instant: charts can be opened from any connected computer, anywhere. This includes offsite access via an encrypted virtual private network (VPN) to access patient information when providers are out of the office.

Our clinic returns all phone calls before the end of the day. Staff is also able to prioritize which messages need to be dealt with first using Praxis category and urgency labeling. Storing all patient information electronically has drastically decreased billing errors and insurance rejections, and has resulted in quicker and fuller reimbursement. Most importantly, all of these efficiencies leave us more time for what really matters: our patients. Our staff spends less time on paperwork and more time providing people with personalized attention.

These efficiencies have allowed us to use our EHR better and better. Less stress and reduced workload allowed Dr. Bradley to continue improving our EHR by creating practice advisories and other tools to better manage patient care. These will be discussed in the case studies that follow.

Quality care measures from outside entities: Our practice received immediate recognition from several insurance companies during on-site visits for our use of an EHR in a rural setting, including Anthem, Humana, United Healthcare, and Community Care Network. After a review by our malpractice carrier, our work was further rewarded with a 15% decrease in our annual malpractice premium. We have received bonuses for eprescribing and have been honored by United Health Care as a cost-effective clinic. Dr. Bradley was recently recognized by HealthGrades as a Five-Star Physician. In addition, our clinic attested for Stage 1 of Meaningful Use this year and has received payment. Our EHR made achieving Meaningful Use easy and effective: see Case Study 2.

Improved financial indicators: As seen in Appendix 1, the financial benefits of implementing our EHR have been tremendous, resulting in a 45% increase in overall revenue. See Section 7 for further information.

Improved clinical quality: The improvements in our quality of care have been significant: they are outlined in Case Study 2. Most importantly, Dr. Bradley now spends 75% more of his time with patients. On average, the time he spends with patients per visit has increased by 20%. This has improved patient-physician relationships and bedside manner, and given him the opportunity to implement practice guidelines. Overall, our patients are happier and healthier.

6. Lessons Learned

Use trusted sources: We made sure to turn to trusted resources when researching our EHR, including fellow doctors, reviews, and surveys.

Watch/do the demos: Many EHRs appear almost identical when comparing their lists of features and capabilities. However, dramatic differences exist in how EHR programs are laid out and in how they run. Take the time to watch detailed demos of the products you are most interested in, including demonstrations of both routine and complicated clinical tasks, and tasks for both physicians and office staff. This research will ensure that the EHR you choose works best for you.

Make your decision as a team: We consulted everyone in our office during our EHR research. We made careful prioritized lists of the needs of each of our staff members, including physicians, assistants, office staff, and billing specialists, and sought EHRs that best met the needs of each position. Everyone in the office gave feedback on the EHRs they tested and everyone weighed in on our final decision. As a consequence, our staff remains happy and very engaged with all of our Health IT tools.

Implement gradually: We knew that if we moved too quickly, the transition to electronic health records could be a traumatic process. We made sure to set goals that our office could achieve, both daily, weekly, and monthly. Scanning patient records as they came in for appointments allowed us to gradually move all records to the EHR.

Make patients part of the process: We made sure that our patients understood our transition to electronic medical records and the implications it would have on their quality of care. Through open communication, our patients became part of the process, offering observations and encouragement. Overall, our transparency increased patient satisfaction.

Deal with experienced and responsive companies: The fast response times of both our EHR and IT companies made for smooth implementation and a more comfortable transition. Praxis Live Support was available instantly, and often solved small problems in a matter of minutes. Our IT team is local, and very timely and attentive to our needs. This was crucial in the early days when we were very dependent on technical support: we would have lost hours, even days, to delays if our support team had not been so prompt.

Develop a business plan in advance: Thanks to a well-defined business model that was developed months in advance of implementation, our office went from 100% paper-based records to 95% paperless in six months. The most important lesson here is that proper planning increases the likelihood of success.

7. Financial Considerations

The 2008 purchase and implementation of our system was entirely self-funded: we used no outside funding sources or grants. The clinic had a $100,000 line of credit with a local bank, and we budgeted $45,000 of that amount to purchase software, hardware, and technical support. Thanks to the reductions in cost following EHR implementation, the office was able to repay the line of credit in less than two years.

After implementation, our practice saw an immediate reduction in operating costs (see Appendix 1a and 1c). We saved $1300 a month in transcription costs and office supplies. In addition, we saw a 15% reduction in our malpractice premium. Because the front desk personnel can now verify insurance information before each patient is seen, we have reduced our amounts receivable by ten days (about $12,000). We decreased overhead by ½ FTE, and were able to retrain our full-time medical records employee: she now does phlebotomy four days a week instead of working on medical records four and a half days a week, saving us from hiring a full-time phlebotomist for $25,000. We also bill an additional $3,000 in lab volume each month.

Further, we began to increase patient intake almost immediately, and the effect on our quarterly earnings was dramatic. Overall, we have experienced a 45% increase in revenue and achieved an ROI of 277% in one year (see Appendix 1a and 1d).

However, these cost savings are nothing in comparison to the value of vast improvements in the areas of office efficiency, staff and patient satisfaction, and the new possibilities for patient care. The exciting new capabilities made possible by our EHR are discussed in the case studies that follow.

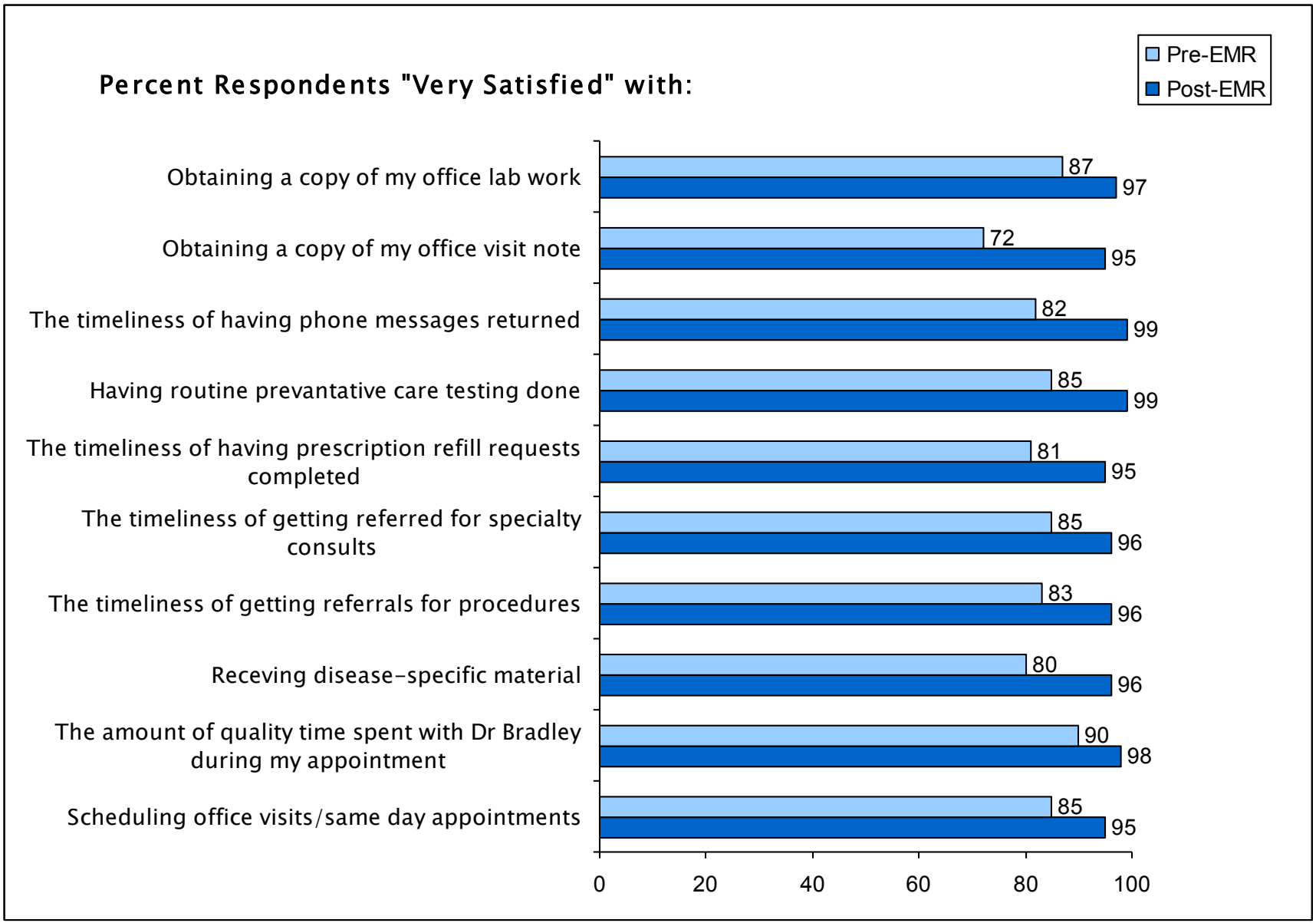
APPENDIX 1a: ROI

INCREASE IN REVENUE	
Average Quarterly Revenue 2008 (pre-implementation)	$240,255
Quarterly Revenue Q1 2012 (post-implementation)	$349,370
Increased quarterly revenue	**$109,115**
% **revenue increase**	**45.42%**

INVESTMENT	
EHR Software	
EHR software (licenses for providers, users)	$15,000.00
Related software (Oracle database)	$600.00
Interfaces	$3,250.00
Yearly formulary fees	$240.00
Hardware	
Local servers	$4,000.00
EHR workstations	$14,000.00
Networking equipment/labor	$1,500.00
External equipment (T1 lines, internet)	$1,200.00
External services (backup)	$350.00
Additional Costs	
Training	$0.00
Networking	$3,250.00
Technical Support	$1,200.00
Server software (remote access, ASA, etc)	$950.00
High speed scanner rental for 6 months	$1,200.00
TOTAL Investment	$46,740.00

RETURN	
Paper Chart Cost Savings (Yearly)	
Reduction in transcription costs	$14,400.00
Malpractice reductions	$6,000.00
Reduction in paper chart supplies	$8,000.00
Reduced need for paper chart space and storage	$1,200.00
Reduced need for lab technician to print results, pull charts	$9,792.00
Staffing Savings (Yearly)	
Reduction in overtime hours paid	$18,000.00
Reduced need for administrative assistant	$1,080.00
Staff reduction: 1/2 FTE	$12,000.00
Increased Collections (Yearly)	
Increased collections for providers	$20,000.00
Reimbursment from ePrescribing	$4,456.38
Change in level of service billing	$10,000.00
Other	
Time and supplies saved with insurance card scanner	$6,864.00
Meaningful Use Stage 1 incentive payment	$18,000.00
TOTAL Return	$129,792.38
Return On Investment (one year)	277.69%

Appendix 1b: Patient Satisfaction Survey, Pre- and Post EHR Implementation



Appendix 1c: Cost Savings from Workflow Efficiencies

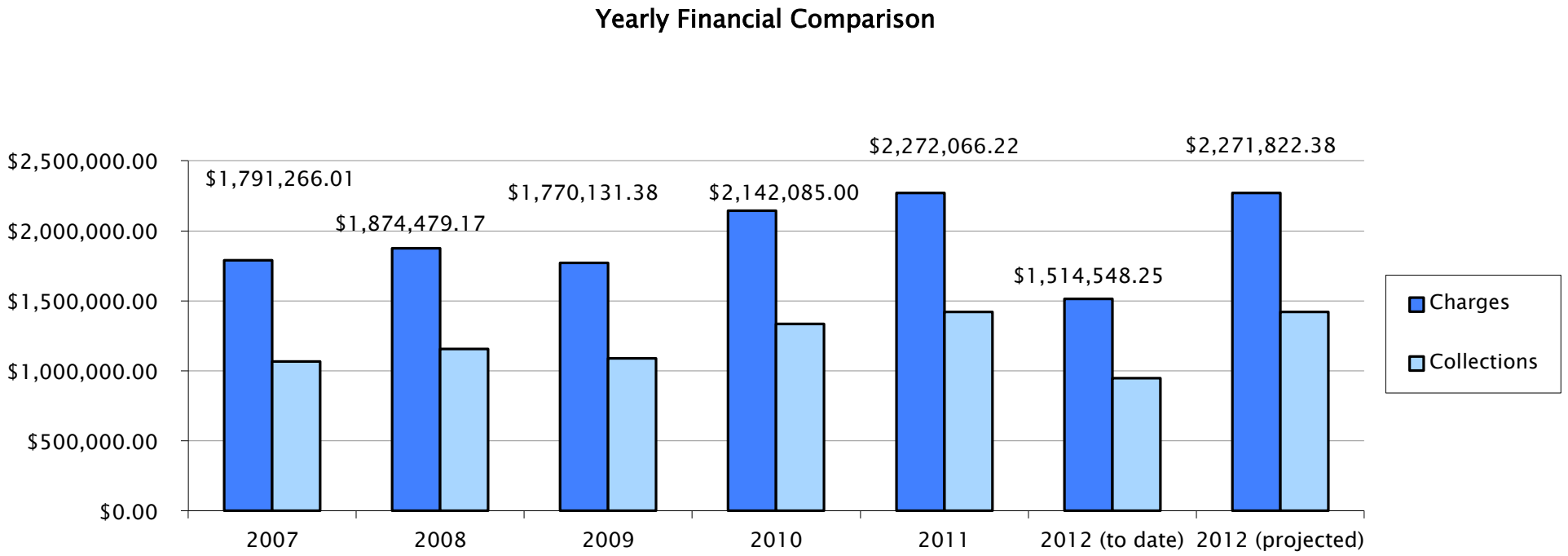
	Pre-EHR		Post-EHR	
Insurance Card Scanner Interface (Receptionist at $12/hr)	**Monthly**	**Yearly**	**Monthly**	**Yearly**
Inputting card information in PM system	$279	$3,341	$279	$3,341
Photocopying cards	$139	$1,670	$47	$560
Finding/pulling charts/filing	$240	$2,880	$0	$0
Replacing charts	$240	$2,880	$0	$0
Total	$898	$10,771	$326	$3,901
Total yearly savings	$6,870			

	Pre-EHR		Post-EHR	
Lab Interface (Lab technician at $17/hr)	**Monthly**	**Yearly**	**Monthly**	**Yearly**
Printing lab results from LIS system	$272	$3,264	$0	$0
Finding/pulling chart/filing	$272	$3,264	$0	$0
Replacing chart	$272	$3,264	$0	$0
Total	$816	$9,792		
Total yearly savings	$9,792			

	Pre-EHR		Post EHR	
Phone Messages (Assistant at $15//hr)	**Monthly**	**Yearly**	**Monthly**	**Yearly**
Finding/pulling charts	$300	$3,600	$0	$0
Recording message information	$900	$10,800	$600	$7,200
Replacing charts	$300	$3,600	$0	$0
Total	$1,500	$18,000	$600	$7,200
Total yearly savings	$10,800			

Total Savings From Workflow Efficiency **$27,462**

Appendix 1d: Yearly Financial Comparison



Case Study 2: Clinical Value

Ambulatory National Patient Safety Goals

- Improve accuracy of patient identification
- Improve the safety of using medications
- Reduce the risk of healthcare-associated infections

National Priorities Partnership Goals:

- Engage patients and families in managing health and making decisions about care
- Improve health of the population
- Ensure patients receive well-coordinated care across all providers, settings and levels of care
- Safety: improve liability and eliminate errors wherever and whenever possible
- Remove waste and achieve effective, affordable care

As a designated Patient Centered Medical Home, our clinic brings good old-fashioned medicine into the future with patient-focused medical care and the use of exceptional technology. The key to this patient-centered focus, and to the subsequent increase in clinical value, has been the development and expansion of practice advisories within our EHR. These tools, unique to our clinic and built by Dr. Bradley and staff, monitor patient conditions in a more comprehensive, nuanced, and consistent way than any paper-based system would allow. By constantly testing and improving these advisories, our clinic combines Health IT and patient attention and provides care of higher clinical value than ever before. Our clinic successfully attested to Meaningful Use this year, achieving 100% scores in almost every category.

1. Background Knowledge

As seen in the previous case study, Praxis EMR allowed us to automate countless tasks in our practice, leaving staff more time to focus on patients. This office efficiency, however, was nothing in comparison to the increase in medical quality we have achieved.

According to the Institute of Medicine, medical quality is "the degree to which health care systems, services and supplies for individuals and populations increase the likelihood for positive health outcomes and are consistent with current professional knowledge." Under this definition, adopting and continually developing an EHR is one of the most effective steps a clinic can take to advance medical quality. Praxis EMR does this particularly well: as you will see in this case study, we have selectively customized the tools and practice guidelines of our EHR to consistently maximize positive health outcomes.

2. Local Problem and Intended Improvement

In addition to concrete quality metrics, we had another focus when developing our EHR to improve clinical value. Our clinic seeks to be the most effective community resource possible, and we want our patients to receive the best health care possible. However, it is not enough to provide outstanding treatment within our own clinic. We want to ensure that our patients are getting the best care even when there is a transition of care to another clinician or facility. For this reason, we quickly moved to interface with other local institutions. This included connecting to other clinics, the local hospital, and the state's immunization registry, as well as opening a web-based patient portal that allows our patients to access their information and communicate with our office online. Connecting to other resources in the region allows us to better support our patients, wherever they are receiving care.

3. Design and implementation

As a highly flexibly electronic medical system that does not use templates, Praxis EMR allows us to customize every aspect of our clinic and patient flow. We have taken advantage of this unique adaptability to progressively advance clinical quality in our practice.

Custom clinical practice guidelines: Our push to improve clinical quality hinged on clinical practice guidelines. As part of our initial training, our trainer taught our staff not only how to use our EHR's existing features, but how to build and customize practice guidelines and alerts. After basic training, our staff moved immediately to build the alerts that monitor the most relevant conditions and indicators in our practice (e.g. hypertension and diabetes). Our EHR trainer supported Dr. Bradley in building and testing the first few alerts, but within a week Dr. Bradley was building his own.

These clinical practice guidelines (CPGs) are reminders to providers to schedule patients for routine preventative maintenance procedures. CPGs are activated based on the patient's age,

gender, and medical conditions. Our office has developed a vast number of CPGs, including reminders for mammograms, PSAs, colonoscopies, and monofilament testing for diabetic neuropathy, to name just a few.

Lab interface: Our clinic had been working with an internal lab system before installing our EHR. After installation, we worked with Praxis and our lab provider to create an interface between the two systems. Support personnel from our EHR worked with us to test and customize the interface, and it was running in a matter of weeks. Since that time, we have added other interfaces with external lab systems. Our clinic is prepared to automatically import lab results and other information from any external laboratory system we encounter.

Immunization interface: When implementing our EHR, we knew that we wanted to connect with other health resources in our area, such as the Kentucky Immunization Registry. We contacted the Registry directly, submitted our information, and set up an interface. Less than 5% of doctors in Kentucky use the registry as part of their daily practice. Our interface allows us to see the immunization information of all of our patients. We have built corresponding alerts and practice advisories into our EHR, reminding us to provide vaccinations or take other steps whenever a patient presents with certain given criteria. For instance, when a healthy baby of a certain age arrives at the clinic, the system will review the immunizations the baby has already received and alert staff to provide him with all appropriate scheduled vaccinations. In another example, we have set up a practice advisory so that all smokers over the age of 18 receive a pneumonia vaccine per CDC recommendations.

It took about two weeks to build the series of practice advisories that connect to the immunization registry. They were built directly by Dr. Bradley and staff, with no further training or support needed from trainers.

Local hospital interface: Another step we promptly took upon installing our EHR was to connect to the local hospital and implement a record exchange. The hospital in our area uses a different EHR system. We contacted our EHR, who quickly fine-tuned an interface between the two systems. Our staff can log into the hospital system and submit orders on our patients when they are in the hospital, or order outpatient tests. Lab results and other results are immediately sent from the hospital to our clinic, and our patient's charts are automatically populated within our EHR.

Patient Portal: As a final piece of support technology for patients outside the clinic, we worked with Praxis to create a custom patient portal. Patients can log into our patient portal to see their lab results, past and upcoming appointments, and alerts to make an appointment if necessary. Patients can also ask questions and schedule appointments through the portal. This information is sent instantly to staff, who respond accordingly by immediately viewing the patient's chart.

Meaningful Use: Our clinic attested to Stage 1 Meaningful Use this year, utilizing many of the customized population management metrics and practice advisories we had built for our clinic. In addition, Praxis has developed built-in protocols for all 15 of the Meaningful Use Core Quality Measures, as well as the additional Menu Set Quality measures, and provides them to users at

no additional cost. Overall, attesting to Meaningful Use was a quick and stress-free process, thanks to our existing practice management tools.

As is clear in Appendix 2b and Appendix 2c, our clinic easily surpassed every Meaningful Use benchmark, achieving 100% scores in almost every category. We received our Meaningful Use incentive payment and already have the mechanisms in place to seamlessly attest to Stage 2 Meaningful Use in 2014.

4. How was Health IT Utilized?

Custom practice advisories were built to monitor the following conditions and procedures (see Appendix 2):

- Blood pressure control
- Complete lipid management
- Use of aspirin
- Diabetes screening tests
- Diet/physical activity
- Appropriate medication/utilization
- Kidney function testing
- Smoking status and treatment advice
- Mammograms
- PSAs
- Colonoscopies
- Monofilament testing for diabetic neuropathy

The following EHR interfaces allowed us to enhance quality of care immediately:

- In-house interfaces:
    - In-house lab results are directly imported into the EHR
    - Stress tests and ultrasound reports are generated with the EHR
    - EKGs, spirometry, and bone density reports are scanned directly into patient charts, to be accessed at any time
    - Insurance card scanner streamlines patient intake
- External interfaces:
    - Interface with local hospital system
    - Interface with Kentucky Immunization registry
    - Interface with local radiology group
    - Patient portal

5. Value Derived/Outcomes

Improved monitoring of quality of care metrics: The American Board of Family Medicine analyzed our clinic's treatment of a number of crucial quality care metrics and compared our performance to that of other clinics. As you can see in Appendix 2a, we were already screening 100% of patients for blood pressure, HDL/LDL, and smoking cessation before testing even began. Our clinic also surpasses our peers in the areas of blood pressure and cholesterol control measures (see Appendix 2a).

The Praxis query engine enables us to monitor quality indicators and report them to regional and national agencies for review, as well as maintain internal quality control (see Appendix 2 and 3). The query engine can pull any data from any patient's chart quickly and easily. In addition to building practice advisories, our clinic also builds its own queries to track clinical success. Of particular note, our practice has over 330 diabetic patients and we have successfully screened them 100% of the time with annual HbA1Cs, lipid panels, and urine microalbumins, placing us well above the state and national benchmarks for quality.

Patient Safety: Since implementing our EHR, our patient safety has improved dramatically. We continually perform chart audits for medication reconciliation and for allergy list management. When using paper charts, we reached 92% accuracy for medications, and 90% accuracy for managing allergy lists. We now score 100% in each category. In short, medical error has virtually been eliminated in these critical areas due to our EHR.

Improved immunizations: Since implementing the interface with the immunization registry, 100% of patients who come to the clinic are screened for immunizations, and appropriate steps are taken to provide missing immunizations.

Patient satisfaction: Most importantly, we have received overwhelming positive feedback from patients about our interfaces with the hospital and the immunization registry and about our new structure for monitoring clinical quality metrics. Several patients have told us that our clinic gives them a "looked-after" feeling: whether they are at the clinic or the hospital, it feels as if everyone taking care of them is on the same page, and they don't have to start from scratch when transitioning from one care center to another.

Our community has embraced us: we have received the Reader's Choice Award for Best General Practitioner from our local newspaper for the last three years. In addition, Dr. Bradley has been rated as a 5-Star Physician of Excellence for the past 2 years by HealthGrades, a nationally renowned physician rating service that gives awards based on patient satisfaction surveys as well as other indicators of quality.

Provider satisfaction: We are fortunate to work with an EHR that makes it easy to continuously enhance our system by adding new tools. These tools are developed periodically by Praxis itself, but we create many of our own as needed. Because we have built so many of the EHR features we use in our clinic, we feel a true sense of ownership over and connection to our Health IT tools. It is hard to overstate the sense of professional fulfillment and satisfaction that comes from working with a system that has been built for your unique practice. Everything

about our EHR is customized to our clinic, from the layout and wording of every chart and condition, to the way labs print, to the names of every medicine and illness.

PCMH Recognition: This year our clinic was honored by The Health Care Incentives Improvement Institute as the first Bridges to Excellence (BTE) Patient Centered Medical Home (PCMH) in Kentucky. In addition to PCMH status, Dr. Bradley was honored with three BTE Awards, including excellence in Chronic Diabetes Management, excellence in Hypertension Management, and the Physician Office Systems Award, which recognizes leading-edge use of information systems in a clinical setting (see Case Study 3). We have also been recognized by the National Committee on Quality Assurance as a PCMH.

6. Lessons Learned

Take the time to really know your EHR: Despite our busy workloads, it is vital to make time to learn your EHR system and to gain a deep understanding of all of its capabilities. A superficial knowledge of your EHR will get you through your work day, but it won't help you practice better and better medicine. Our clinic was committed to engaging with our EHR from day one, and we have stuck to that commitment ever since. We are practicing medicine in our own language, and the results have been astounding. It is unfortunate to think of how many doctors do the bare minimum with their EHR because they don't think it is worth investing time in it.

Keep your interfaces current: If your clinic chooses to establish new interfaces, it is important to communicate actively with your partner organization to ensure the interface is running with the most up-to-date information. Since interfacing with the Center for Disease Control, for instance, our clinic makes sure to keep up with their latest guidelines. Within the last few years, the CDC began to recommend a second chicken pox vaccine for children at the age of 6. We immediately built this change into a new practice advisory within our EHR, and are now providing the vaccine to 100% of eligible children.

This is a key example of how beneficial it is to work with an EHR like Praxis that does not use standardized templates and allows you to build your own care controls. Had we chosen a number of other template-based EHRs, we would have had to wait for a factory update with new CDC guidelines before beginning to vaccinate 6 year olds for chicken pox. Instead, we were conducting these vaccinations within days of hearing about the policy change.

Minimize changes to workflow: After reflecting on the interfacing process, we should have implemented lab interfaces earlier on in the process of EHR installation and training. We initially thought that it would be best to learn the basic features of our EHR and gradually add other features. However, every time you begin to use a new EHR feature, it has a profound effect on office workflow, and staff must adjust accordingly. For this reason, it would have been smoother and more efficient to being using our EHR's simple lab interfaces as soon as possible.

Choose the right interfaces: There are hundreds of interfaces on the market that can interface with our chosen EHR. We took the time to research which interfaces were both fully functional and improved quality of care and office efficiency.

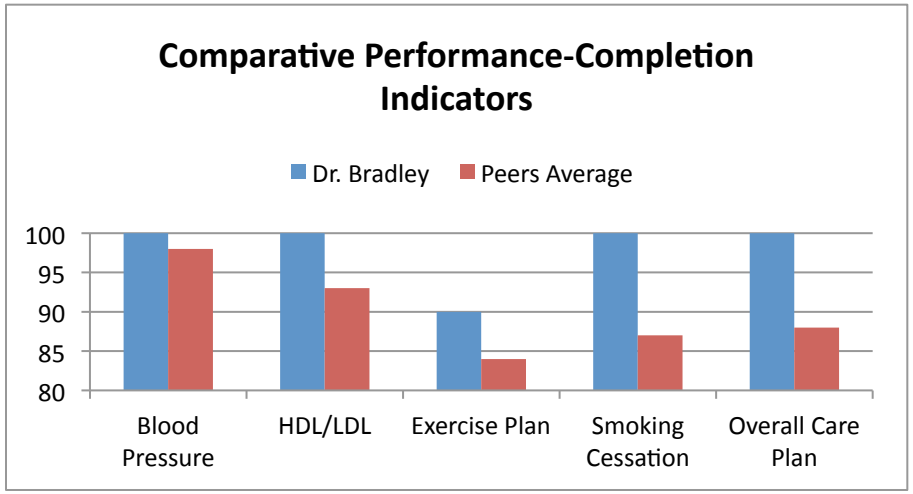
7. Financial Considerations

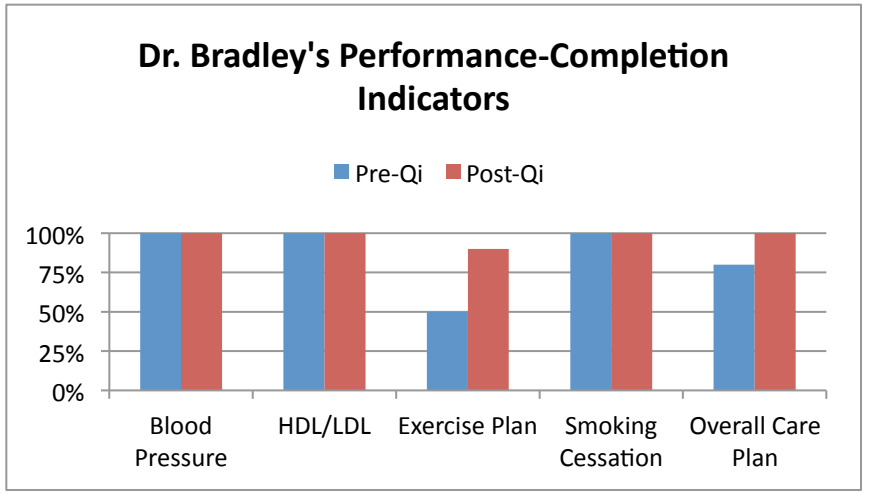
Our interfaces with billing, external labs, Health Information Exchange, the local hospital, and Kentucky Immunization registry were completed at no cost. The interface with our internal laboratory system cost $3,250. However, this onsite laboratory has paid for itself many times over. Aside from this initial interface purchase, no other expenses have been incurred.

The clinical quality CPGs outlined above were all built into our EHR at no extra cost: Dr. Bradley and staff built them as needed. It was critical, of course, to invest a significant amount of time into the development and testing of these tools.

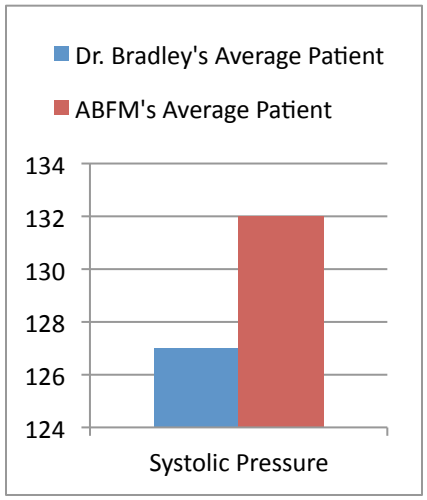
Our EHR is constantly releasing upgrades and new features. Very soon, we will be able upgrade our system with a tool to update to ICD-10 codes. This will eliminate ICD-10 rejections and prevent delayed reimbursements. Be sure to ask your EHR vendor about total costs for your EHR purchase: ask to see a first year as well as a five-year cost timeline. We used this strategy and there have been no financial surprises.

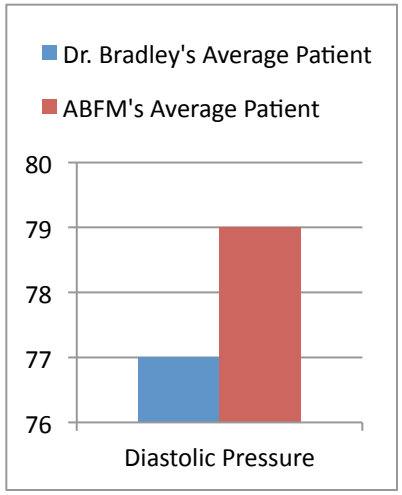
APPENDIX 2a: Clinical Value Indicators by the American Board of Family Medicine

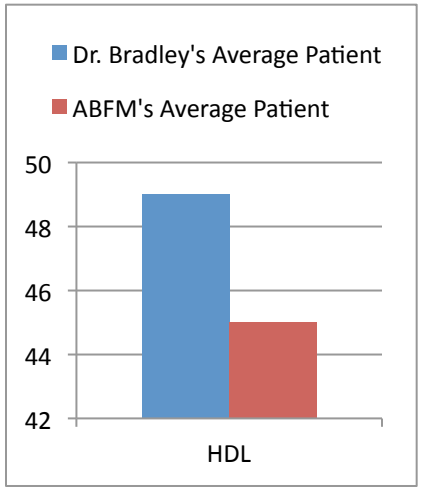


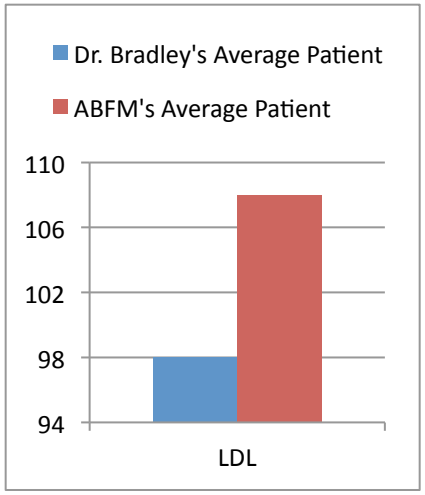


Comparison of Dr. Bradley's Submitted Patients to ABFM Average

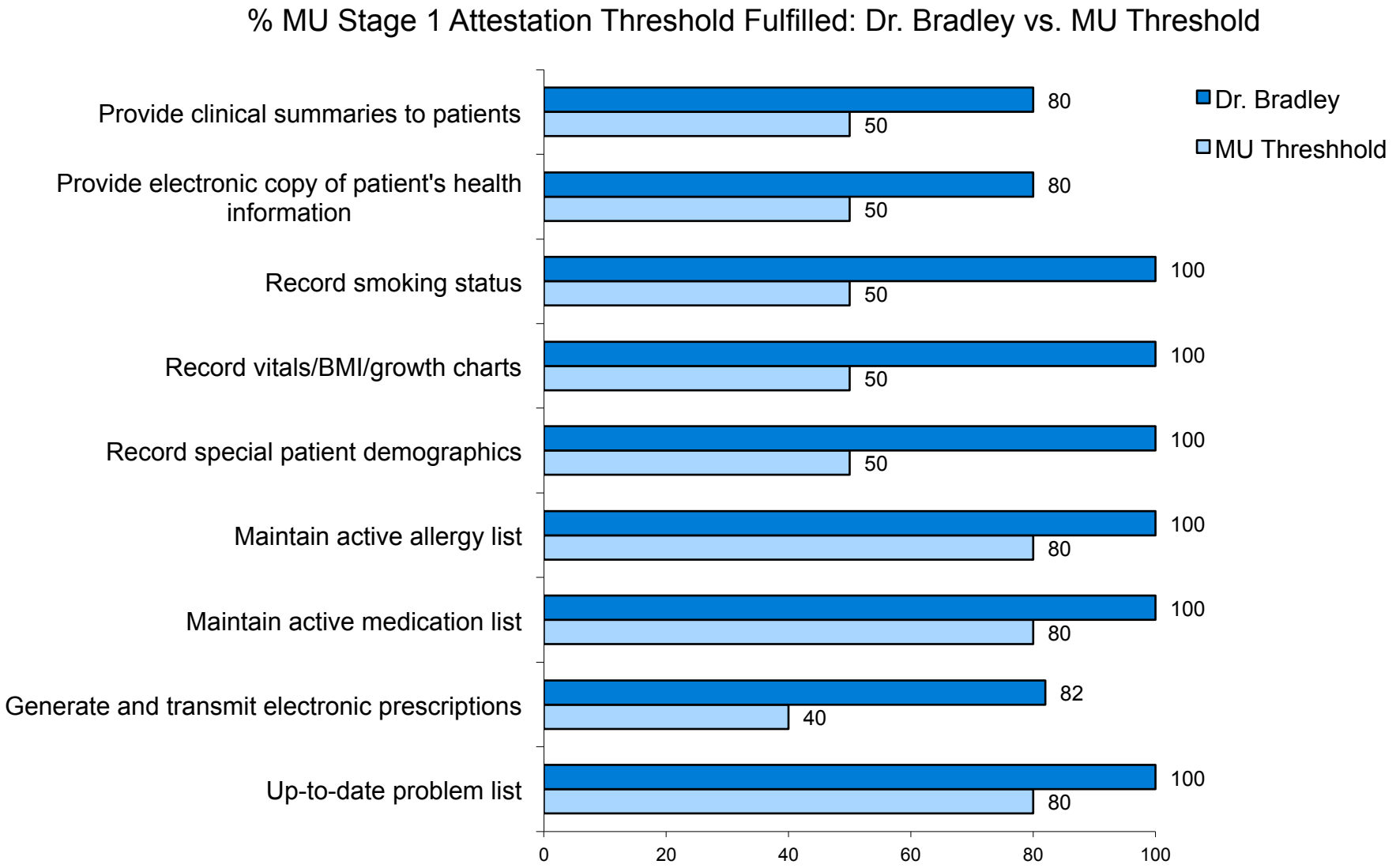








Appendix 2b: Meaningful Use Attestation



Appendix 2c: Meaningful Use Core Measures

Enable the functionality of drug-drug and drug-allergy interactions	✓
Report ambulatory clinical quality measures to CMS	✓
Implement one clinical decision support rule relevant to specialty	✓
Perform at least one test of EHR capacity to electronically exchange information	✓
Review a security risk analysis and implement security updates as part of risk management process	✓
Demonstrate EHR ability to submit electronic data to immunization registry	✓
Incorporate external drug formulary	✓
Incorporate more than 40% of all clinical lab data results into EHR	✓
Generate report listing patients with a specific condition	✓
Provide disease-specific education to more than 10% of patients	✓

Jeremy L Bradley MD, FAAFP

Case Study 3: Population Management

Ambulatory National Patient Safety Goals

- Improve accuracy of patient identification
- Improve the safety of using medications
- Reduce the risk of healthcare-associated infections

National Priorities Partnership Goals:

- Improve health of the population
- Ensure patients receive well-coordinated care across all providers, settings and levels of care
- Improve liability and eliminate errors wherever and whenever possible
- Remove waste and achieve effective, affordable care

The implementation of electronic health records has made our practice a state and national leader in population management. Our clinic has used health IT to maintain close relationships with our patients and better manage their chronic conditions. Our work has gained us recognition as the state's first designated Bridges to Excellence Patient Centered Medical Home, as well as PCMH recognition from the National Committee on Quality Assurance. Since implementing our EHR, our clinic consistently scores well ahead of state and national averages in the maintenance of diabetes, hypertension, and tobacco abuse management.

1. Background Knowledge

The first time we heard about patient centered medical care (PCMH) was during the presidential race four years ago. President Obama talked about a team approach to patient care: care coming not just from the MD, but also from nurses and other support staff. Patients should receive care from an entire family of caregivers. EHRs further advance this concept: they allow doctors, staff, and patients to communicate more effectively than ever. Upon hearing about PCMH, we thought, "this is how it should be done." We immediately began looking for ways to implement this approach in our practice.

PCMH creates a more dynamic, team-based approach to medical care, allowing patients to be more involved in their healthcare decisions. According to the ACP, “The PCMH practice is responsible for providing for all of a patient’s health care needs or appropriately arranging care with other qualified professionals. It is a model of practice in which a team of health professionals, coordinated by a personal physician, works collaboratively to provide high levels of care, access and communication, care coordination and integration, and care quality and safety.”

The advent of electronic health technology offers unprecedented opportunities to practice the PCMH philosophy, shifting healthcare from intervention-based care and towards evaluation and management-based strategies. The capabilities of today’s EHRs make it easier than ever to manage chronic conditions consistently and accurately throughout a clinic’s patient base.

Population management is a key example of PCMH philosophy at work. The potential of PCMH-based care to improve health in areas like Daviess County is especially promising. Because Daviess County is rural and has a relatively small number of healthcare providers, a well-coordinated population management scheme can have a huge effect.

When successful, PCMH care supports the health of an entire community in the most comprehensive and cost-effective way possible. This approach is directly aligned with our clinic’s philosophy, and we continually strive to embody PCMH principles.

2. Local Problem and Intended Improvement

While our practice has constantly sought to exemplify patient centered medical care and to actively manage our patients’ chronic conditions, we wanted to go further. We sought out a national pay for performance program to guide and evaluate our work. We hoped to better develop our tools for treating chronic conditions, and to add even more concrete components to our population management strategy.

As a rural clinic that serves the majority of area residents, population management is particularly important to us. Because we are a community leader in medical services, any steps

we take to manage chronic conditions throughout our patient base have a real effect on our community as a whole. In an area with a population of 50,000, we are directly serving 18% of the population, and many more indirectly.

Our population management strategy springs from the same passion that moved us to implement an EHR: we know that we can profoundly impact the lives of people in our area, and, as one of their few medical resources, we have an even deeper responsibility to provide the highest-quality care.

3. Design and implementation

Bridges to Excellence is a non-profit organization that recognizes and rewards clinicians who deliver superior patient care. We contacted BTE because we wanted to work under a nationally recognized program that uses key quality indicators to ensure delivery of safe, timely, effective, affordable, and patient-centered care. Like BTE, we seek to make significant leaps in clinical quality by implementing comprehensive patient management solutions.

BTE Care Recognition Programs are Clinician Recognition Programs intended to identify clinicians who deliver high-value care to patients with specific chronic conditions. BTE evaluates a number of different chronic conditions. We chose to seek recognition for two conditions: diabetes and hypertension. These conditions present some of the greatest risks in our state and community. According to the CDC, Kentucky has the 5th highest obesity rate in the country, resulting in elevated rates of diabetes and hypertension (see Appendix 3b).

After applying to BTE and receiving their qualifying metrics, we turned to our EHR to look at our clinic's data. Praxis made it easy to find and synthesize all the data needed to qualify for recognition. The system has a powerful query engine that queries all patient charts for any parameters we choose. We instantly had a picture of how well we were fulfilling BTE indicators. While the majority of our existing CPGs helped us meet BTE standards, we did build two new CPGs: urine protein testing and diabetes screening for our hypertensive patients. These CPGs took a matter of minutes to design and implement.

4. How was Health IT Utilized?

Custom practice advisories and health maintenance protocols were built around the following population management metrics (see Appendix 3a, 3c, and 3d):

- HgBA1c control
- Blood pressure control
- LDL control
- Ophthalmologic exam
- Nephropathy assessment
- Podiatry exam
- Smoking status and cessation advice
- Complete lipid profile
- Aspirin use
- Urine protein test
- Annual serum creatine test
- Diabetes screening test
- Counseling for diet and physical activity

5. Value Derived/Outcomes

PCMH Recognition: Our clinic was honored by BTE as the first Patient Centered Medical Home (PCMH) in Kentucky. In addition to PCMH status, we received three BTE Awards, including excellence in Chronic Diabetes Management, excellence in Hypertension Management, and the Physician Office Systems Award, which recognizes leading-edge use of information systems in a clinical setting.

Our clinic screened 100% of our patients for the following conditions and controls, well beyond state and national averages:

- Nephropathy assessment
- Smoking status and cessation advice
- Complete lipid profile
- Aspirin use
- Urine protein test
- Annual serum creatine test
- Diabetes screening test

Most importantly, our work with BTE showed us that our practice advisories really do make our patients healthier. Between 2007 (pre-EHR implementation) and today, the blood pressure, cholesterol, LDL values, and triglyceride levels of our hypertensive patients have dropped significantly (see Appendix 3d). Further, 100% of hypertensive patients are receiving the

preventative care they need (see Appendix 3c). It has been rewarding to see that electronic health technology really improves the overall health of patients.

Living the PCMH philosophy: PCMH recognition is based around the following factors. These indicators were priorities in our practice before working with BTE and before our EHR, but as we have developed our EHR we have truly come to exemplify them:

- **Ongoing relationship with a personal physician**: Because Dr. Bradley finishes 100% of his charting while in the exam room, he has more time to engage directly with patients.
- **Physician-directed medical practice**: Dr. Bradley has personally built and tested all of the population management tools we use daily in the office. These tools truly reflect our clinic's ways of practicing medicine.
- **Whole-person orientation**: The capabilities of our EHR make patients feel better cared-for. Our system allows us to document comprehensive patient histories and to automatically trigger practice advisories based on these histories. In addition, our patients exist for us far beyond the confines of their individual visit: they are part of a population management philosophy that coordinates care for our entire community.
- **Care is coordinated and/or integrated:** Our EHR allow us to work seamlessly with pharmacies, hospitals, and other health providers. In addition, coordination within the office itself is at an all-time high.
- **Quality and safety**: The automatic alerts in our EHR are consistent and accurate. More importantly, they only appear in the exact circumstances to which they apply. As seen in Case Study 2, our medical accuracy is virtually 100%.
- **Enhanced access to care**: Our interfaces with other clinical institutions, as well as the increased amount of face time patients get with Dr. Bradley, have dramatically enhanced access to care, as well as facilitated transitions of care to other facilities.
- **Payment appropriately recognizes the added value**: Our EHR system appropriately incorporates all preventative measures and strategies as well as direct interventions for chronic disease management. This allows our clinic to receive added financial incentives from employers and health plans due to our PCMH recognition and working philosophy.

6. Lessons Learned

Choose a rating organization that will improve your practice: Work with an organization that asks for pertinent data and quality guidelines that make people healthier. We chose to work with the BTE program because the population management metrics they measured were areas in which we truly wanted to improve and excel in our practice. There are many organizations with many guidelines and recommendations, but not all are equally effective in actually improving quality of care (for instance, various organizations have recommended mammograms, then stopped recommending them, then started again. The case of PSAs for men over the age of 50 is similar. We will continue to provide these services to our patients

regardless of changing year-to-year protocol). We were happy to work with a program that challenged us on metrics we believe in.

Improve the conditions that most impact your community: When selecting areas of care in which to improve, make sure to focus first on the areas that most powerfully impact your unique patient population (see Appendix 3b). While BTE analyzes various conditions, our clinic chose to seek recognition for diabetes and hypertension, as they most seriously affect our patients. Now that we have established protocols for managing them, we are seeking new ways to improve and new conditions to address.

Implement and develop your EHR for the right reasons: Overall, do not implement an EHR merely to achieve Meaningful Use, P4P, PQRI or other financial Incentives, or to avoid penalties. Instead, implement an EHR that will help improve your practice of medicine. Specifically, choose an EHR that will: 1) Improve your medical quality 2) Improve your medical documentation 3) Speed up your charting 4) Increase your productivity 4) Reduce your professional stress. Practice quality medicine with your EHR, and the rewards and third party recognition will follow.

7. Financial Considerations

The cost to enroll in BTE was $95 per provider. As discussed in Case Study 2, the custom protocols we built to improve population management were developed with no extra cost to our clinic. We programmed the population management alerts directly into Praxis, and the system immediately began using them for all applicable cases. It was critical, of course, to invest a significant amount of Dr. Bradley's time into the development and testing of these tools.

As discussed in Case Study 2, we successfully attested to Meaningful Use Stage 1 this year, and have received the incentive payment. This payment will certainly help our practice, but to be honest, it is not our only priority. We are currently receiving $2,000 a month from employer and insurance incentives due to our PCMH status, and will continue to do so for years to come. We are far more concerned with long term quality-based incentives than we are with one-time government incentives, which our EHR system allows us to accomplish automatically: our clinic is prepared to attest to Meaningful Use Stage 2 and beyond.

APPENDIX 3a: Population Management Metrics by Bridges to Excellence

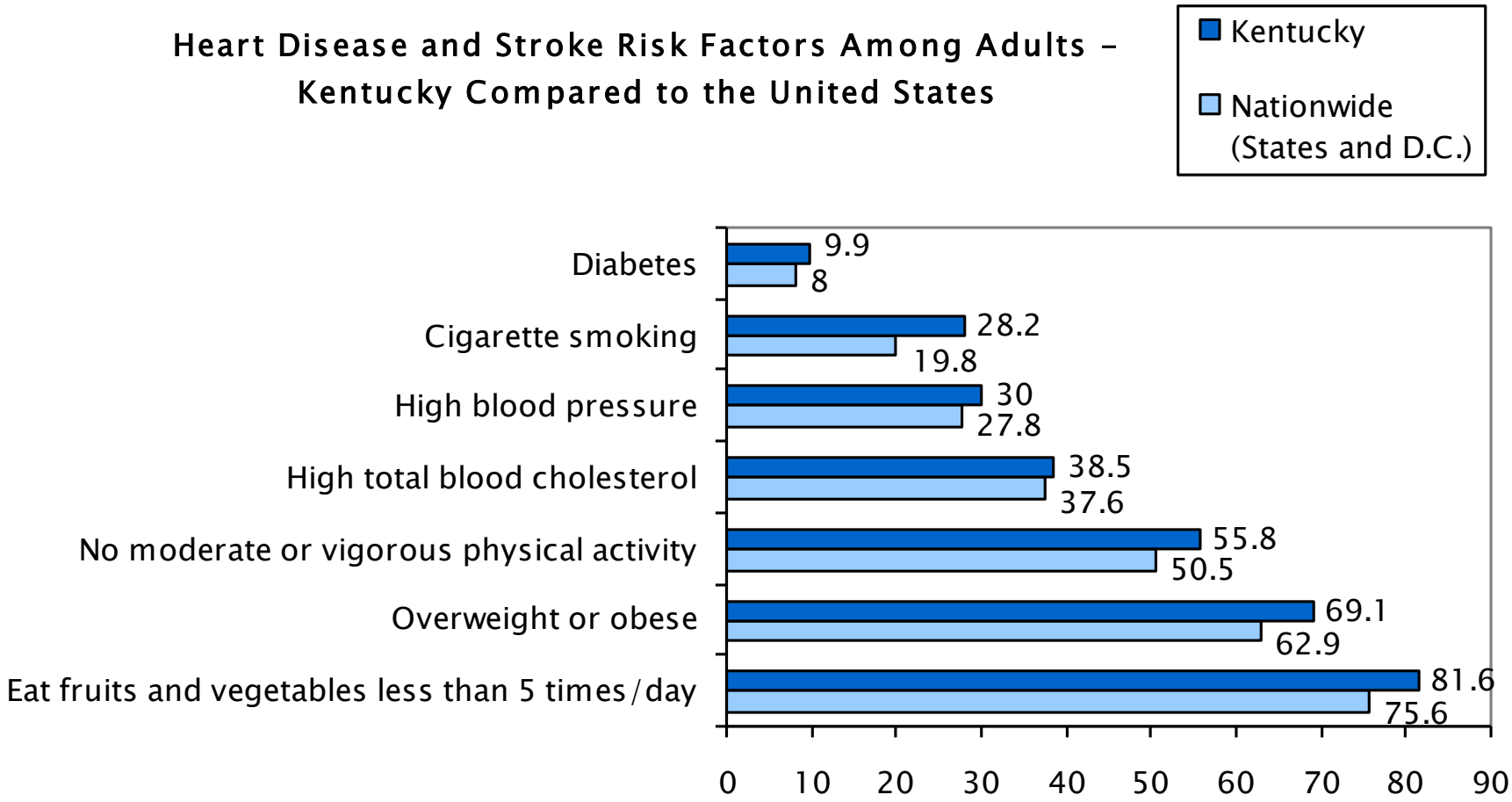
Diabetes Recognition Program: Level 2 for Dr. Jeremy Bradley (2011 - 2013)

Clinical Measures	Threshold	Sample Meeting Threshold	Maximum Available Points	Points Earned
Poor composite measure				
HgBA1c Control	> 9.0	10/25 = 40%	40	24
Blood Pressure Control	>= 140/90			
LDL Control	>= 130 mg/dl			
Superior control measures				
HgBA1c Superior Control 1	< 7.0	12/25 = 48%	5	2.4
HgBA1c Superior Control 2	< 8.0	19/25 = 76%	5	3.8
Blood Pressure Superio Control	< 130/80	17/25 = 68%	10	6.8
LDL Superior Control	< 100 mg/dl	14/25 = 56%	10	5.6
Process measures				
Ophthalmologic Exam	N/A	6/25 = 24%	10	2.4
Nephropathy Assessment	N/A	25/25 = 100%	5	5
Podiatry Exam	N/A	20/25 = 80%	5	4
Smoking Status and Cessation Advice & Tx	N/A	25/25 = 100%	10	10
Total points			**100**	**64**
Points needed to achieve recognition			**60**	**60**

Hypertension Recognition Program: Level 3 for Dr. Jeremy Bradley (2012 - 2014)

Clinical Measures	Threshold	Sample Meeting Threshold	Maximum Available Points	Points Earned
Poor composite measure				
Blood Pressure Control	>= 160/100	0/25 = 0%	30	30
LDL Control	>= 160 mg/dl			
Superior control measures				
Blood Pressure Superior Control	< 140/90	20/25 = 80%	20	16
LDL Superior Control	< 100 mg/dl			
Process measures				
Complete Lipid Profile	N/A	25/25 = 100%	5	5
Aspirin Use	N/A	20/20 = 100%	N/A	N/A
Urine Protein Test	N/A	25/25 = 100%	10	10
Annual Serum Creatine Test	N/A	25/25 = 100%	5	5
Smoking Status and Cessation Advice and Treatment	N/A	25/25 = 100%	10	10
Diabetes Screening Test	N/A	25/25 = 100%	5	5
Counseling for Diet and Physical Activity	N/A	25/25 = 100%	5	5
Total points			**90**	**86**
Points needed to achieve recognition			**54**	**54**

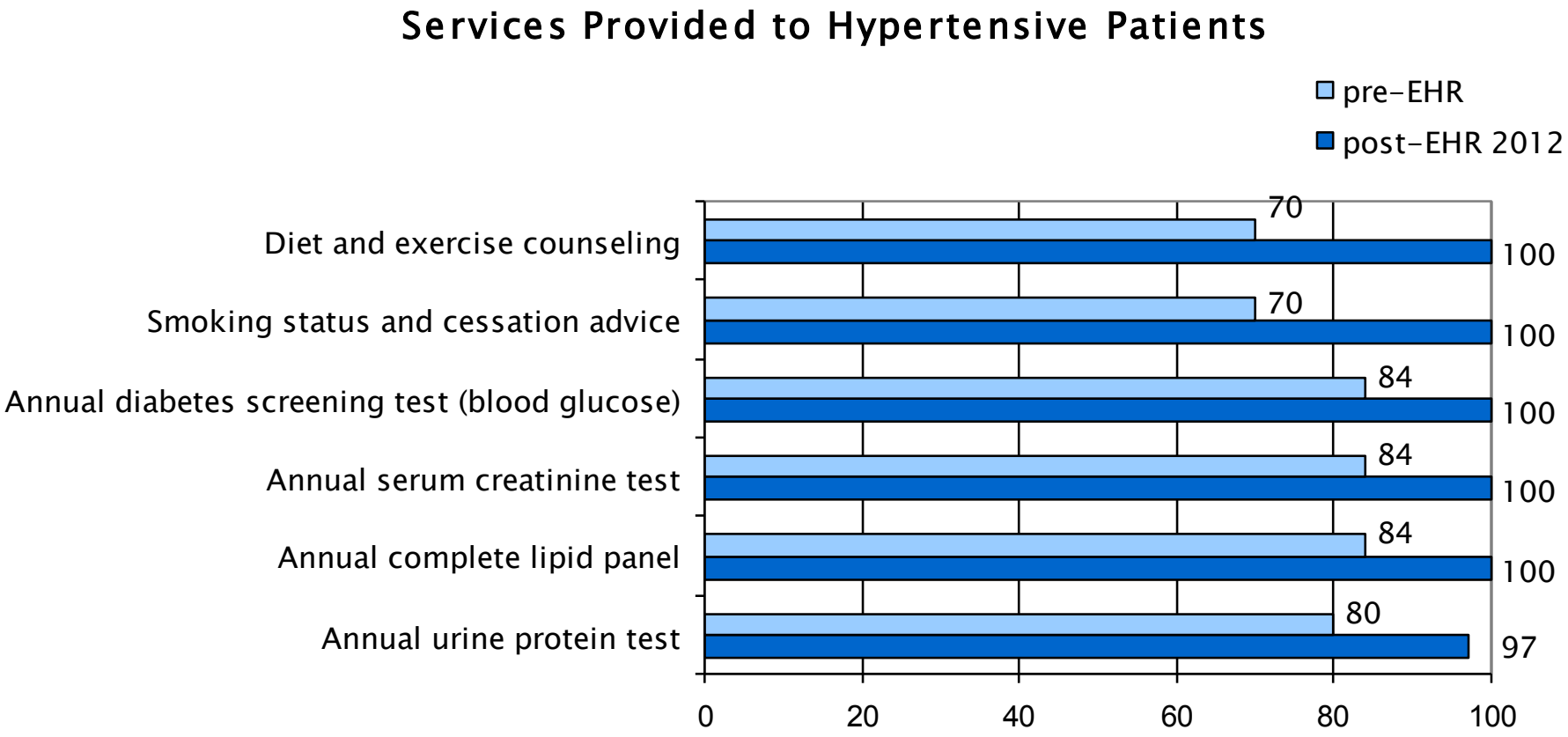
Appendix 3b: Health in Kentucky



Center for Disease Control: 2007 Behavioral Risk Factor Surveillance System

Appendix 3c: Bridges to Excellence Quality Measure Data

BTE Quality Measure Data for 100 Hypertensive Patients Aged 18-75
Pre-EHR 2007 and Post-EHR August 2012



Appendix 3d: Bridges to Excellence Quality Measure Data

BTE Quality Measure Data for 100 Hypertensive Patients Aged 18-75
Pre-EHR 2007 and Post-EHR August 2012

Indicator	pre-EHR 2007	post-EHR 2012	% decrease
Average systolic blood pressure (mmHg)	136	132.3	2.7%
Average diastolic blood pressure (mmHg)	82	70.6	13.9%
Avg. LDL value (mg/dl)	140	101.1	27.8%
Avg. HDL value (mg/dl)	32	43.6	-36.3%
Avg. total cholesterol (mg/dl)	196	177.2	9.6%
Avg. Triglyceride level (mg/dl)	168	151.2	10.0%

Jeremy L Bradley MD, FAAFP

Case Study 4: Disaster Planning and Preparation

National Priorities Partnership Goals:

- Safety: improve liability and eliminate errors wherever and whenever possible

No matter how advanced an electronic health record may be, it is nothing without an effective and fail-safe way to protect patient information. Researching and investing in a quality backup system for our clinic was just as important as investing in the right EHR. This year, three years after implementing our EHR, we updated our existing backup system to reflect the latest developments in data backup and restoration technology. Under our new disaster recovery plan, we can now fully restore our system in a matter of hours rather than days.

1. Background Knowledge

As electronic health records develop and become more complex, the need for quality backup procedures becomes more and more critical. The rural location of our clinic makes quick and effective backup even more crucial: our patients cannot turn to other providers while they wait for our system to be restored. When implementing our EHR, we recognized that it was critical to create and regularly test a disaster recovery plan, and to be prepared to change this plan in response to developments in backup technology.

2. Local Problem and Intended Improvement

While our previous external backup system was fully functional and did protect our data, it became clear after discussions with our local IT support that it was no longer the most efficient nor effective technology on the market, and the potential delays of a full system restore were cause for concern. Our system backed all of our clinical data up to a backup tape. Backing up to tapes can be challenging, as there are many brands and formats of tape drives. In order to restore a crashed system, you need to obtain a tape drive that is compatible with your backup tape.

In addition, as is the case with many systems, the restoration process for our old system was long and complex, utilizing data recovery software built into and entirely dependent upon our factory-installed operating system. To restore our data, we would have had to obtain a new server, reinstall the operating system and backup software, catalog our medical data, and reinstall our EHR from scratch.

Worst of all, in the event of an emergency such as a natural disaster, our old backup system would have taken two to three days to perform a full system restore. In a busy rural practice, we simply could not afford these kinds of delays. Our goal was to update our system to the most current technology, ensuring that our information was as secure as possible, while dramatically reducing total restore time.

3. Design and implementation

At start of this year, we consulted with our local IT professionals about our current backup setup and how to improve it. They supported us when we initially installed our EHR three years ago, and have assisted us periodically ever since. They were impressed by the internal backup capabilities of Praxis, but understood our concerns about the limitations of our external backup. After a discussion about our exact needs, they recommended an option called Symantec backup and recovery software.

We purchased the appropriate technology and implemented the system in April. The implementation process was smooth: installation took only 2-3 hours, and staff were trained to maintain the system in one day.

Following installation, we developed a concrete plan of action for serving patients in the event of a full system crash. While the system is being restored, phone messages and refill requests will be documented on duplicate carbon paper and entered into the system once it is restored.

We check the performance of our Praxis database backup daily to ensure that it is successful. Our clinic also conducts a full system restore monthly with the help of local IT support, and revisits our HIPAA Disaster Recovery/Backup Plan quarterly. These practices have become formal office policy (see Appendix 4).

4. How was Health IT Utilized?

Our backup system consists of a number of backup schemes: internal, external, and online.

Internal backup: Our EHR software contains an advanced internal backup system with a variety of capabilities. This internal backup allows full system restores as well as quicker single-user restores, in the event that one user needs to recover information after a crash. It also offers both hot (while EHR is open) and cold (while EHR is closed) backup procedures, so that we are constantly backing up our information throughout the day.

Further, each time the system performs a hot backup, all system files are automatically defragmented. This has saved staff from the constant struggle to keep files stored efficiently.

We were and continue to be very happy with the internal backup guarantees of our EHR software. However, internal backups are not sufficient in the even of a serious emergency like a natural disaster. Our new external backup protects us against serious emergencies, and is a vast improvement over tape drives.

External backup: The backup system functions by taking an image of our entire hard drive, including installed programs and databases, that can be recovered at a later time. This information is encrypted for security purposes.

The backup system runs every night, creating two full system backups on two separate USB-compatible 2 TB Buffalo external hard drives. Because we are using USB-compatible external hard drives rather than tape drives, we no longer need to worry about tape drive compatibility: all hard drives can connect to a USB external drive.

Another crucial feature of the Symantec restore software is that it is interfaced with Praxis, so that it can restore an individual file or files when necessary, without having to restore the entire system. For instance, if a prescription or other information is removed or changed and the error is detected two or three days later, the original file can be restored quickly and easily as a piece of discrete data.

The key capability of our backup system is the fact that it operates by performing a *bare metal restore*. Unlike other backups, which only save the data within your programs, the Symantec backup software saves our entire computer system in its current state. In other words, there is no need to reinstall our EHR software or any of the other programs it is interfacing with. There is no need to recatalog the data: everything is preserved exactly as it is. You can restore the entire system to a different server, even on entirely different hardware, and use it immediately.

Most importantly, in the event of a disaster, our entire system can be restored in a matter of hours rather than days.

The system requires minimal upkeep: our staff checks each day to ensure it is functional. We cycle our 2 incremental backup hard drives daily: the most recent backup version is taken offsite each night on one hard drive, while the other hard drive is backed up with that day's information. A third external hard drive is left onsite: it performs an additional incremental backup each day as well as a second full backup every weekend.

Online backup: Praxis also includes an online backup, in which our encrypted database is stored online periodically throughout the day. While not all providers find an online backup necessary, we enjoy the reassurance of knowing that our program data is being stored automatically and off-site.

5. Value Derived/Outcomes

Our clinic is now running on the most state-of-the art backup and restoration technology, and more than complies with HIPAA requirements. The variety of backup and recovery options we have established will allow us to quickly recover a file, a day's work, or the entire system as efficiently as possible. In addition, our system takes our staff less time to maintain, saving several work hours per month.

6. Lessons Learned

Internal backups are not enough: Most EHRs contain internal backup capabilities, and ours is superior. However, they are not enough in the event of a major disaster. A quick external restore in addition to internal backup is crucial.

We recommend that all doctors take a serious and critical look at their backup procedures. While your system may be doing the job and complying with HIPAA requirements, as our old system was, make sure to have a real understanding of the consequences of a full system restore, and how long the process will take. If you find that your practice cannot sustain the delay that a full restore requires, seek a better backup solution.

Use a trusted and responsive IT team: Great technology is not enough: when implementing a backup system, work with an experienced IT team that you know and trust. Our IT team has assisted us for years, and is very familiar with the needs of our practice and with our EHR software. This made choosing and installing a new backup system much easier. Further, our IT team is very responsive, making sure to be on-hand periodically after installation to answer questions, make quick site visits if necessary, and support staff in using the new technology. Our IT team also performs monthly maintenance procedures to ensure that our backup and restoration systems are functioning appropriately.

Don't take backup for granted: Finally, do not delegate backup responsibilities entirely to a tech person outside of your office: the results could be disastrous. While external IT support is critical, make sure that members of your office staff are comfortable with and actively monitoring your backup system.

7. Financial Considerations

Our backup upgrade cost $920 for installation, software, and hardware, and was funded with general operating funds (see Appendix 4).

APPENDIX 4: Backup and Disaster Recovery

The following Backup and Disaster Recovery Plan was updated this spring in conjunction with our backup upgrade, and is part of our clinic's policies.

HIPAA Disaster Recovery/Backup Plan

Jeremy L Bradley MD PSC

A) Data Backup Plan

Backups must be run as follows. Front office staff must monitor all backups, and directly contact IT support with any questions.

- Automated backup of EHR database to server every 24 hours monitored by Dr. Bradley or designated office personnel
- Automated backup to external drive done every evening and taken off site by Dr. Bradley or designated office personnel
- Automated backup to online server monitored twice daily and confirmed every evening
- Monthly testing of all backup and recovery systems by local IT support
- Quarterly review of disaster Recovery/Backup Plan by Dr. Bradley and local IT support

B) Disaster Recovery Plan

In the case of a natural disaster, the most readily available source of system recovery media will be reinstalled on a new server. Following a system restore, any new information obtained since the disaster will be entered into the system.

Emergency contacts: Robert Hast: (270) 316-1354 and John Sullivan: (270) 302-9331

C) Emergency Mode

Following a disaster and prior to a complete system restore, the office will operate in emergency mode:

- If there is computer access but no database, patient health summaries will be stored on removable flash drives, which can be restored onto individual workstations.

Backup Expenditures

Our backup upgrade was funded with general operating funds.

USB external hard drives (3)	$600.00
Installation and backup software	$320.00
Total	$920.00