MISY 5360 Research Report

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Southeast Texas Medical Associates, LLP (SETMA) is a multi-specialty clinic with five clinical locations in the Southeast Texas region founded in 1995. SETMA implemented its first electronic medical record system in 1998 and began using business intelligence in 2009. This report will outline the company's BI philosophy and explain how SETMA uses BI and data analytics in pursuit of better healthcare.

An Overview of Southeast Texas Medical Associates, LLP

Southeast Texas Medical Associates, LLP (from this point forward known as SETMA) is a multi-specialty clinic with five clinical locations. SETMA currently serves the southeast Texas region with five clinics in the municipalities of Beaumont (3), Nederland and Orange with a sixth clinic planned for Lumberton. The multi-specialty clinics are supported by over forty healthcare professionals in the following areas; Cardiology, Diabetes Educators, Dieticians, Endocrinology, Family Medicine, Infectious Disease, Internist, Neurology, Nurse Practitioners, Ophthalmology, Pediatrics, Physical Therapist, Rheumatology. These clinics are connected with a secure electronic medical record (EMR) system to store and access SETMA patients' records. SETMA operates a clinical laboratory, mobile x-ray service, physical therapy department, as well as a number of special clinics.

SETMA was founded August 1st, 1995 by Dr. James L. Holly and Dr. Mark A. Wilson. SETMA began with 4 physicians and 21 employees and has grown to more than 40 medical providers and over 250 employees. SETMA has not only become a leader in implementing medical technology in the southeast Texas region but Dr. Holly is also highly sought out to speak on technology subjects such as electronic patient management (EPM), business intelligence (BI) and Medical Data Analytics. His expertise in the subject is indisputable but the many awards that SETMA has won over the years say it all.

- The Texas Physician Practice Quality Improvement Award Committee has recognized SETMA with The Texas Physician Practice Quality Improvement Award - April 2013

- Southeast Texas Medical Associates, LLP has been selected to receive the 2012 eHealth Innovator Award for your preventive health initiative Lose Weigh, Exercise and Stop Smoking (LESS) - (eHealth Initiative 2012 Conference in Washington, DC - 1/11/2011)
- SETMA named one of Thirty Exemplary Practices for Clinical Decision Support by the U. S. Office of the ONC for HIT (February 2011) -- "Advancing Clinical Decision Support" is an intensive, multi-part project funded by the U.S. Office of the National Coordinator for Health Information Technology (ONC) to address the major barriers to achieving widespread use of clinical decision support. The project is being led by the RAND Corporation and Partners Health Care / Harvard Medical School. Rand Case Summary
- SETMA Selected by Patient-Centered Primary Care Collaborative (PCPCC) Practices in the Spotlight: the Medical Home and Diabetes (Practices in the Spotlight: the Medical Home and Diabetes, March 30 PCPCC Stakeholders Meeting in Washington, DC)
- Joslin Diabetes Center, Joslin Practice-based Performance Improvement Project (PI-CME), 2011
- HIMSS Stories of Success February 2011
- Healthcare Informatics Innovator Award February 2011

This list names just a few of SETMA's many awards. A complete list can be found out SETMA.com under Awards. But one of the most impressive awards came with the runner up position in the Gartner Business Intelligence Excellence Awards in 2011. Among the finalists for the award that year was Yahoo! and UPS. The additional runner ups that year included

Toyota Motor Sales, USA, Inc. and The Boeing Company. This award places the southeast Texas medical practice in some very prestigious company.

SETMA implemented its first electronic medical records system in March of 1998 using NextGen software. SETMA added electronic health records in January of 1999. Electronic medical records are defined as a collection of a patient's medical history and serves as a legal record for his/her doctor while electronic health records belongs to the patient and allows the patient input and access to his/her records. By May of 1999, SETMA had morphed from EMR/EHR to electronic patient management (EPM). SETMA's EPM focuses on the gaining of leverage and advantage in patient care and treatment outcomes with the EMR. It was in October of 2009 that SETMA implemented business intelligence and data analytics with 11 years' worth of data. SETMA refers to this implementation as the COGNOS Project referencing the IBM software of the same name.

Primary driving factors for SETMA's BI implementation

The primary driver for using business intelligence in a medical practice is simple: To improve the healthcare given to a patient. That is the simple answer. To support and achieve this primary driver, SETMA has turned to business intelligence with the use of COGNOS by IBM. The most crucial question SETMA had to ask was how to change not only provider behavior but more importantly patient behavior? According to Dr. Holly, "Typically healthcare providers only receive delayed, retrospective reviews of their performance, which does not change behavior significantly." With the use of the COGNOS project, the SETMA IT

department led by CIO, Richmond Holly was able to create provider based reports on patients that provided a "real-time" evaluation of the patient's condition and allowed for the auditing of provider performance. Again Dr. Holly explains "The principle is that without immediacy between the consequences and/or evaluation of an action and the action itself, the potential for the consequence to effect positive change is diminished or eliminated. While auditing provider performance is never for punitive reasons, the principle is the same. If the reporting of the results is significantly removed in time from the events being audited, it will have little impact upon provider behavior."

This complacency is referred to in the medical literature as "treatment inertia". This implies that a healthcare provider has the tendency to not act when a patient is showing no immediate signs of pain or distress. It is through the use of BI and real-time reporting that SETMA has begun changing provider and patient behavior in a way that when faced with chronic conditions that cause no short-term pain or side-effects but never the less will result in severe long-term, life altering effects.

To accomplish this primary driver SETMA outlined seven supporting goals:

1. To know without a doubt the practice's performance through data analysis.
2. To look for areas that needs improvement through "Evidenced-based medicine.
3. To know why a patient is not being treated to goal or target and address that reason.
4. To change provider behavior and remove "treatment inertia".
5. To change patient behavior and in such reduce the long-term medical problems.

6. To examine with statistical methodology patterns of care and outcome.
7. To ensure all the above were accomplished, achieve the highest level of recognition by NCQA as a Patient-Centered Medical Home.

Implementing the EMR with NextGen

By seeing into the future of not only EMR but also EPM, SETMA began a journey that only now almost 15 years later, has been imposed on all medical practices. The HITECH (Health Information Technology for Economic and Clinical Health) act will require all patient data be in electronic format by January 1, 2015 to avoid penalty. While the rest of the medical profession reacts to this new legislation, SETMA was way ahead of the curve in not only implementing an EMR but realizing the potential that the EMR data held.

SETMA's choice in 1998 for an EMR system was NextGen. NextGen is an electronic health record (EHR) software provider based in Pennsylvania formed in 1994. "We selected NextGen because their solution was very customizable, and flexibility in this area is critical to physician acceptance," says Richmond Holly, Chief Technology Officer (CTO) at SETMA. "Their support for Microsoft technologies was another strong benefit, as the Microsoft platform is more cost-effective, easier to manage, and integrates seamlessly with our existing desktop environment."

With the guidance of Richmond Holly, SETMA embarked on an EMR implementation journey that has gone from desktops in every examining room and on every hospital floor to

laptops and final now with the use of iPads and Citrix software, the providers always have access to the EMR 24/7. Now with over 11 years' worth of patient data, SETMA began the huge task of setting up a new system that would mine the data and format it for use in the BI software COGNOS.

Moving from Collecting to Analyzing Patient Data

One of the biggest challenges that SETMA faced in the move from gathering data to data analytics was the sheer volume of data Dr. Holly wished to analyze. To analyze the data points that he felt were important to achieving SETMA's goals would have put a huge strain on the EMR system. Dr. Holly states "SETMA's EMR has hundreds of thousands if not millions of data points, only about 200 are needed to evaluate the outcomes of our care."

In addition to the analysis, the creation of daily reports that were desired if generated directly from the EMR would have taken longer than 24 hours rendering they useless for daily patient interaction and bring the transactional database to a crawl adversely effecting daily patient care. The solution provided by LPA Systems, Inc., a business analytics and business intelligence company with highly focused target markets founded in 2001, was the creation of an enterprise data warehouse which then data is segregated to form what Dr. Holly refers to as a "data mart". "Simply put, a 'data mart' is a repository for the data points required for the completion of the above described tracking. The 'data mart' will create a secure folder for these data points and all queries will be pulled from the 'data mart'. These reports will take seconds rather than hours."

The data mart is created by extracting data from the NextGen EMR database. This data is then transformed and loaded into the data mart. This process known as ETL (Extract, Transform, and Load) is used to correct any known data integrity issues while implementing business rules. Incorporated into this process are any needed pre-calculation formulas to maximize report performance by using fact-based, aggregated reporting tables. The process of ETL is necessary according to Dr. Holly because "no matter how good your system is, and NextGen is the best, there are complications when you are trying to extract data for analysis. All of these complexities and complications are resolved in the creation of the data mart. Thus when data is pulled from NextGen, via the data mart created in COGNOS, we can be confident that the data is accurate and reproducible."

The Users and Tools of SETMA's BI implementation

With the help of LPA Systems, SETMA was able to utilize its current IT infrastructure. In addition to the NextGen EMR system, SETMA also uses Microsoft SQL Server 2008 Enterprise edition. LPA then developed a data warehouse from the NextGen data that assures a stable foundation for provider reports and dashboards as well as analytical capabilities using IBM COGNOS 8 Business Intelligence technology. Using a star-schema architecture, the data is stored and optimized for use in the business intelligence layer. This layer was created in a framework model that includes global definitions as well as additional calculations and filters that support SETMA's reporting. The ETL process is accomplished with the use of SQL Server Integration Services (SSIS).

But the heart of SETMA's technology is COGNOS. COGNOS is an IBM computer program described as being for "Business Intelligence and Financial Performance Management." It is a data-mining software program which is elaborate, robust, complex and excellent. The use of COGNOS in healthcare is not new but it is not common place. Chief Information Officer, Richmond Holly chose COGNOS in response to SETMA's desire and need to have real-time reporting capacity for quality measurement, and practice and provider performance.

The users of all this technology include the IT department which is responsible of custom report and dashboard creation. All providers have access to these reports and dashboards in addition to SETMA management. But the real beneficiaries of all of SETMA's hard work and expense are of course the patients as will be discuss more in a later section.

Types of Analysis Used by SETMA

In addition to analyzing provider performance, SETMA analyzes the data warehouse as a whole and searches (data mines) for patterns that will help provide new strategies for improving patient care. In mining for information to improve patient care, SETMA strives to understand why one patient population is not being treated to or achieving a goal while another patient population is achieving to goal.

Some of the parameters used to help in this process include but are not limited to frequency of patient visits, frequency of key medical testing, number of medications prescribed,

changes in treatments, if any, if patient is not achieving their health goals and referrals to educational programs.

In addition to those parameters, SETMA also actively engages the use of common statistical analysis such as mean, medium, mode and standard deviation. Dr. Holly explains that because of the use of all statistical methods instead of just the most common, SETMA has made some astounding discoveries.

"Because raw data can be misleading, for example, with diabetes care, a provider may have many patients with very high HgbA1cs and the same number with equally low HgbA1cs which would produce a misleadingly good average." Dr. Holly continues to explain that "SETMA's average HgbA1c has been steadily improving for the last 10 years. Yet, our standard deviation calculations revealed that a small subset of our patients were not being treated successfully and were being left behind. As we have improved our treatment and brought more patients to compliant levels, we have skewed our average. By analyzing the standard deviation of our HgbA1c we have been able to address the patients whose values fall far from the average of the rest of the clinic."

SETMA also uses "Quality Assessment and Performance Improvement" (QAPI) as a roadmap for the future. By using data analytics SETMA now has the ability to use the outcomes to design quality initiatives. For example SETMA can now identify disparities in care between ethnicities, socio-economic groups, different age groups and genders.

Major Benefits to SETMA and their patients in using BI

One of the major benefits of SETMA business intelligence implementation was touch upon early under Primary Driving Factors. SETMA's BI implementation allows providers the ability to see their individual performance and the clinic's performance in over 300 measures defined by HEDIS, NQF, PQRI, Preventative Measures, and Diabetes Consortium Data Set in addition to many other measures. Additional reports are available for each of the standards set by NCQA, and SETMA has applied for NCQA recognition as a Patient-Centered Medical Home.

HEDIS (Healthcare Effectiveness Data and Information Set) which is published by NCQA (National Committee on Quality Assurance) currently measures the quality of preventive care, acute care and the care of chronic conditions. NQF (National Quality Forum) was formed in 1999. This agency was created by the Federal Government in collaboration with private organizations to promote quality improvement in healthcare delivery. This is accomplished by setting national priorities and goals for performance improvement, endorsing national consensus standards for measuring and publicly reporting on performance and promoting the attainment of national goals through education and outreach programs. PQRI (Physician Quality Reporting Imitative) is a Center for Medicare and Medicaid Services program which rewards practices that report on quality measurements sets. NCQA (National Committee Quality Assurance) not only establishes HEDIS measures but also is the principal agency for recognizing medical practices as Patient-Centered Medical Home. One of the many reasons for the COGNOS project was to facilitate the practice analysis for achieving this recognition. PCPI (Physician Consortium for Performance Improvement) is a collaborative effort between the AMA, CMS, Institute of

Medicine and the medical and surgical specialty societies. PCPI publishes quality measurement sets for diabetes, congestive heart failure, hypertension, chronic stable angina and care transitions.

With the use of BI and COGNOS, SETMA is actively monitoring all metrics from the above institutions that pertain to its practice. This monitoring is done primarily in the form of internal reports but SETMA takes transparence even farther. All these reports that pertain to these institutions have been posted publicly on SETMA.com since the beginning of the COGNOS project.

Progressive healthcare does not come cheap

SETMA's past and current IT expenditures have, to date, cost in excess of two million dollars. SETMA employs a robust full time IT staff with, at times, six to eight employees. The cost of implementing the NextGen EMR system required a huge software purchase, consulting fees, a new IT infrastructure that includes several Windows based servers in a climate controlled server room. In addition, all examination rooms had to be retrofitted with dedicated Windows desktops and a Citrix server makes the EMR available not only in the clinics and partner hospitals but also to the providers remotely giving them 24/7 access to the EMR. These cost and labor were to just get SETMA the data it desired for performing the analysis on the health metrics.

The COGNOS project which was implemented in 2009 also required a huge capital outlay for software, consultants, IT labor and licensing fees. "SETMA spent about $500,000 on the COGNOS project", says Dr. Holly. "It was expensive but the payoffs are enormous, we're just scratching the surface." In addition to the original expense, SETMA also spends $5,000 a year refining and expanding the work already done and expanding into a new area of data analysis cost $20,000 per area entered. In 2014 the licensee agreement will expire and for new licenses and maintenance from LPA Systems, SETMA's BI Consultants, will cost an additional $20,000.

But is Business Intelligence in a medium size practice worth these costs? Dr. Holly seems to think so and the results have been impressive to say the least. Using the COGNOS project and based on data collected and analyzed, SETMA "has worked to implement a more comprehensive post-hospital care plan." Within the first six months of research, SETMA, which conducts about 160,000 patient visits a year, has reduced unnecessary hospital readmissions by 22%." Using business intelligence and data analytics 22% fewer patients had to be readmitted back into the hospital for the same illness or chronic condition.

With the use of BI, SETMA doctors are able to calculate cardiovascular disease risk at every office visit typically unheard of before the introduction of BI in the medical field. Tasks that use to take a physician or nurse over an hour to calculate by hand can now be done in less than a second with the use of data analytics. This real time data not only provides a basis for real-time treatment but also allows the patient to take an active role in his/her own healthcare. For example, "a doctor can now point out key risk factors around relative heart age scores, so if

the patient is 65 years of age, but is showing a relative heart age of 75 years, it allows the physician to discuss ways in which they can work together to adjust lifestyle choices to regulate those numbers." SETMA is actively engaging in this type of treatment today.

Long-term strategic healthcare advantages by using BI

One of the most impressive strategic outcomes of SETMA's use of business intelligence and data analytics is Dr. Holly's use of the 300 metrics or data points that was discussed above. With these data points SETMA has developed two terms that pertain to patient care and chronic condition analysis, cluster and galaxy.

A "cluster" is seven or more quality metrics for a single condition, i.e., diabetes, hypertension, etc. while a "galaxy" is multiple clusters for the same patient, i.e., diabetes, hypertension, lipids, CHF, etc. As explained by Dr. Holly, "fulfilling a single or a few quality metrics does not change outcomes, but fulfilling 'clusters' and 'galaxies' of metrics at the point-of-care can and will change outcomes." He continues "unlike a single metric, such as 'was the blood pressure taken', which will not improve care, fulfilling and then auditing a "cluster" or a "galaxy of clusters" in the care of a patient will improve treatment outcomes and will result in quality care." Figures created by Dr. Holly are included on the second to last page of this report as examples.

How BI changed operational procedure and increased tactical advantages at SETMA

As use of the EMR grew and more and more data was gathered, SETMA attempted to run reports directly against the NextGen EMR using its native database and built-in query functions. This first attempted to mine their EMR and generate useful reporting, took 36 hours to run reports on daily patient encounters. This put a tremendous strain on the EMR and the reports were anything but real-time.

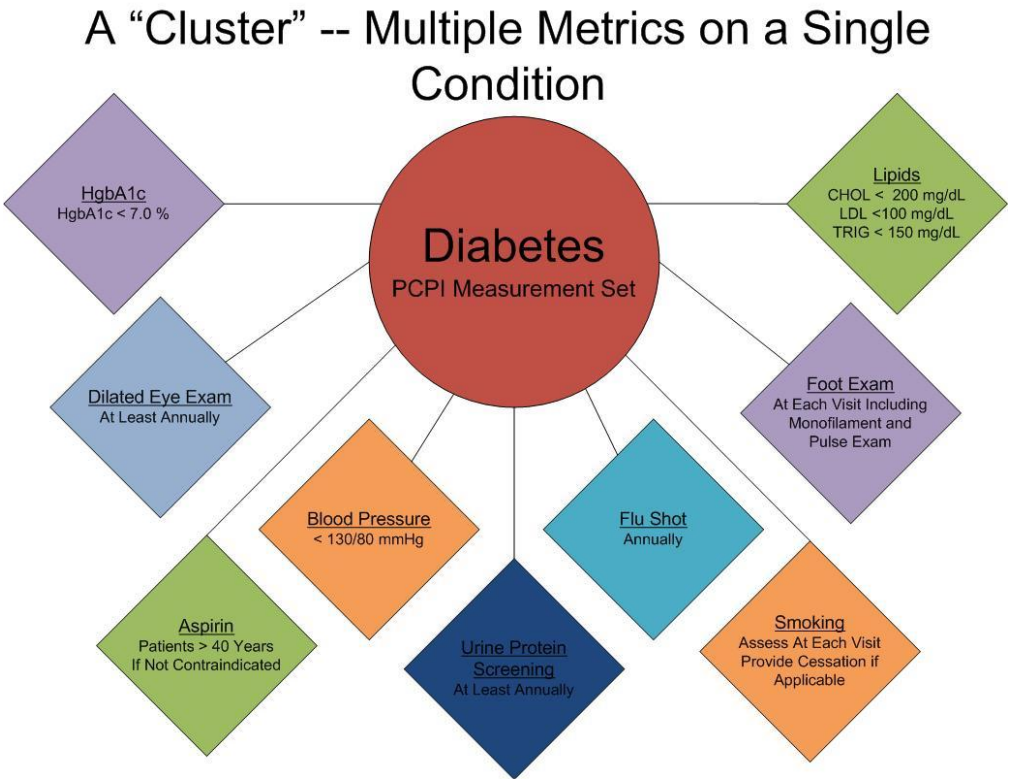
Since the introduction of BI based on the COGNOS system which implemented a data warehouse and data mart, analysis on patient data points can me ran in seconds not days. SETMA is a prime example of what can be achieved when a medical practice gathers patient data in an EMR then cleans the data and loads it into a data mart for immediate processing using BI tools and data analytics. Trends and patterns can be identified against the patient data which results in immediate improved healthcare.

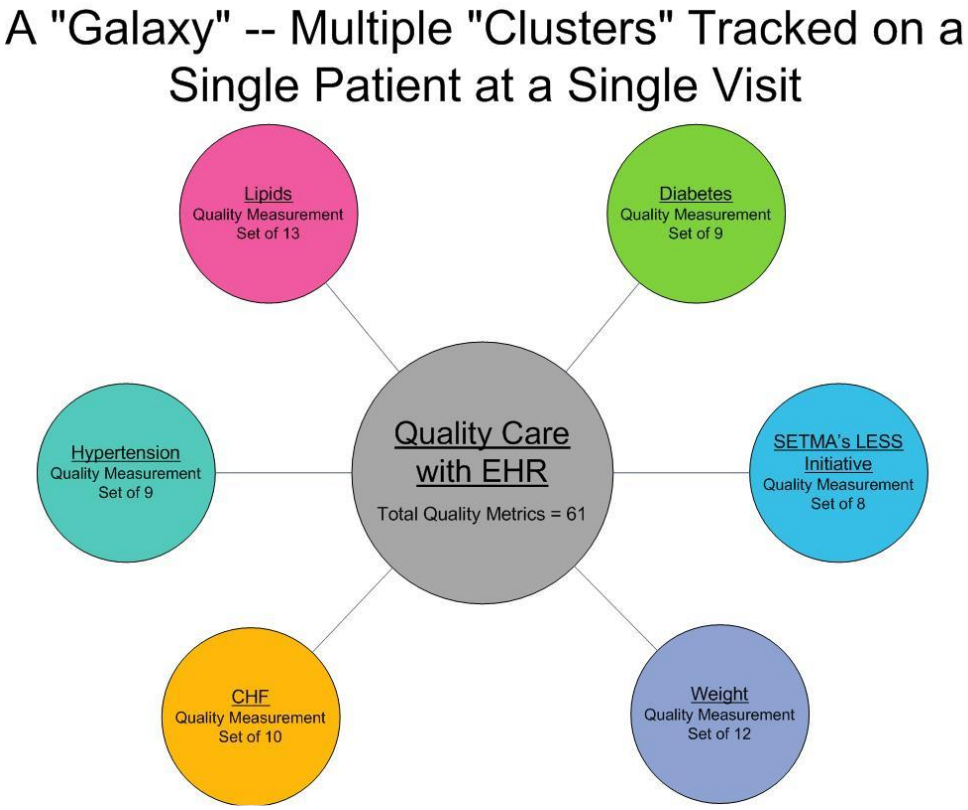
SETMA looking forward

In a recent IDC's survey of 40 hospitals and 30 insurers, half of the responds expressed that “their highest investment priority was advanced analytics”. In that same survey 46% agreed to that data warehousing would play a huge factor in their practice. So in this survey hospitals and insures agree that what SETMA has done should be done and data analytics is the right course of action for improved healthcare.

Moving forward SETMA has its eye on Predictive Modeling. Predictive Modeling is a commonly used statistical technique to predict future behavior. Predictive modeling solutions are

a form of data-mining technology that works by analyzing historical and current data and generating a model to help predict future outcomes. In predictive modeling, data is collected, a statistical model is formulated, predictions are made, and the model is validated (or revised) as additional data becomes available. Dr. Holly is currently review the possibility of using predictive modeling but has encountered a cost issue. Dr. Holly states that "Predictive Modeling will allow us to anticipate the need for hospitalization and/or for the development of complications in individual patients and will help with the prevention of avoidable readmission." A bid from one consulting firm for the development of such a system was over $500,000 a year. "That is ridiculous" stated Dr. Holly. But one thing is evident. If predictive modeling is important to the future of healthcare, Dr. Holly will make it happen today.


A “Cluster” -- Multiple Metrics on a Single Condition
Diabetes
PCPI Measurement Set
HgbA1c
HgbA1c < 7.0 %
Lipids
CHOL < 200 mg/dL
LDL <100 mg/dL
TRIG < 150 mg/dL
Dilated Eye Exam
At Least Annually
Foot Exam
At Each Visit Including Monofilament and Pulse Exam
Blood Pressure
< 130/80 mmHg
Flu Shot
Annually
Aspirin
Patients > 40 Years
If Not Contraindicated
Urine Protein Screening
At Least Annually
Smoking
Assess At Each Visit
Provide Cessation if Applicable



Sources:

The information used in this report is from articles and interviews found on SETMA's website (SETMA.com) that currently has over 1000 documents chronicling SETMA's journey into both electronic records and business intelligence. In addition the author has personal knowledge of SETMA's BI implementation gained as both a former employee and a current contractor for SETMA. Additional information came directly from Dr. Holly in the form of personal interviews.