Formerly known as:

Treating you well.™

Nicholas E. Davies Award of Excellence – Ambulatory Care Application - 2011

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Website: www.ReliantMedicalGroup.org
Specialty: Reliant Medical Group, formerly known as Fallon Clinic, is a multispecialty group practice representing 30 different specialties
# of Providers: 265 physicians (225 FTEs) and 92 advanced practitioners (PAs, NPs, etc…) (80 FTEs)
Employee FTEs:

Classification:	FTE's
Advanced Practitioner	80
Front Desk	226
MA/MOA	201
Management and Other Administrative	509
Medical Records	41
Medical Support	240
Nurse	159
Physician	225
Grand Total:	**1681**

Number of Sites: 23
We have no commercial/employment relationships with any vendor of our EHR system.
Annual Patient Encounters per Provider: 4,600 (PCPs) and 3000 (specialists)
Active Patients per PCP: 2,070   **Total Patients Cared for by Reliant Medical Group:** 200,000
Members of the EHR Implementation Team:

Carlo Vivenzio
Chris Baffuto
Chris Diguette
Cynthia Barker, MA
Dan Walker
Dawn Boucher
Deborah Snyder, RN
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Lynne Bachofner
Natalie Conley, RN
Parisa Freshman
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Paul Lavallee
Paul Nichols
Rebecca Snyder
Richard Morel
Scott Pilate
Susan Gauthier
Susan Leboeuf
And **many** others…

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I. The Organization

Reliant Medical Group, formerly known as Fallon Clinic, is a 357-provider not-for-profit multispecialty group practice representing 30 specialties located in 23 sites throughout central Massachusetts. Since its inception in 1929, Reliant Medical Group has been run and owned by physicians who are dedicated to the mission of "maximizing the health of our patients and the community through expert medical care, compassion, innovative delivery models, medical research and education, and the appropriate use of health care resources." Reliant Medical Group has embodied and cultivated every aspect of this mission throughout all levels of the organization. Reliant Medical Group's goal is to provide the highest quality, safest, most efficient and most effective care and service to the patients of central Massachusetts. Recognizing that this was a public service mission, in 2005 the clinic transitioned to a not-for-profit, tax-exempt organization under Section 501(c)(3) of the IRS Code. Subsequently, funds that would have been used to pay state and federal income taxes were freed up for investing in everything from capital improvements to the Epic Electronic Health Record (EHR) project. In October 2011, Fallon Clinic as it was known at the time, became a member of Atrius Health, an alliance of 5 other medical groups in Massachusetts. While continuing to be an independently operated organization, joining Atrius Health enabled like-minded organizations to share resources and best practices in an increasingly competitive healthcare environment. While joining Atrius Health only required a change in logo, Fallon Clinic decided to take advantage of the new signage to solve a long-standing problem: patients confusing the clinic with the insurer, Fallon Community Health Plan. Hence, in October 2011, Fallon Clinic's name changed to Reliant Medical Group.

Reliant Medical Group provides direct care for a population of approximately 200,000 active patients. Reliant Medical Group is at financial risk through capitated arrangements for approximately 55% of these patients, including 20,000 Medicare Advantage patients and 15,000 Medicaid patients.

II. Management

Reliant Medical Group's journey to an EHR started in 2001 when the CIO and Medical Director for Informatics conducted lunch meetings at 17 sites, which included more than half of the clinic's physicians along with many nurses, medical assistants, and practice managers. These meetings started out with the question "Tell us about your practice. What's working well? What's not working well? Don't just limit the conversation to technologies." While the conversions would start out talking about parking or HVAC issues, they would invariably shift towards more direct healthcare delivery issues. Indeed these meeting identified 127 challenges with the delivery of healthcare, including issues such as notes and results being misfiled and the paper medical record not always being available for appointments or telephone calls. During each and every one of these meetings, the physicians and staff spontaneously concluded that an EHR would solve many of those problems.

The CIO and Medical Director for Informatics desired to continue to build momentum for the EHR concept that was conceived by the front-line physicians and staff. As such, they conducted 7 "Town Meetings" attended by most of the physicians and approximately 25% of the staff to discuss the EHR concept and identify 140 EHR functional requirements. Subsequently, a multidisciplinary team of physicians, staff, managers and senior management that comprised the Healthcare Information Technology Evaluation Committee (HITEC) identified and quantified over 100 benefits of an EHR.

With the help of a consultant, review of published studies, and participation of managers responsible for relevant areas of operation, HITEC determined that the following benefits would be "baked" into the budget over the 10 years that would follow signing the contract to implement the EHR:

Result of the EHR	Financial Benefit
Increased use of note generator tools	Reducing transcription costs by 75%
Minimize use of paper charts and the associated chart pulling and filing tasks	Reducing medical record staff by 72%
Increased patient safety and reduced clinical risk	Reducing malpractice premiums 5%
Elimination of QuickChart and IBM mainframe computer	IT savings
Increase in online charge entry by providers	Reducing charge entry staff by 60%
Increased office and facility charge capture	Recapturing 21% of missing charges
Reduced payment write-offs from denied claims	Recapturing 27% of written-off claims
Reduction in paper forms	Eliminate on average 2.5 forms/visit
Reduced copying and faxing	Copying and faxing supply costs
Elimination of new and repaired charts	New chart costs
10-Year Total Savings:	**$63.7 Million**

In addition, HITEC recognized likely financial benefits that were more difficult to guarantee and thus were not "baked" into the budget but added financial justification for implementing the EHR. These included things like reductions in redundant testing, reductions in adverse events, and improved E&M coding levels resulting in potentially another $44 Million savings over 10 years.

Lastly HITEC and the Town Meetings identified numerous other benefits that were more difficult to financially quantify or focused more on healthcare clinical quality, safety, effectiveness, service, or satisfaction. These included among many others:

- Increased revenue and efficiency when participating in clinical trials due to EHR data
- Reduction in space and equipment required for on-site paper chart storage
- Improved preventive care (e.g. immunizations, mammograms, etc..) and chronic disease management (e.g. diabetic control) rates due to point-of-care alerts and population management tools
- Online ordering, encouraging appropriate tests to be ordered and ensuring that they are always completed will improve efficiency, effectiveness, and patient safety
- Streamlined electronic prescription renewal process with clinical decision support tools will have less chance of error and will improve medication monitoring
- Improved satisfaction of patients, providers and staff resulting from more efficient, effective and reliable communication, workflows and clinical outcomes

Having established a vision with objectives for the EHR (described in Section I above), Reliant Medical Group proceeded with vendor-selection (described in Section III below) and implementation planning. While Reliant Medical Group is physician owned and run, it recognized that everyone would be impacted by the implementation of the EHR, including patients who would continue to need our services throughout the implementation. It's been likened to changing the engine on an airplane while in mid-flight. Our goal was to make sure that the "airplane" didn't crash. So we decided, against the advice of our vendor who recommended implementing full functionality at each site in 4 consecutive 1-week blocks, to instead provide pauses between each phase. Our philosophy was to implement the largest piece of workflow change that a site could handle without "crashing the plane." Then we'd give enough time for the "airplane" to "regain full altitude" before hitting it with another change. For changes that didn't require "Big-bang" across the entire organization, we would implement the same functionality at each site one site at a time, so that by the time we came back to the first site with another change, they would have become proficient on the prior functionality since they had been using it for at least 6 months.

The figure below shows our implementation phasing. The depth of each colored bar below the black line is proportional to the impact on the providers, while the height of the bar above the black line reflects the impact on the staff:

	2006										2007												2008	
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb

Staff

MD

Cadence/Resolute scheduling, billing, and incoming/outgoing referrals

QuickChart replacement for viewing notes/results/Rx's. Staff update allegies/immunizations/health maintenance.
        Staff enter lab orders & internal consults requests in Epic. (TMS still in IBM, printed onto paper)

Paperless telephone messages for staff & providers. Paperless radiology reports and outgoing letter generation to patients.
        Primary Care
        Specialty

Paperless exam room notes and order entry for providers and staff. Paperless lab result processing
        Primary Care
        Specialty

Epic circleback optimization

Phase 1 was a "Big-bang" replacement of our scheduling and billing system with Epic's modules. Two months later we made clinical information such as dictated notes, lab results and radiology reports visible in Epic. This was valuable to physicians when patients called and the paper chart wasn't readily available.   The importance of this phase was that it solved the first problem that physicians identified in lunch meetings several years earlier – instant and simultaneous access to patient information. This instant gratification also taught physicians how to logon to the EHR and navigate through the screens.

With staff back to full productivity, Phase 3, the "Paperless Telephone Message" phase, was rolled out one site at a time. This involved nurses and staff taking telephone messages in the computer and then sending them through the EHR to the physicians. For the staff, this taught them how to use the documentation tools in Epic, as well as how to enter prescriptions. For physicians, it taught them how to use Epic's "InBasket", how to use Epic's documentation tools, how to write prescriptions, how to enter orders for labs, and how to send letters – most of the key components of the EHR. But the beauty of this phase was that the physicians would be responding to these telephone messages in the non-threatening environment of their office. No patients looking over their shoulder and criticizing their typing skills; no patients unable to leave the exam room until orders were entered. This dramatically took the potential for intimidation off of the physicians and made them much more willing to learn the system and how to type. Many also had used a free copy of Mavis Beacon Typing that we had distributed the year prior as the result of a readiness assessment, in order to prepare for this moment.

We took a few months between Phase 3 and Phase 4 to provide some optimization training to make sure that everyone was using Epic efficiently, as well as to install computers in each provider's exam rooms. No instructions were given on how to use these computers and no requirements were placed on using them. Yet when we returned to their site to prepare for Phase 4, almost all of the physicians had spontaneously started to use the computers in the exam rooms to show patients graphs of the lab results and refill prescriptions because the physicians had developed the skills and comfort level to now perform in front of patients! Physicians had found the value in the EHR that motivated them to use it. It was at this point that we first realized that this phased approach was indeed working.

Phase 4 – CPOE in the exam room – was the final phase for each site. This phase was much more successful because of the foundation of skills that were built up in the prior phases. In fact, the only new functionality taught to physicians was how to enter follow-up instructions and perform billing! Of course we taught them visit and procedure-specific documentation techniques, but they already knew

the basic use of these tools. But definitive proof of the success of this phased implementation came when we looked at the physician productivity statistics for the clinic. Appendix C shows the average productivity for each physician starting the 2 weeks prior to go-live of Phase 4. Week 3 was the go-live week. By the end of the go-live week, physicians were opening up blocked-time on their schedule, and within 2 weeks following go-live, physicians were exceeding their baseline productivity! The phasing of functionality into manageable pieces, giving each user time to become proficient before implementing more change, and providing opportunities to find value in the EHR were all key to our success.

In addition to a carefully phased implementation, Reliant Medical Group meticulously converted the paper medical records into the Epic EHR behind the scenes in order to minimized disruption at the sites. This was particularly important because no one at the site had time to convert the paper charts while continuing to see patients and learning a new system. Similarly, it is physically difficult to juggle a paper medical record, a pen, a keyboard and a mouse in a small exam room at the same time! Reliant Medical Group employed three methods to convert historical data into the Epic EHR. First was through automated electronic conversion from a homegrown results repository called QuickChart. Since 1993 Reliant Medical Group had saved copies of every dictated/transcribed note, lab result, and radiology report into QuickChart. These included notes and results from 5 community hospitals, a home health agency, and a reference lab that Reliant Medical Group had created connectivity to via direct HL7 interfaces as well as an internally developed health information exchange (HIE) (SAFEHealth.org). Similarly charges and, for Reliant Medical Group's "capitated" patients, claims had been loaded into QuickChart to automatically create a Past Medical History, Past Surgical History, Immunization History, Medication History, as well as last Health Maintenance and Disease Management dates. Approximately 100,000 terms were then meticulously mapped by Dr. Garber and then using an internally developed interface engine, over 100 million clinical data records were transformed and loaded into Epic, along with links to EKGs from our MUSE system and upcoming pre-scheduled appointments. This data load was accomplished using standard Epic inbound interfaces for registration, results, transcriptions, clinical observations, pharmacy and scheduling. Following go-live, we continue to load all of these data sources directly into the EHR, keeping all of these histories and lists automatically up to date! In addition, these created (and continue to create) encounters when patients have ER visits, Hospital admissions, or Nursing Facility stays, so that it's possible to see in one place everything that's been happening on the patient. Similarly, external test results file interdigitated with results from tests performed within Reliant Medical Group so that there is only one place to look for lab, radiology, or other procedure results. We also implemented bi-directional orders/results interfaces to our Quest Diagnostics reference lab, as well to Surescripts for prescriptions. Lastly we implemented an outbound document interface to the SAFEHealth HIE, an outbound CCD interface, and an outbound Immunization Registry interface.

One important lesson learned was that the data conversion project took a full year which was longer than we had expected. This was in part due to underestimating the extensive mapping required for lab results that originated from 7 different reference labs over the preceding 15 years, as well as the length of time it took to load so many records via interfaces into Epic. In retrospect there was no doubt that it was worth the effort and worth the wait, but we should have started the conversion earlier.

For the remaining ~5% of relevant data in the paper medical record that couldn't be electronically converted, medical records staff entered these into Epic. For discrete data such as Allergies, Family History, Growth Charts, and Problem Lists, teams of abstracters manually entered these into the appropriate fields in Epic prior to each patient's first scheduled visits at a Phase 4 site. For other non-discrete data such as audiograms or the last handwritten pediatric well-child visits, these were scanned into the Vignette document imaging system with an indexed link automatically loaded into Epic just prior to the first scheduled visit at a Phase 4 site. A team of physicians and nurses identified specific criteria for what to scan including the type, age and quantity of documents to scan. Documents were indexed at the patient level (e.g. Advance Directives), visit level (e.g. outside consultant notes), or

procedure level (e.g. outside Breast MRIs). This indexing not only allowed the images to easily be found and viewed from within Epic, but for procedures like breast imaging, it also satisfied the relevant Health Maintenance measures in the Epic EHR.

As a result of this extensive and methodical conversion and abstraction, when sites went live with Phase 4, physicians no longer needed the paper medical record and didn't have to juggle paper and electronic records. We continued to deliver the paper charts to the stations for up to a year in the event that something was needed urgently, but that was almost never the case. What was more remarkable, however, was that when a physician looked into the Epic EHR on the first day of Phase 4, they could see encounters from 15 years prior with visit notes, prescriptions, diagnoses, and test results. These could be searched and filtered as easily as an encounter that was created directly in Epic. It appeared just as if we had been live on the Epic EHR for 15 years!

Exceptional project leadership and planning that involved all branches and levels of the organization were also critical to the success of our EHR implementation. The first step was to integrate clinical and operational experts into the technical aspects of the project. Two Reliant Medical Group nurses were recruited to become the Nurse Champion and an Epic Analyst. Similarly the Medical Director for Informatics, Dr. Garber, cut back on his practice so that he could dedicate 70% of his time to the project as the Physician Champion. Then these clinicians went through a 6-week training program to become certified Epic Analysts. Three additional physicians were recruited and trained to be part of the implementation team. This gave the team not only the skills to build and implement Reliant Medical Group's version of Epic, but also to understand how the EHR could most efficiently be used in real-world clinical settings. In fact, many creative solutions described below in Section IV were selected for presentation to other Epic customers at Epic User Group meetings, and were only possible because of having Epic-certified clinicians embedded in the implementation team.

Reliant Medical Group built on this concept of using front-line physicians and staff to help "Fallonize" Epic and be supportive champions through several venues. First was during the EHR vendor-guided "Design, Build and Validate" (DBV) workflow redesign sessions. Dozens of physicians, nurses, medical assistants, technicians, check-in/check-out staff, billing staff and managers from across the clinic participated in these sessions to make sure that design decisions were made that cut out waste while keeping valuable functions in place. This "Lean value-stream mapping" shed light on numerous wasteful steps that could be replaced by efficient processes that were enabled by, and optimized during, the EHR implementation. These new workflows were then documented, policies updated, and corresponding training materials created. These workflows are now updated and maintained throughout Reliant Medical Group using Lean processes under the oversight of the Patient Care Improvement System (PCIS) Steering Committee and the Kaizen Promotion Office.

These DBV members and other technologically savvy employees subsequently became "superusers" who were the local advocates for the EHR at each site, showing the value of the EHR and promoting new functionality. Each site had provider, nurse, MA, and check-in/check-out staff superusers who also became the eyes on the ground to alert the implementation team of any problems, concerns, or ideas. Similarly, the Epic Advising, Reviewing, and Steering (EARS) committee, consisting of a diverse group of 22 physicians with various specialties, practice sizes, and computer skills, provided valuable clinical input into decisions ranging from workstation design to decision support alert frequencies to standard styles for order sets and documentation tools. An additional 65 physicians and numerous nurses worked with the implementation team to build specialty-specific documentation tools and order sets. While content came from the specialties, only the clinicians on the implementation team were able to actually build the tools. This allowed us to maintain consistent styles and choice of documentation tools. Whenever possible or appropriate, clinical information was documented in the appropriate section of Epic as discrete data and then pulled into the note. Working with coding and risk management staff we were able to similarly ensure that documentation templates provided the appropriate support for billing and medicolegal purposes.

Managing a project as large as an EHR implementation required careful oversight, coordination, and prompt issue resolution. The EHR implementation was run by the Physician Champion, Nurse Champion, IT Owner, and a talented Project Manager, all of whom understood both the technical aspects of the project as was as the clinical and operational aspects of Reliant Medical Group. The EHR vendor provided corresponding analysts to work with the project team. The project was tracked using a 3,500-line project plan, as well as a Risks, Assumptions, Issues, Dependencies (RAID) spreadsheet which doubled as a decision-tracker which proved valuable when resolved issues resurfaced. Reliant Medical Group used very few consultants because we wanted to keep the knowledge and skillset in house, which has proven to be invaluable as we continue to enhance Epic long after the initial implementation phases.

The Project Team reported to the Epic Steering Committee comprised of the CIO, Physician Champion, Nurse Champion along with representatives from Operations, Finance, and Revenue Operations. Meeting frequently, they monitored the status of the projects and were able to quickly resolve scope or resource issues. The Epic Steering Committee reported regularly to the "C-Level" Management Council in order to keep them informed and engaged throughout the project.

Targeted and clear communication permeated the entire implementation process. This communication was critical, not only to keep users engaged in the rollout, but also to obtain timely feedback on how things were going. An all-employee kick-off meeting, numerous presentations at departmental and managerial meetings, software demonstrations, frequent memos, and newsletters kept everyone informed about what was coming and how to prepare. Direct feedback to the implementation team and trainers, as well as through calls to the "Help Desk" allowed for rapid adjustments to EHR workflows and content as needed. This open and frequent two-way communication was crucial to the success of this project, and continues to this very day.

Despite all of these efforts to keep the front-line physicians and staff engaged in the EHR implementation, the reality of making significant change is hard for everyone, and keeping a positive momentum even harder through a several-year project. As a result, we found it necessary to actively "re-market" the EHR, reminding everyone through presentations and newsletters of the numerous EHR benefits that had been defined by such a broad group of Reliant Medical Group employees. In addition, then CIO Ed Nazzaro held one-on-one meetings with every manager, department chair and site chief to remind them of the value of the EHR and their important role as leaders to champion the EHR and disseminate these values. These herculean efforts reinvigorated the EHR implementation and allowed it to proceed with positive attitudes as each person had a fresh vision of the future.

Effective training and support were also crucial to the success of Reliant Medical Group's implementation. Training at each phase was mandatory for all physicians and staff. Sites were given at least 6 months advanced notice as to their go-live date for each phase. This would give them enough advanced warning so that physicians and staff would not take vacation and schedules could be appropriately lightened for Phase 3 (by 25% for 1 week) and Phase 4 (by 50% for the first week and by 25% for the second and third weeks). We tried to avoid school vacation weeks. We also left a blank slot at the end of the Phase 3 and Phase 4 rollout schedules just in case something went wrong at a site, in which case that site could be moved back to the open slot without disrupting the rollout. We never needed to use those slots.

Training for each phase involved hands-on classroom training using a combination of PowerPoints and live scenarios. Reliant Medical Group hired several recent college graduates who were interested in working in the healthcare field and trained them to become EHR trainers. As a result, we were able to afford a greater number of these high-quality trainers than would otherwise have been possible. Just-in-time training of physicians and staff was done the week prior to each go-live and was customized to both the specialty and the category of user (provider, nurse, medical assistant, etc…). While attending training was a job requirement for all physicians and staff, CME/CEU credits as well as food were also provided as rewards.

As part of Phase-4 and new-hire training, each user was required to watch a 10-minute video that Reliant Medical Group produced teaching exam room etiquette for using the computer in front of the patient. Using the "LEVEL" tool developed by Kaiser Permanente, actors demonstrated the wrong way and right way to **L**et the patient look on, use **E**ye contact with the patient, **V**alue the computer as a tool, **E**xplain what you are doing, and **L**ogoff and say you are doing so. While these humorous vignettes were well received, LEVEL also dramatically changed how patients are engaged in the exam room. Historically, the paper medical record would be a secretive document on the physician's lap where notes were scribbled that the patient could never read. In contrast, using LEVEL, the computer monitor is strategically located between the physician and patient to form a triangle so that both can view the screen simultaneously. The computer is the proverbial "elephant in the room", and by acknowledging its presence and demonstrating its value to the physician and the patient, everyone wins.

Exam room ergonomics where also critical to the success of implementing the LEVEL methodology. A mock-up of several exam rooms with varying computer monitor and keyboard configurations was created and evaluated by the EARS committee along with several nurses and medical assistants. The decision was made to use a narrow keyboard with touchpad, an under-the-counter swinging keyboard tray with mouse, a wall-mounted computer, and an articulated monitor-mounting arm. This configuration worked well for the most part, however we did discover that we should have tested this in real-world settings before rolling all of these out. We quickly discovered that the cuffs on the physician lab coats were rubbing against the touchpads causing erratic mouse movements so these touchpads had to be shut off. Also several physicians hurt their knees on the sharp edges of the computer mount, causing us to cover these with foam pipe insulation. Lastly, in the pediatric exam rooms we found that kids would unplug the computers, so we had to install plug covers. Since all of the server/network/PC procurement and installation was done by Reliant Medical Group staff, we were well equipped to handle these modifications without significant impact on budget. In fact, the actual IT costs for the entire project were very close to budget throughout the entire implementation as the result of meticulous planning for the implementation and preparation of the budget.

In addition to classroom training, each site had a mandatory "dress rehearsal" the night before their Wednesday go-live. This dress rehearsal covered multiple patient scenarios that enabled providers and staff to integrate what they had learned individually into a coordinated workflow, right in their own offices. This exercise was extremely valuable in building confidence and reducing the stress of the go-live day. After a site had gone live, we also held combined meetings with all providers and staff to discuss any issues with workflows and to identify knowledge gaps.

Trainers were onsite for two weeks following each go-live to provide support to the users. Local "superusers" helped to some degree to support the clinic-wide "Big-bangs" of Phases 1 and 2; however the superuser strategy proved to be less effective than hoped, as even these individuals were still mastering the technology, still needed to care for patients, and thus had little time to teach others. In retrospect, for the "Big-bangs" we should have hired additional support staff. However, the nursing and check-in/check-out staff superusers still convene monthly by webinar and work together with the optimization team to teach new tricks, maximize everyone's skill level, and provide feedback.

Following Phase 4, several "Documentation Summits" were held where the most successful users of Epic's documentation tools demonstrated their workflows. General documentation principals were also reinforced such as the value of re-using data that had previously been entered. These Documentation Summits not only gave the other physicians ideas on how to improve their own documentation techniques, but it also gave them encouragement that they too could become highly efficient in their documentation.

Nuance's Dragon Naturally Speaking Medical was also deployed to over 100 physicians who continued to desire to dictate some of their notes. Reliant Medical Group did a formal study of the impact of using Dragon, and found that it was most efficient to use a hybrid approach taking advantage of both the EHR's ability to reuse data such as Medication Lists, Allergies, Past History, etc…, as well

as Dragon's ability to create very descriptive History of Present Illnesses as well as Medical Decision Making. In all, our study showed that while Dragon took on average an extra 8 minutes/day to use, it significantly improved the quality of the notes, improved physician satisfaction with the note creation process, as well as provided a financial savings of ~$7,000/year/physician.

Since the end of Phase 4, an optimization team consisting of two of the original trainers and two physicians systematically circle back to all of the sites to observe the workflows of physicians and staff, and to teach new tricks. They also demonstrate workflows with a computer and projector during "Live Lunches" where everyone learns something, although invariably each learns something different. Having physicians work directly with physicians is particularly useful because of the shared clinical understanding as scenarios are demonstrated. The end result of these "Live Lunches" is that workflows are re-standardized for those that have drifted, and everyone is raised to an optimal level of efficiency.

Now 3 years following Phase 4, the implementation never really ends. New physician and staff hires go through mandatory EHR classroom training encompassing all 4 phases and receive on-site mentoring and support. The core Epic EHR implementation team continues to be staffed at close to the same level as was during the implementation including a nurse, medical assistant, and three physicians who all maintain clinical content and build new functionality in the EHR in order to continuously improve the quality, safety, effectiveness, efficiency, and satisfaction of healthcare delivered by the Reliant Medical Group.

Reliant Medical Group adheres to its electronic protected health information risk management program (see Appendix D) that is comprised of both a vulnerability analysis as well as having a good disaster plan. Fallon has two data centers that are setup in an active-active mode that allows for almost immediate failover and recovery from most common disasters. All information contained in the Epic EHR is logged between our production and Disaster Recovery (DR) data centers. We also split our Active Citrix environment that hosts our EHR system between these two data centers and have the capacity at each to host all clinical users. These systems are tested monthly (Last: 4/16/2011) when we go to a downtime "Read-Only" state using our DR data center during off hours in order to apply production updates and patches. Reliant Medical Group also performs a complete system restore and validation every few months (Last: 1/31/2011) whenever we rebuild our development and quality assurance environments. Reliant Medical Group also evaluates its DR process and downtime procedures each year to incorporate any changes in systems or workflows that would affect the Clinic. These processes proved to be effective on 1/16/2009 when we had a catastrophic hardware failure with database corruption. "Read-Only" access to our EHR from the DR site was available within 1 hour and system restore/validation was complete 35 hours after the initial failure.

In summary, Reliant Medical Group nurtured a broad-based support for the EHR which was conceived during lunch meetings throughout the clinic where physicians and staff identified 127 challenges with the delivery of healthcare and spontaneously concluded that an EHR would solve many of those problems. Most physicians and a quarter of all staff collectively identified 140 EHR functional requirements, while senior management identified and quantified over 100 hard and soft benefits of an EHR, including $64 Million in savings over 10-years that was built into the clinic's long-term budget.

Against the EHR vendor's advice, Reliant Medical Group divided implementation into 4 phases, implementing the largest piece of workflow change that a site could handle without "crashing the airplane." Then we gave enough time for the "airplane" to "regain full altitude" before hitting it with another workflow change. These phases also focused on providing instant value to the physicians so that they spontaneously learned to use the system for their own benefit. Phase 3, the "Paperless Telephone Message" phase, taught physicians how to use all of the key components of the EHR while in the non-threatening and slower-paced environment of their office. This dramatically took the potential for intimidation off of the physicians and made them much more willing to learn the system and how to type. The result was that almost all of the physicians spontaneously started to use the computers in their exam rooms as soon as they had developed the skills and comfort level to perform in front of patients.

Proof of the success of this phased implementation came during the final phase of CPOE in the exam room when physicians had a 15% drop in productivity that lasted only 2 weeks following go-live, and subsequently exceeded their baseline productivity. While this phasing of functionality into manageable chunks was key to our successful implementation, it did not extend the total implementation time because of how we cycled through the various sites with each phase.

In addition to a carefully phased implementation, Reliant Medical Group meticulously converted the paper medical records into the Epic EHR behind the scenes in order to minimized disruption at the sites. Fifteen years of medical history was electronically preloaded into the EHR. These came from interfaces to 5 community hospitals, a home health agency, a reference lab and a health plan which provided claims data. An interface engine and health information exchange (HIE) (SAFEHealth.org) developed by our extraordinarily talented IT department facilitated this data connectivity. For the remaining ~5% of relevant data in the paper medical record that couldn't be electronically converted, medical records staff either manually entered these into the appropriate fields in Epic or scanned them prior to each patient's first scheduled visits at a Phase 4 site. Scanned notes and reports were indexed such that not only could the images be easily found and viewed from within Epic, but also procedures like breast imaging would automatically satisfy the relevant Health Maintenance measures.

As a result of this extensive and methodical conversion and abstraction, when sites went live with Phase 4, physicians no longer needed the paper medical record. When a physician looked into the Epic EHR on the first day of Phase 4, they could easily find encounters from 15 years prior with visit notes, prescription orders, diagnoses, and test results, just as if we had been live on Epic for 15 years!

Exceptional project leadership and planning involving all branches and levels of the organization was also critical to the success of our EHR implementation. Several Reliant Medical Group nurses and physicians became certified Epic Analysts and dedicated the majority of their time to the Epic implementation team, allowing for a technical EHR vision that aligned with clinical needs. In addition, several hundred other physicians, staff and managers from across the clinic participated in Lean workflow redesign, clinical content build, and steering committees. Project transparency and inclusivity was further facilitated by targeted and clear communication which permeated the entire implementation process.

Mandatory classroom training, dress rehearsals and on-site support were also crucial to the success of Reliant Medical Group's implementation. Reliant Medical Group hired several recent college graduates and trained them to become EHR trainers, allowing us to afford more trainers and support than otherwise would have been possible. Food and CME/CEU credits were provided as rewards for attendance. Each employee was also required to watch a 10-minute video that we produced to teach exam room etiquette for using the computer in front of the patient. This has resulted in a better and more consistent experience for patients when in the exam room.

Following Phase 4, several "Documentation Summits" were held where the most successful users of Epic's documentation tools demonstrated their workflows. Nuance's Dragon Naturally Speaking Medical was also deployed to almost half of the physicians who continued to desire to dictate some of their notes. Reliant Medical Group did a formal study of the impact of using Dragon, and found that it was most efficient to use a hybrid approach taking advantage of both the EHR's ability to reuse data as well as Dragon's ability to create a very descriptive History of Present Illnesses and Medical Decision Making. In all, our study showed that while Dragon took on average an extra 8 minutes/day to use, it significantly improved the quality of the notes, improved physician satisfaction with the note creation process, as well as a financial savings of ~$7,000/year/physician.

Since the end of Phase 4, an optimization team consisting of two of the original trainers and two physicians systematically circle back to all of the sites to observe the workflows of physicians and staff, and to teach new tricks. They also demonstrate workflows live using a computer and projector.

III. Technology Purchasing

Reliant Medical Group recognized that the process used to select an EHR vendor was as important as picking the best EHR vendor. The process needed to be transparent, inclusive, and guided by a clear vision as well as an understanding of risks and benefits. HITEC started with the 140 functional requirements defined through the cross-enterprise process described above (Section I) and technical requirements defined by the IT department, and with the help of a consultant, enumerated potential risks and how they could be mitigated. These risks included such things as "Chosen vendor could go out of business" with mitigation being "Select market-leading vendor on sound financial footing with substantial client base." With these requirements and risk-mitigation strategies in mind, Reliant Medical Group created an RFP listing all of these and sent them to the 5 EHR market leaders identified by our consultant, Keith MacDonald. HITEC scored the responses based on their ability to meet our requirements and selected the top three as finalists.

Just as there was a participatory environment determining the need for an EHR, a diverse team was used to select the vendor. The "Advisory Council for the EHR" (ACE) was created which consisted of over 70 multidisciplinary physicians as well as clinical, business, and IT staff. They were given the RFP responses from the 3 EHR vendor finalists to review. HITEC then drafted a 4-hour demo script about the medical journey of our fake patient, Wanda Getbedder. This script laid out not only a story, but also the specific functional requirements to be demonstrated at each moment during the presentation along with scoring. These script/score cards were given to the 3 RFP finalists as well as the ACEs who then sat through and rated 12 hours of vendor demos.

The vendor demo score cards revealed 2 clear leaders which required further investigation. Multidisciplinary teams performed site visits, reference checks, and attended User Group meetings for these top 2 vendors. KLAS survey results were reviewed and financial due-diligence was performed to evaluate the long-term health of these vendors. Finally, a detailed and sophisticated financial 10-Year Total Cost of Ownership and Benefits (ROI) analysis was performed with the help of a spreadsheet developed by our consultant.

The results of this exhaustive evaluation consistently pointed to one EHR vendor being most likely to be able to meet the 140 functional requirements necessary to achieve the 100+ benefits aimed at solving the 127 problems identified several years earlier, and to lead the clinic towards a healthy future. However of all of methods that were used to evaluate the vendors, 3 turned out to be the most revealing. First were the site visits. Our #2 vendor was not able to show us a practice as large as ours, and the smaller practice that we visited continued to deliver and use paper charts well over a year following implementation. In contrast, when we visited the Palo Alto Medical Foundation and Harvard Vanguard Medical Group, they were larger than Reliant Medical Group and were using their Epic EHR in exactly the way that we had envisioned using it. Second, when we attended the user group meetings from each vendor, we had unfettered access to customers and heard numerous complaints about problems with existing functionality from our #2 vendor. By contrast, at the Epic Users Group Meeting we saw numerous customers present their success stories and constructively work with the vendor to envision more advanced functionality. Finally the ROI analysis revealed that while our #2 vendor was $1 million less expensive over the course of 10 years, if there was a delay of 6 months in the rollout due to issues with functionality, those potential savings would have been lost.

At the end of this 9-month and $150,000 vendor selection process, ACEs were reconvened to review the results of all of the evaluations performed and vote for our EHR vendor. ACEs unanimously voted to select Epic as Reliant Medical Group's EHR vendor. The results were then presented to the Reliant Medical Group Board of Directors who concurred with this decision. Now 7 years later, it's clear that not only had we selected the correct EHR vendor, but also our ROI analysis was remarkably accurate (see Section V).

Epic was also able to deliver on time and within budget, all of the interfaces that they said were available during the demos. As mentioned in Section II above, these interfaces were critical to

minimizing disruption during implementation and ultimately to the success of our implementation and we were only interested in purchasing those interfaces at that time. However now we are in the process of implementing an interface to Microsoft HealthVault so that patients with home monitoring devices can upload their readings into Epic. We expect that this new interface will further improve our patient engagement and enable us to more closely monitor our patients.

   In summary, Reliant Medical Group used the "Advisory Council for the EHR" (ACE) which consisted of over 70 multidisciplinary physicians as well as clinical, business, and IT staff, to select the EHR. For each of the top 3 EHR vendors, they reviewed the RFP responses and sat through a 4-hour demo script.

   Of all of the methods that we used to evaluate the vendors, 3 turned out to be the most revealing. First were the site visits where only one vendor was able to demonstrate an organization just like ours that was paperless and using the EHR just as we had envisioned. Second, was attending the user group meetings from each vendor, where we had unfettered access to customers and received very candid opinions and a clear understanding of the state of the vendors' software. Finally a sophisticated financial 10-Year Total Cost of Ownership and Benefits (ROI) analysis revealed that while our #2 vendor was $1 million less expensive over the course of 10 years, if there was a delay of 6 months in the rollout due to issues with functionality, those potential savings would have been lost. The ACEs ended up unanimously voting for Epic which may have been more expensive in the short term, but now 7-years later, was clearly less expensive in the long term.

IV. Functionality

   Reliant Medical Group has implemented almost all of the functionality that Epic's Ambulatory EHR has to offer. However we would like to highlight some of our novel uses of this functionality. Some of these improvements were implemented prior to Phase-4 go-live, and some were subsequently implemented as part of optimization and upgrades.

   As mentioned above in Section II, Reliant Medical Group painstakingly prepopulated the Epic EHR with 15 years of clinical data. While a list or 15 years of encounters sounds potentially overwhelming, we were careful to include and display the specialty and diagnoses associated with most encounters. This allows a physician to easily sort or filter the list to just see, for instance, neurology visits and procedures.

   The EHR implementation team spent a great deal of time making sure that the right information is displayed at the right time in the right format. For example, when prescription renewal requests are received from the patient or pharmacy, a medical assistant creates a note that automatically displays the dates of the last physical, as well as last and next visits with that specialty. It then prompts them to enter the drug class that is being renewed, which automatically populates the note with recent relevant test results for monitoring that drug, recent vital signs, etc… This is all prominently displayed to the physician so that it's easy to decide whether to renew the medication and how much to give.

   We also improved the efficiency of the Results InBasket where we created a column that displays the next appointment date for that patient in the same specialty. This allows physicians to sort by that date and easily process those ordered for upcoming appointments differently. We also added a column that displays an alert if the test contains a result that is significantly abnormal. Labs typically flag numerous tests as abnormal even if they aren't truly "significantly abnormal." This makes it hard for physicians to prioritize their work. We defined "significantly abnormal" as being either critically abnormal, or moderately abnormal but getting worse:

Critically Abnormal — Always Urgent | Moderately Abnormal — Urgent if new/change | Slightly Abnormal — Never Urgent | **Normal Range** | Slightly Abnormal — Never Urgent | Moderately Abnormal — Urgent if new/change | Critically Abnormal — Always Urgent
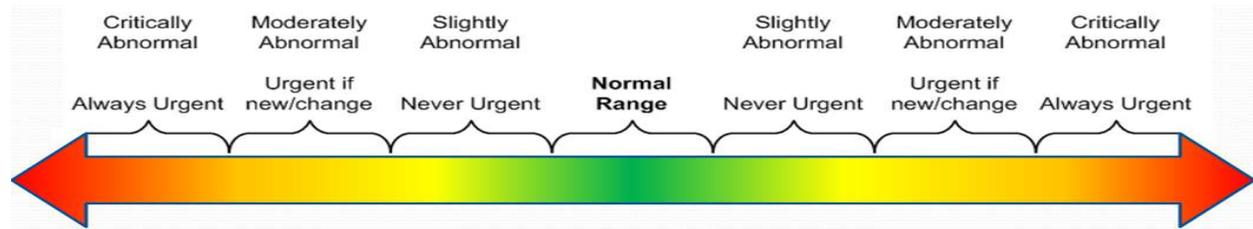
The Results InBasket now is automatically sorted putting the "Significantly Abnormal" results at the top followed by the less urgent "Abnormal" results so that it is easy for a physician to prioritize their work.

Similar efficiencies and improvements in patient safety were enabled by coordinating with enhancements to our internally developed interface engine. For instance, when our radiologists read a Chest CT scan and see a pulmonary nodule, they insert standard canned text (Fleischner Criteria) into their report based on the size of the nodule using speech recognition. Embedded into this text is a special code that the interface engine recognizes and spawns a second result identifying the size-range of the nodule. As this enters Epic, it is flagged as significantly abnormal in the physician's InBasket, as well as automatically sending a copy to the Pulmonary Nodule Registry Inbasket so that they can confirm that the patient is in the registry and being appropriately monitored.

Another innovative use of the Reliant Medical Group interface engine and EHR along with its back-end database occurs when patients are discharged from the hospital. Besides sending discharge summaries automatically to the PCP's and Case Manager's InBaskets, the interface engine 3 days later checks the EHR for the prescription claims that are loaded nightly into Epic to identify which new medications that patient has been started on and whether any monitoring tests need to be ordered that haven't already been ordered. This information is then sent to the PCP's InBasket. In addition, if hospital follow-up appointments haven't been booked, another InBasket message is automatically sent from the interface engine to the PCP's appointment secretary in order to make sure that one gets scheduled.

We also use the EHR's back-end database to make sure that patients show up for tests that were ordered and for appointments that were scheduled. A few days prior to appointments or the expected dates for labs, patients' names and phone numbers are automatically extracted and sent securely to the ELIZA Interactive Voice Response (IVR) system to remind patients of their upcoming appointment. Through this system, they can also cancel the appointment which sends data back into Epic to cancel their appointment and let the staff know that the cancellation took place. However, if the patient still no-shows for their lab test (defined as being 25% overdue compared to the date that it was ordered) and it's not subsequently completed by another order, then a letter is automatically generated and mailed to the patient to remind them of how important it is to still get this test completed.

Reliant Medical Group has put so much emphasis on medication monitoring because it did research to show that inadequate monitoring is the #1 cause of preventable Adverse Drug Events (ADEs) in the ambulatory environment[1]. The medication responsible for the most severe preventable ADEs is warfarin. The Reliant Medical Group created a warfarin monitoring program in the EHR before it became standard Epic functionality. This program not only displays dosages and INR test results in a meaningful manner, but it also immediately notifies the anticoagulation clinic nurses as soon as a patient misses their monitoring lab test. We also have the EHR notify those same nurses and prescriber whenever a warfarin patient is given an antibiotic so that they can ensure that a follow-up INR test is performed in 3-5 days since these can cause serious bleeding in these patients if not monitored closely.

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[1] Gurwitz JH, Garber LD, Bates DW, et al. Incidence and preventability of adverse drug events among older persons in the ambulatory setting. JAMA 289:1107-1116. 2003.

Reliant Medical Group has also used Epic's standard decision support functionality to promote the ordering of appropriate health maintenance and disease management tests such as mammograms, HbA1C, Cholesterol, and diabetic eye exams. Physicians see these alerts when patients are near-due or overdue and a test hasn't already been ordered. Similarly, staff booking labs prior to physicals see these same patient-specific alerts which make it easy for them to order the appropriate tests.

Reliant Medical Group has also used the EHR to more close monitor patients who may be "falling through the cracks" between visits. Using internally developed software integrated with Epic, health coaches in our Patient Centered Medical Homes (PCMH) can identify patients with "actionable delinquencies". For instance if they are overdue for a monitoring test, that is very actionable and the patient should be contacted to get the test performed. However if they are overweight, that is less actionable. Thus we came up with a relative score known as the "Barometer of Actionable Delinquencies" (BAD). The patients who have the highest BAD score sort to the top of the registry so that the health coach knows exactly who to call first. The EHR also automatically mails out letters to patients on their birthday telling them of any health maintenance or disease management tests or procedures that they are due for.

In order to help physicians use evidence-based medicine to make clinical decisions, the physicians on the Epic implementation team have built guidance into the names of the orders so that it's easy to order the correct test. For instance we created "1-click" orders that contain the relevant diagnosis/history (e.g. Hematuria), timeframe (e.g. within 2 weeks), and correct study (e.g. CT Abdomen and Pelvis with and without contrast) so that they can be easily found and then signed with literally one click of the mouse. We were also one of the first Epic customers to integrate the UpToDate medical reference into Epic so that it's readily accessible at the point of care and accrues CME credits.

Reliant Medical Group has also focused on consumer engagement. Besides making the computer monitors easily visible in the exam rooms, we implemented Epic's tethered personal health record (PHR). This allows patients to view almost everything in their record online, including using their iPhone. They receive test results, can ask questions, request prescription renewals, download CCD summaries of their record, or do "e-Visits" for specific problems such as cough or back pain. Children of elderly parents as well as parents of young children can obtain "proxy access" to the patient records. Adolescents have uniquely secure access so that their parents only have limited proxy access to their records. This way, adolescents can be more honest with their physicians when using the PHR or when in the office.

These, and many other EHR innovations, have resulted in documented improvements in the quality, safety and efficiency of care provided by Reliant Medical Group, as well as improvements in satisfaction. These improvements are discussed below in Section V.

One piece of functionality that Reliant Medical Group did not implement was the ability for patients to pay for "e-Visits" because we didn't want to discourage their use considering they had been getting similar services for free over the phone. We also have not turned on a real-time physician-performance dashboard because we have not had time to validate the results since it became available to us several months ago. We are in the process of letting patients use the PHR to directly book on physician schedules, and are also testing kiosks which allow patients to streamline their check-in process.

In summary, while Reliant Medical Group has implemented almost all of the standard functionality that Epic's Ambulatory EHR has to offer, it creatively enhanced this functionality and merged it with the power of an interface engine and Epic's back-end database in order to create measurable improvements in the quality, safety, and efficiency of healthcare delivery. Through interfaces to most of the clinic's healthcare partners and reloading claims data back into Epic, Reliant Medical Group was able to achieve the vision that their clinicians only need to look in the Epic EHR in order to find out everything that has happened or will be happening to their patients. As a result of these interfaces, the "Encounter" tab in the EHR automatically lists every scheduled appointment, telephone

call, office visit, consult, procedure, ER visit, hospitalization, surgery, or nursing facility stay for the patient, including those that did not involve Reliant Medical Group providers!

Patient safety and workflow efficiency has been improved by automation in several areas, such as populating prescription renewal requests with patient appointment information and relevant test results so that physicians are presented with all of the information they need in order to make the renewal decision. Similarly, lab results are specially flagged and sorted to the top of the InBasket only if they are critically abnormal, or have significantly changed from prior results, making it easier for physicians to prioritize these over mildly abnormal results. Physicians are automatically alerted when a patient is discharged from the hospital and requires a medication monitoring test that hasn't already been ordered. Appointment secretaries are similarly automatically notified when a patient has been discharged from the hospital but no followup appointment has been scheduled. Anticoagulation nurses are instantly notified if a patient misses their monitoring lab test or if a physician prescribes an interacting medication that will require closer monitoring.

Documentation and ordering is evidence-based and matches the specific preferences of each physician without staff having to memorize anyone's preferences. Physicians chose in advance how much of their note they want completed by the rooming MA. They can have the MA just enter the chief complaint and vital signs ("No Enchilada"), or for comprehensive physical exams the MA can also do a full Review of Systems and copy the patient's last physical examination findings into the current note ("Whole Enchilada"). During office visits, medical assistants are alerted by the EHR to start the physician's note with exactly the variety of template that the particular physician likes to use without the MA having to know in advance which they prefer. This also enables MAs to "float" to other sites without requiring site-specific training. Similarly when on the phone, nurses are automatically presented with the individual physician's treatment preferences for the most common patient complaints without having to memorize them. Physicians can easily use "1-click" orders that guide them to do what's appropriate based on the patient's particular problem. Physicians are automatically presented with orders for health maintenance or disease management tests and procedures if the patient is due and none has already been ordered. Appointment secretaries are similarly presented with patient-specific orders when they are booking labs prior to physical exams. Consultants don't even have to remember to send copies of their notes back to referring physicians; we have added functionality to our EHR so that a copy is automatically sent directly to the referring physician's Epic InBasket if they are a Reliant Medical Group provider, or to the specialists's secretary along with mailing address and fax number if the referring physician is from the community. All of these enhancements allow processes to happen more efficiently and more reliably.

Patients are also direct beneficiaries of Reliant Medical Group's advanced EHR implementation. For instance, they are automatically called by an IVR system to remind them of upcoming appointments or lab tests, and automatically receive letters if they do not get their lab tests performed. Through Epic's PHR, they automatically receive their test results online. They also automatically receive letters on their birthdays telling them about health maintenance and disease management tests and procedures that they are due for. They also receive a call from the health coaches in our Patient Centered Medical Homes because the health coaches can easily identify patients with "actionable delinquencies".

V. Value

Reliant Medical Group's desire to improve the quality, safety, and efficiency of healthcare delivery with the EHR resulted in measurable benefits. While we had always performed well on our quality measures, we found that we could use the EHR to be even better. We also discovered that it wasn't enough to just implement an EHR – we also had to turn on the clinical decision support (CDS) alerts in order to see incremental benefits. Indeed, our diabetic and breast cancer screening quality measures shown in Appendix B reveal that when we turned on CDS two years after the EHR go-live, we were able to achieve significant improvements, exceeding the National 90th Percentile in most cases.

Reliant Medical Group was also able to show improvements in patient safety. As mentioned above in Section IV, the medication responsible for the most severe preventable ADEs is warfarin. The graph in Appendix B demonstrates how the percentage of INR monitoring blood tests in a dangerous range (>5) dropped by 30% during the 3 years following moving our Anticoagulation Clinic over to using the Epic EHR. Similarly, a graph in Appendix B reveals that the lab no-show rate dramatically dropped by 70% when we implemented the system to automatically call patients to remind them of upcoming lab tests.

Reliant Medical Group's initial assumption when implementing our EHR was that there would **not** be an increase in productivity, but rather, there would be a 1-2 month drop in productivity. In fact, we budgeted, promised, and paid $1 million to physicians for this anticipated drop in productivity if they attended 100% of the training and closed 90% of their encounters within 2 days of the visit. However we discovered that physician productivity had only a brief 15% drop and within 2 weeks was above baseline productivity, as show in Appendix C and described in more detail above in Section II.

We were also able to demonstrate further improvements in efficiency with the "1-click" radiology orders described above in Section IV. As shown in the graph in Appendix C, radiologists were changing over 10% of orders because the wrong test was being ordered for evaluation of the problem. Following implementation of the "1-click" radiology orders that directed clinicians to easily order the correct test from the beginning, we've seen clear improvements in workflow efficiency with over a 50% reduction in the number of orders requiring change.

Reliant Medical Group implemented numerous other process improvements, some of which were described above in Section IV. For some we have metrics to show improvements but are unable to attribute them solely to the EHR. For others, measurement would be too difficult. However we believe that an indirect measure of all of these process improvements is reflected in our satisfaction surveys. Appendix B has three satisfaction survey graphs. The first shows a significant improvement in all-employee satisfaction with their jobs following the EHR implementation. The second graph shows a similar improvement specifically for the physicians. The 2010 AMGA physician satisfaction survey showed that 64% of Reliant Medical Group physicians were "Very Satisfied" (the highest rating) with Reliant Medical Group's computers, compared to a national average of 60%. The third patient satisfaction graph showed that patients weren't quite as forgiving during the implementation and as a result we briefly showed a drop in satisfaction. However this promptly returned to the baseline high level of patient satisfaction. (Note that this is not the Press-Ganey "% Satisfied", but rather the percentage of patients who rated Reliant Medical Group a 5 on a 5-point scale.)

While we implemented our EHR long before "Meaningful Use" (MU) was defined by CMS, we did find that MU did have an impact on our organization. While prior to MU we had 100% use of the EHR, our focus was on providing the correct functionality; MU extended our focus to ensure that this functionality was consistently used. As proof of our success in that endeavor, 96% of our Eligible Providers just passed "MU" requirements during the 1/1 – 3/31/2011 measurement period.

The anticipated MU incentive payments will help shorten the time to yield a return on our investment (ROI). The first graph in Appendix A shows the anticipated impact of MU incentive payments on our annual EHR-related costs and benefits in excess of baseline IT costs. If we had been doing our implementation now, our ROI would have decreased from 7 years to 5 years. The table in Appendix A outlines the Business Objectives described above in Section II, and the actual savings to date. We are meeting all of our Business Objectives with the exception of the transcription savings. It had originally been anticipated that by now we would have seen a 75% reduction in the use of transcription services. We never expected to eliminate transcription because there are many notes or components of note (such as History of Present Illness and Assessment) that are often best done as free-text in order to clearly convey thoughts on mechanism of injury, timeline of events, or medical decision making. There are also physicians who, in an effort to be optimally efficient, dictate while being mobile, whether it's walking between exam room and office or while driving in a car. So in an effort to

balance note quality, physician productivity and cost, we felt that we would only be able to achieve a 75% reduction in transcription. However the second graph in Appendix A shows that we have only achieved a 63% reduction. We plan to further optimize the use of Dragon speech recognition in order to achieve further gains towards this Business Objective.

As with most investments, the savings and MU incentives come after most of the money has been spent implementing the EHR. We were fortunate that prior to embarking on our EHR implementation journey, we sold our in-house pharmacies and were able to use that cash to fund our implementation. The table in Appendix A shows the capital outlay and impact on operating expenses during the 3-year build and implementation phases, along with the subsequent 3 years of operating the EHR. While Reliant Medical Group had a network and PC infrastructure in place along with a mainframe computer prior to the implementation of the EHR, most of it had to be replaced or enhanced in order to meet the new platform, performance, and fault-tolerance requirements necessary for the Epic EHR. The initial 3-year build and implementation costs totaled ~$24 Million, which was approximately 4% of Reliant Medical Group's total budget.

Connecting to other components of the healthcare community not only facilitates the rate at which EHR users see value, but also improves the quality, safety and care delivered throughout the entire healthcare community. Reliant Medical Group has been a leader in the novel use of interfaces and HIEs as more fully described above in Section II. We have also worked with the Massachusetts Medical Society to interface our EHR to Massachusetts eHealth Collaborative's Quality Data Center in order to compare our quality metrics with those of other organizations in the region. Dr. Garber and his colleagues have also worked hard to disseminate our lessons learned through over 70 local, state, and national presentations and several publications. They also actively participate in multiple state and national healthcare organizations, infusing them with real-world experiences with EHRs and HIEs.

Reliant Medical Group continues to enhance our EHR as described above in Section IV, and below in Section VII. Our biggest lesson learned is that "implementation" never ends, and that "implementation" alone is not sufficient to successfully achieve the maximal benefits from an EHR. EHR users tend to find a process that allows them to get through their workday, even though it may not be standard work, and may not be the most efficient way to accomplish a task. They also may not be doing important tasks consistently for all patients. As a result, we learned that it's important to monitor performance both from reports (e.g. through "Open Encounter" or "InBasket Message Volume" reports that we use) as well as from direct observation. We have found that using remote PC screen monitoring (with the user's permission) not only helped with resolving problems called to the Help Desk, but also to observe how physicians used their computer in the exam room.

We also found that our Epic EHR can easily be enhanced in creative ways using standard functionality, many of which are described above in Section IV. We seek ideas by listening to our users, monitoring AMDIS and Epic Listservs, attending all Epic User Group meetings, and share experiences with the Northeast Epic Region Doctors (NERDs). We also monitor regulatory changes and take monthly software updates/upgrades. These enhancements need to be properly communicated and trained in order to get users to take advantage of this new functionality.

VI. Lessons Learned

Reliant Medical Group used a methodical, transparent, and widely inclusive approach to selecting, implementing and optimizing the EHR which has resulted in demonstrable benefits in support of the clinic's mission, goals and objectives. Starting with when physicians and staff throughout the clinic first conceived of the idea that we should implement an EHR, through the definition of benefits/risks, functional requirements, actual vendor selection, kickoff celebration, creation of clinical content, and post-implementation celebration, the entire Reliant Medical Group came together to be part of the process and a part of its success. We were all owners; we were all champions for the EHR. During the most difficult times we reminded each other of why we were doing this, of the benefits that

we had collectively envisioned, and were able to keep moving forward. This broad-based collaborative effort with extraordinarily talented and dedicated physicians and staff was critical to our success.

Epic-certified Reliant Medical Group physicians and nurses embedded into a gifted and passionate IT implementation team were also critical to ensure a clinical focus prevailed above all else, and that an understanding of both the clinical and technical aspects of the project enabled innovative solutions to any problem that we came across. It also allowed for a reality check on what the impact at the sites and in the exam room was really going to be like in a busy practice, allowing us to confidently go against the vendor's advice in order to acknowledge legitimate physician insecurities and make the rollout successful with a negligible drop in productivity. It also made the team focus on methods to abstract the majority of the paper medical records in a way that took advantage of the strengths of the EHR without burdening staff at the site who had to learn the new system while continuing to deliver medical care. However we did underestimate the time it would take to do interface and data mapping, so in hindsight would have started that project earlier.

Lastly, it's not enough to simply implement an EHR, but instead an organization needs to turn on and continually improve all of the interfaces and clinical decision support/automation tools in order to enable the maximal benefits in quality, safety and efficiency. In addition the organization needs to monitor the utilization of the EHR by users, both through reporting as well as direct observation, in order to ensure that they are always using it in the most efficient and meaningful way. If they aren't, provide them the necessary teaching and tools to make it more useable. Listen closely to "complaints." Indeed the vast majority of "complaints" that we received were actually opportunities for us to improve the system… and that's exactly what we did!

VII. Future Plans

Reliant Medical Group is already fairly advanced in terms of the EHR functionality that has been deployed and the HIE connectivity that has been achieved. Still, we know that we can do better. As described above in Section V we gather ideas from diverse sources. We use a formal review and governance structure to prioritize enhancements and projects based on how they improve the quality, safety, and efficiency of healthcare that we deliver. While this future enhancement and project list is quite long, here are a few examples:

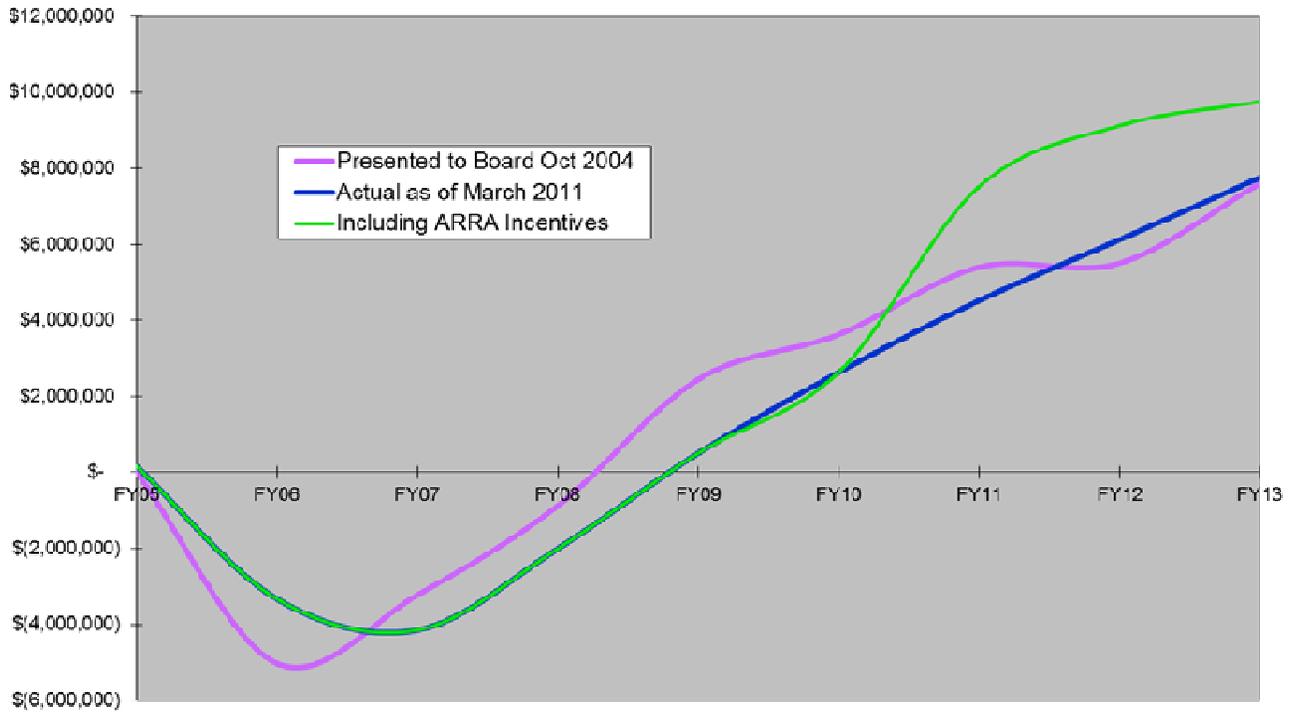|	
Usability & Access to EHR	• Smartphone access to Epic for physicians • iPad access to Epic for Physical and Occupational Therapists • Improve integration between PACS and Epic • Larger computer monitors
Clinical Decision Support	• More alerts for health maintenance, disease management, and medication monitoring
Population Management	• Migrate BAD Score Registry to function within Epic
Connectivity	• Interface with more healthcare providers and the statewide HIE (for which Dr. Garber is Principal Investigator on a federal grant) • Import claims data from more payers into Epic
Patient Engagement	• Expand support for more types of home monitoring devices • Expand use of online patient eVisits • Smartphone access to Epic for patients
Regulatory Requirements	• ICD-10/5010 upgrades
Performance Monitoring	• Closed-loop missing results report • Physician-performance dashboard • SAP's Business Objects and Epic's Datalink

Appendix A: Return on Investment (ROI)

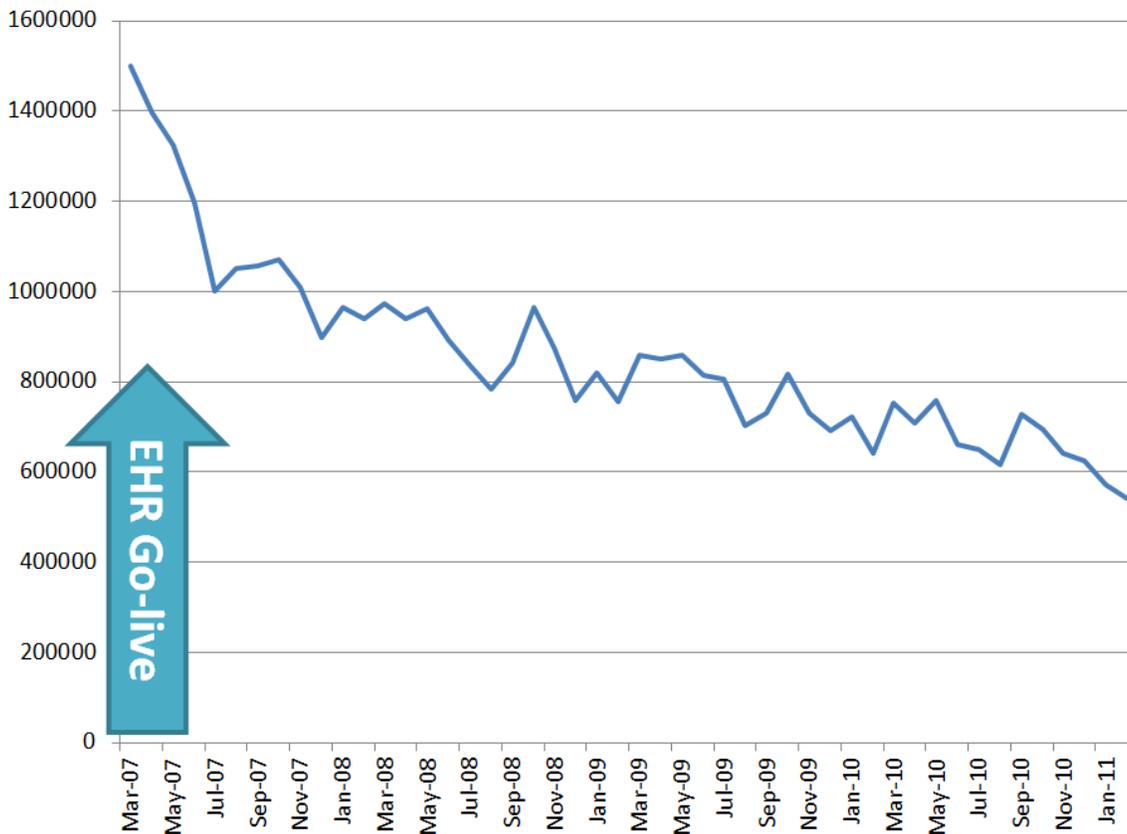| CASH OUTLAY:	6-YEAR TOTAL:
EHR Hardware	$ (4,530,000)
EHR Software & Consulting	$ (3,470,000)
Other Hardware & Software	$ (7,090,000)
Implementation	$ (970,000)
Total 6-Year Cash Outlay:	**$ (16,060,000)**

OPERATING EXPENSES:	6-YEAR TOTAL:
PC's, Printers, etc…	$ (4,130,000)
Operating Lease Costs	$ (250,000)
Staffing (loaded with benefits)	$ (9,060,000)
Training & Maintenance Costs	$ (10,780,000)
Total 6-year Operating Expenses:	**$ (24,220,000)**

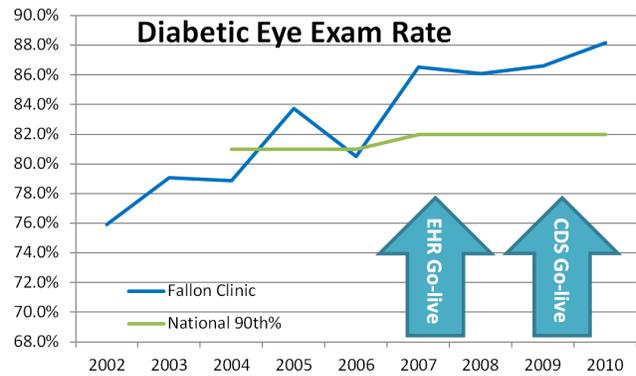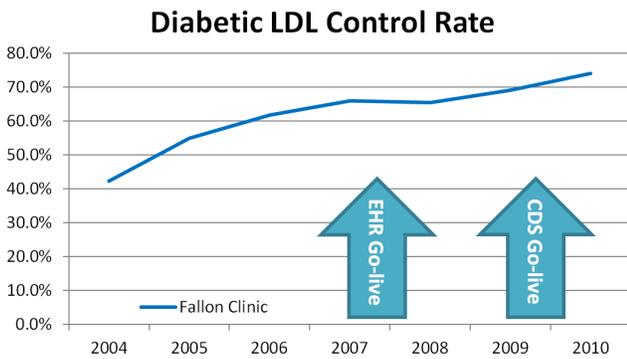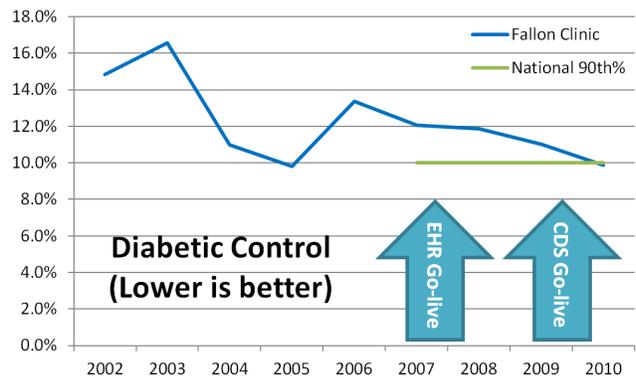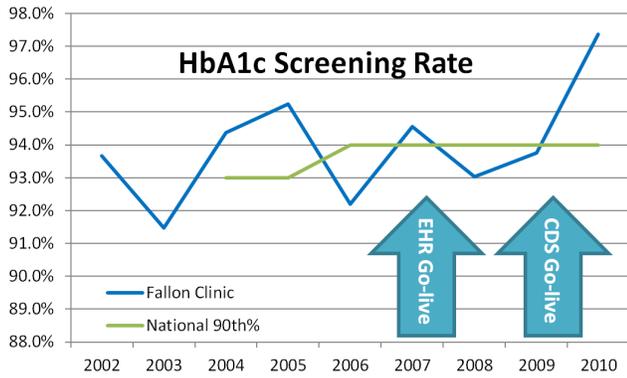| SAVINGS:	6-YEAR TOTAL:
Chart Pulling & Filing Staffing	$ 5,640,000
Form Costs	$ 380,000
Chart Costs	$ 60,000
Transcription Costs	$ 6,050,000
Copying & Faxing (Costs)	$ 150,000
Charge Entry Staffing	$ 850,000
Malpractice Premiums	$ 1,430,000
Missing Charges Recapture	$ 1,010,000
Payment Writeoffs	$ 970,000
Mainframe	$ 2,290,000
IT Staff	$ 1,120,000
Total 6-year Savings:	**$ 19,950,000**

EMR-Specific Annual Profit/(Loss) Including Benefits

Legend:
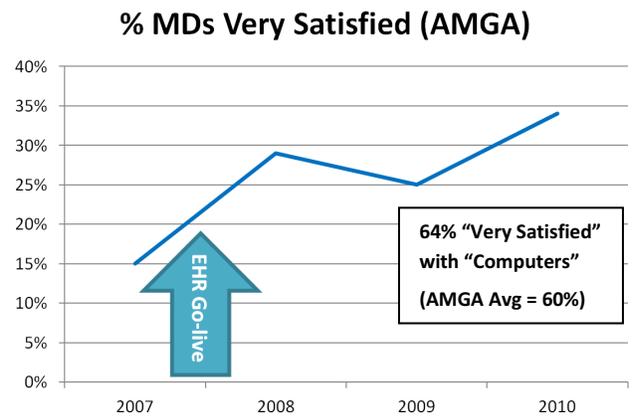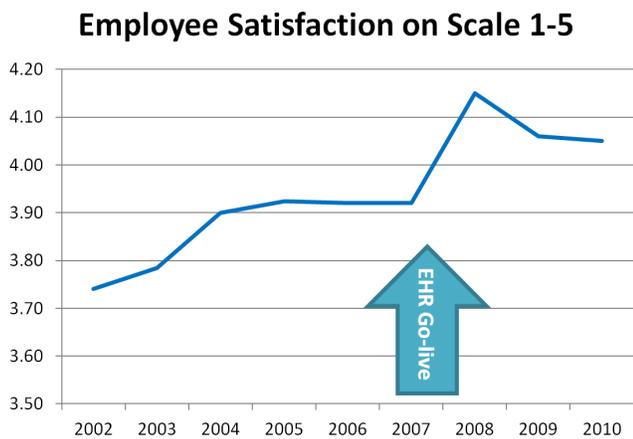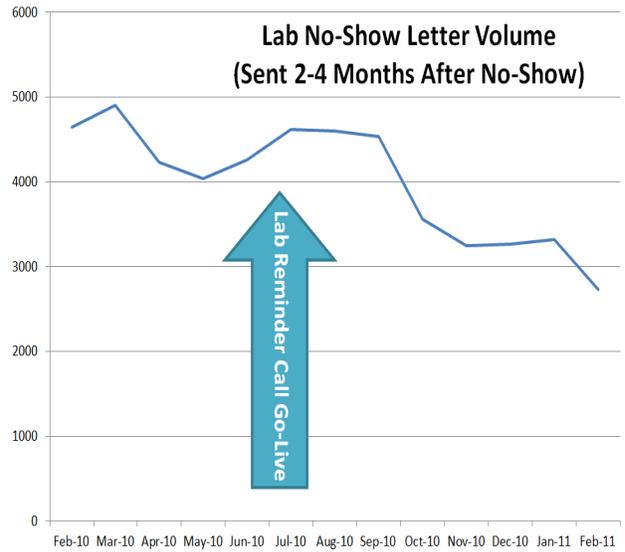- Presented to Board Oct 2004
- Actual as of March 2011
- Including ARRA Incentives

Lines of Transcription

EHR Go-live

Appendix B: Quality, Safety and Satisfaction

HbA1c Screening Rate

Diabetic Control (Lower is better)

Diabetic LDL Control Rate

Diabetic Eye Exam Rate

Diabetic Nephropathy Screening Rate

Breast Cancer Screening Rate

% INRs > 5 (Lower is better)

Anticoagulation Clinic Go-live

(Y-axis: 0.0% to 1.8%; X-axis: 2006Q3, 2006Q4, 2007Q1, 2007Q2, 2007Q3, 2007Q4, 2008Q1, 2008Q2, 2008Q3, 2008Q4, 2009Q1, 2009Q2, 2009Q3, 2009Q4, 2010Q1, 2010Q2, 2010Q3, 2010Q4)

Lab No-Show Letter Volume
(Sent 2-4 Months After No-Show)

Lab Reminder Call Go-Live

(Y-axis: 0 to 6000; X-axis: Feb-10, Mar-10, Apr-10, May-10, Jun-10, Jul-10, Aug-10, Sep-10, Oct-10, Nov-10, Dec-10, Jan-11, Feb-11)

Employee Satisfaction on Scale 1-5

EHR Go-live

(Y-axis: 3.50 to 4.20; X-axis: 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010)

% MDs Very Satisfied (AMGA)

EHR Go-live

64% "Very Satisfied" with "Computers" (AMGA Avg = 60%)

(Y-axis: 0% to 40%; X-axis: 2007, 2008, 2009, 2010)

Patient Satisfaction - % Excellent

EHR Go-live

(Y-axis: 74.00% to 80.00%; X-axis: Q4-05, Q1-06, Q2-06, Q3-06, Q4-06, Q1-07, Q2-07, Q3-07, Q4-07, Q1-08, Q2-08, Q3-08, Q4-08)

Appendix C: Impact on Processes

Fallon Clinic Provider Average Productivity Starting 2 Weeks Prior to Phase-4 Go-Live

% Radiology Orders Requiring Changes

Radiology 1-Click Order Go-Live
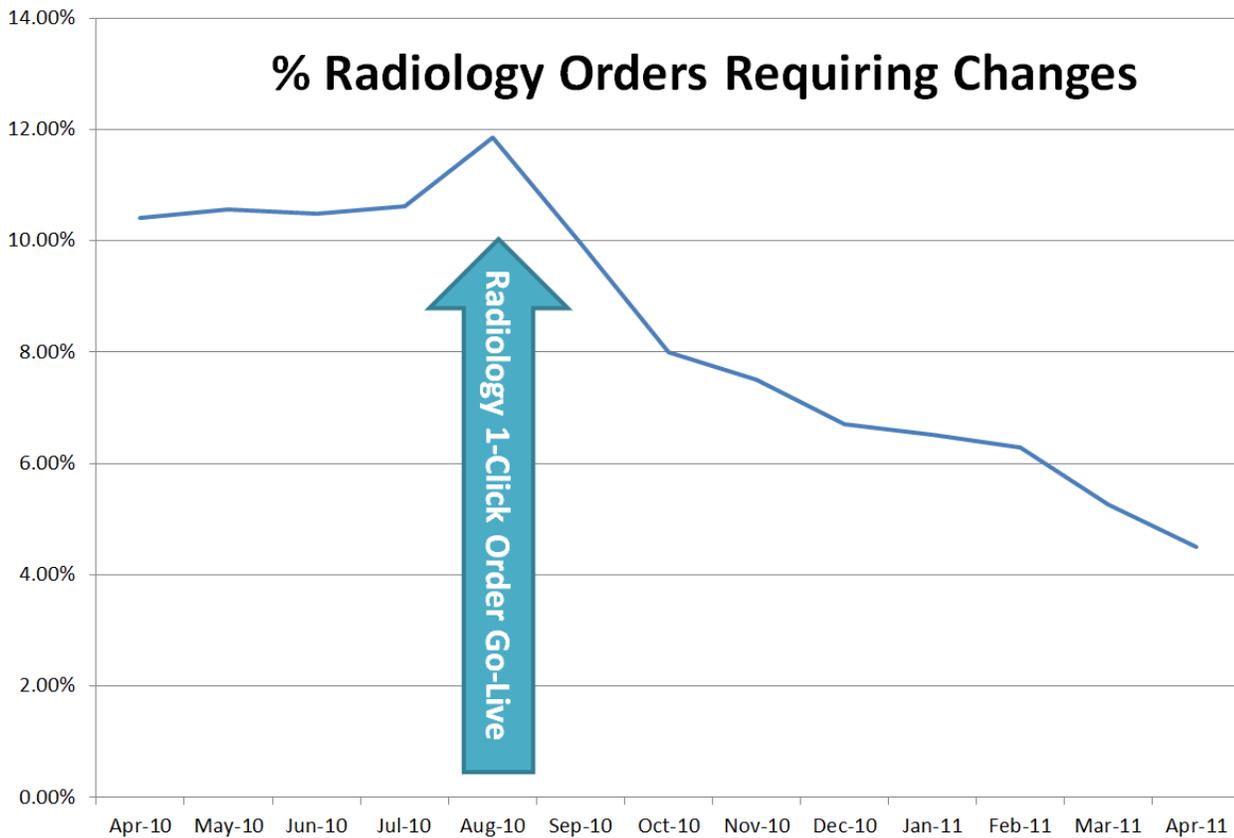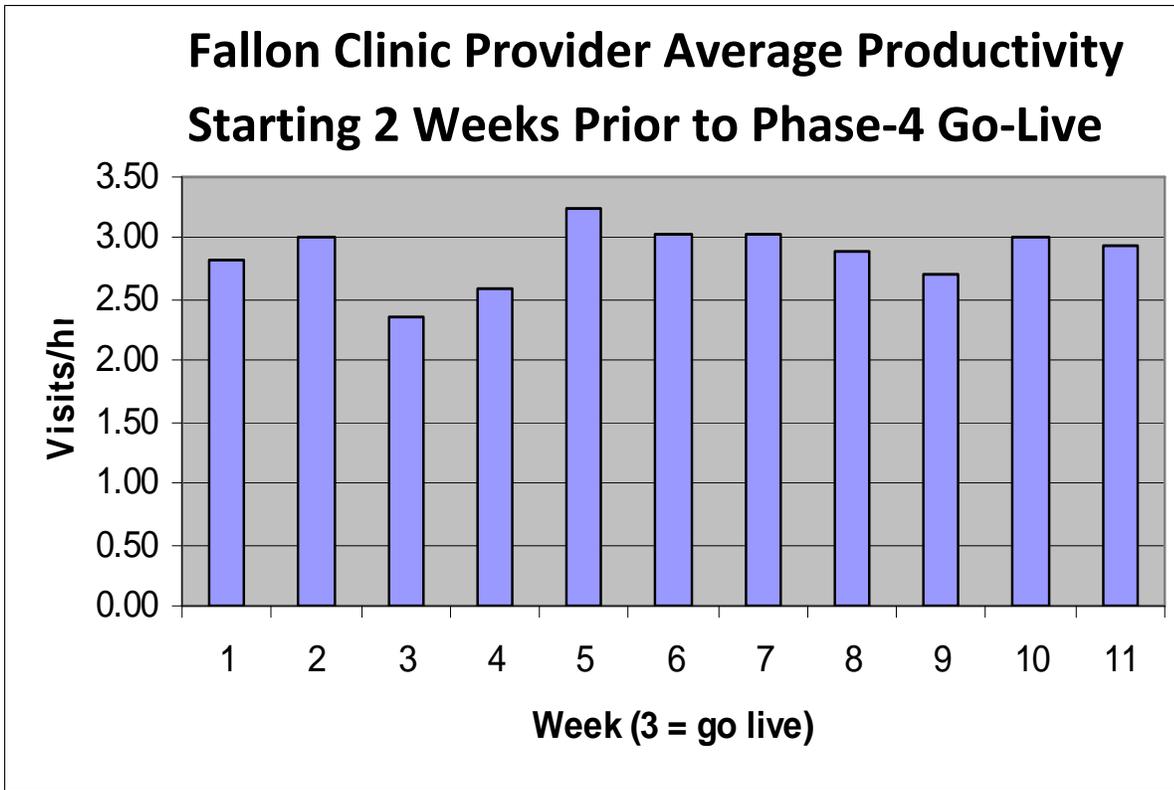
Appendix D: Disaster Recovery Policy

FALLON CLINIC, INC.	INFORMATION TECHNOLOGY POLICY MANUAL
SUBJECT: EPHI RISK MANAGEMENT PROGRAM	NO: SE-32

Policy

Fallon Clinic (FC) IT Security Office (ITSO) will perform periodic information security network risk assessments for the purpose of determining areas of vulnerability, and to initiate appropriate remediation, in order to protect electronic protected health information (EPHI).

Purpose

The purpose of this policy is to allow the ITSO to perform information security risk assessments on all FC systems, to include applications, servers, and networks, and any process or procedure by which these systems are administered and/or maintained.

DEFINITIONS:

Risk: Those factors that could affect confidentiality, availability and integrity of Reliant Medical Group EPHI and its related systems.

Procedure

The execution, development and implementation of the Risk Management Program is the responsibility of FC IT.

The Risk Management Program is comprised of the following Procedures:

1. Exploit and Vulnerability Incident Response Team (EVIRT)
   EVIRT has been created to proactively assess vulnerabilities and exploits of vulnerabilities, so as to insure appropriate steps are taken within IT to safeguard IT systems and applications. EVIRT meets weekly to discuss events.

   a. Event Assessment.
   b. Urgent Events: Immediate actions address as needed.

2. Vulnerability Assessment

   A vulnerability assessment may be used to; identify weaknesses that could be   exploited, predict the effectiveness of additional security measures in protecting information resources from attack. Should remediation be required, the respective FC Employees will cooperate and assist the ITSO as corrective measures are taken.

   a. Risk Analysis - Network Security Scanning software application.
   b. Risk Management - ITSO shall review reports generated by the Network Security Scanning software on a quarterly basis.

3. IT Disaster Planning
   Establish and implement policies and procedures for responding to an emergency or other occurrence including but not limited to fire, vandalism, system failure, or natural disaster that affects systems containing EPHI.
   a. Data Backup Plan
   b. Disaster Recovery Plan
   c. Emergency Mode Operation Plan
   d. Testing and Revision procedures

4. IT Audit Program
   Procedure to ensure IT Managers and staff are adhering to established best practices.
   a. Data Center Requirements
   b. Data Center Maintenance (Environmental)
   c. System Access
   d. System Firewall Log
   e. Asset Management
   f. Desktop Media Sanitization
   g. Configuration Management
   h. Card Key Access
   i. Production Control [Note: Audit to be performed by IT Business Office]

ENFORCEMENT:

Any employee found to have violated this policy might be subject to disciplinary action, up to and including termination of employment.

Prepared by:_____ Date: _____

   HIPAA Security Officer

Issued by:_____Date: _____

   Manager, IT Business Office

Approved by:_____Date: _____

   Chief Information Officer