

Section A. Identifiers

1. **Name and Title of Submitter:** Daniel Griffin, MD
2. **Practice Name:** Alpenglow Medical, PLLC
3. **Address:** 1006 Robertson Street
4. **City:** Fort Collins **State:** CO **Zip:** 80524
5. **Phone:** 970-482-3820 **Fax:** 970-482-4942
6. **Email:** dgriffin@alpenglowmedical.com **Website:** alpenglowmedical.com
7. **Number of Physicians in Practice:** 2
8. **Number of FTEs (list by staff category):**

Physicians: 2.0
Medical Assistant: 1.0
Office Manager: 1.0
Reception: 1.0
Billing: .75
9. **Provide detailed information regarding any commercial/employment agreements with the vendor/s of EHR hardware/software.**

No commercial/employment relationships with any vendor of the EHR system.
10. **Annual Number of Patient Encounters:** 10,000
11. **Please list the names of the members of the EHR Implementation Team (who will all be considered authors of the application):**

Daniel Griffin, MD

Section B.

The Organization

Alpenglow is a single site, freestanding, privately owned LLC providing outpatient medical services to adults. It is located in an urban MSA, in a city with 127,000 residents. The clinic serves 70% Medicare beneficiaries, 28% privately insured, 2% private pay or uninsured, and less than 1% Medicaid. The patient population is 85% Caucasian, 10% Hispanic and 5% African-American, as is the community served.

Alpenglow was started as a solo practice in 1999, but added a second physician in April 2004. The current clinical staff consists of 2 physicians and 1 medical assistant, and in 2005 this staff provided care in about 10,000 patient encounters. The office performs the following services: routine adult preventive care, acute care, EKGs, stress testing, phlebotomy, cryoablation and skin lesion removal.

The goal of Alpenglow is to deliver efficient, quality healthcare with no patient waiting time and 100% patient satisfaction. The electronic health record (EHR) is an important component to achieving the goal.

Management

a. Business Objectives

Alpenglow was constructed around the business principle of superior customer service, with the primary goal of achieving 100% patient satisfaction. Dr. Griffin's early training and personal experiences as a patient shaped his interest in creating a different type of clinical practice that would specifically value patient time and customer service, while delivering high quality medical care. He envisioned a clinic that would allow same day or next day appointment availability as the norm, never requiring patients to wait beyond their scheduled appointment time when present in the office, and allowing the patient to terminate the clinical encounter.

His secondary objectives were to support clinic and physician work efficiency in order to maximize revenue generated per hour of operation, to control the impact of work on family and social time, and to reduce malpractice risk.

In order to accomplish these ambitious goals, Dr. Griffin focused on two necessary structural elements: electronic management of patient and practice information, and elimination of unwanted staff turnover.

1. Electronic management of patient and practice information

Dr. Griffin's personal impression of the inefficiency introduced into physician work by poor documentation methods was confirmed by coursework done for a certificate program in "The Business of Medicine" accessed on-line through the Harvard Schools of Medicine and Business. As a result of this course, Dr. Griffin became convinced that solving the problem of concurrent documentation was critical for a clinic to succeed as a business, and to maximize customer satisfaction, quality and staff efficiency. He noted that although documentation is clearly a necessary activity for quality medical care, it is uncompensated work and therefore reduces the hourly income of the physician and the revenue generating potential of the practice, typically impacts family and social time, and adversely affects the flow of work in the office. His observations also led him to conclude that variation in documentation and billing needs was a much larger contributor to patient waiting times than was variation in the time spent in the patient-physician encounter. Additionally there is ample evidence that traditional post-visit paper documentation is associated with inadequate clinical quality and inconsistent billing practices. Selection and full implementation of an EHR at Alpenglow was therefore viewed as critical to:

- capture concurrent documentation during the clinical encounter,
- streamline the processes of ordering ancillary tests and consultations such that these activities do not distract from patient care during the clinical encounter,

- produce accurate billing,
- support clinical quality through captured knowledge management made available for future similar patients,
- track clinical performance.

2. Staff turnover

In addition to seamless integration of information, staff experience, commitment and teamwork is the foundation for success at Alpenglow. The front office needs to be skilled at scheduling requests, respecting the time cushion between patients, expediting patient needs as they present themselves, and promptly returning phone messages in order to ensure the no-waiting policy. Staff commitment to the Alpenglow model of customer service is essential to continued success. Dr. Griffin hires staff based on their acceptance of his vision for services delivery and commitment to patient-centeredness. He points out that the problem with most staff applicants has been that they have worked somewhere else, and therefore have to be re-trained. Among the expectations for staff at Alpenglow is:

- Agreement to the model of absolute respect for the patients' time
- Agreement to fully use the EHR as intended, and develop new processes if indicated
- Expectation to contribute to continuous improvement through suggestions and attendance at monthly meetings
- Expectation to train on updates
- Expectation to access continuous education
- Expectation to develop and maintain respectful relationships with patients generally

Once employees are oriented and trained in the system, it is important to retain them. Dr. Griffin supports this goal by compensating employees well above the general market, funds and provides time off for continuing education, and protects staff from abusive patients by asking those patients to leave the practice.

Specific Business Objectives

- Gross revenue: Generate a minimum of \$400,000 per year
- Personal profit: Generate \$200,000 per year
- Collection rate: Achieve 90% collection rate
- Increase staff: From 1 FTE MD, 1 FTE MA and 1 FTE office manager at the time of installation
- Staff participation: Set aside budget dollars for each staff member to attend a number of continuing education activities each year (such as IV training, coding, and management)
- Staff turnover: 0 staff turnover due to staff choice
- Quality of life: Physicians and staff begin seeing patients at 9:00 am
- Quality of life: Physicians and staff able to leave the office every day by 5:00 pm
- Quality of life: Physicians work 4 days per week and staff work 4.5 days per week
- Workflow management: Achieve 100% concurrent documentation
- Patient satisfaction: Achieve 100% patient satisfaction
- Patient retention: Achieve 100% patient retention

- Patient waiting: Eliminate unnecessary patient waiting time
- Patient access: 0-1 day to next available appointment
- Clinical outcomes: Discuss preventive screening (i.e. colon cancer, mammography, osteoporosis, cholesterol, etc.) and chronic disease management as applies at each patient encounter. Incorporate electronic disease management system into EHR to track disease-specific populations
- Coding accuracy: Achieve 100% coding accuracy
- Medication accuracy: Achieve 100% medication accuracy. Incorporate medication databank into EHR to check all medications for drug and/or disease interactions

b. Project Organization

Alpenglow was designed to use an EHR from the day it opened, and therefore did not transition from a previous paper-based practice. However, every staff member present when the practice opened was very involved with the implementation, and continuous functionality updating and efficiency improvement remains the responsibility of all staff. The practice opened with Dr. Griffin, an MA and an office manager, and has expanded to the staffing described in Section A. All staff is required to participate in updated training on the system as needed. There is no need for a formal plan around maintaining, updating, and improving the system due to the small size of the staff and the culture of open communication. It is made very clear, however, that all have a responsibility to contribute to the process of continuous improvement.

Dr. Griffin took the approach of phasing in patient visits instead of functionalities when the practice opened (see description, section f, “System Implementation”). Every employee was, and still is, responsible for making notes about bothersome aspects of the electronic system, and/or suggestions for improvement as it affects their work. Quick improvements, such as color-coding of schedules, are made as identified, and lists of more pervasive or difficult issues are discussed at monthly meetings. If issues can be fixed in-house they are, and if not, Dr. Griffin contacts the vendor for further discussion and requests assistance. Dr. Griffin is the manager of the EHR, and has an effective working relationship with the vendor who typically responds to his needs promptly.

Staff suggestions resulting in improved processes include:

- Reception staff reported a need to view patient photos to ensure they were correctly identifying patients without having to open the chart. Photo feature added.
- Reception staff reported waiting several seconds for needed information due to slow printing and all information printing to one central printer. Alpenglow purchased new printers and a software upgrade that allows clinical information (i.e. procedures, prescriptions, and lab results) to be printed at the back nursing station and administrative information (i.e. routing slips and ordered tests) to print to the reception desk. The printer in the reception area was placed directly in front of the reception staff on their desk and allows them to see and remove print outs without having to turn or leave the work station.
- Office staff noted a large volume of material, such as consults, arriving in paper format and desired a faster means of scanning into the EHR. Dr. Griffin shared this concern with the vendor, and the vendor developed a method to batch scan and sort information to each patient chart. Alpenglow also purchased high-speed batch scanners to get the paper information into the system at about 88 ppm. This improvement eliminated hours of staff time per day.
- Clinical staff noted that the update of current medications was a time consuming process (2 clicks per medication). Dr. Griffin worked with the EHR vendor to reduce this time to 2 clicks to activate the entire medication list.

c. Clinical Objectives

Dr. Griffin's top priority for an electronic system was to capture clinical encounter documentation in real time to increase the quality of documentation, include the patient in the accuracy of documentation, and to reduce malpractice risk through improved accuracy and completeness. Additionally, he wanted a system that could serve as a database for knowledge management of ideal clinical care. Although Dr. Griffin intentionally avoided a template-driven EHR, he wanted a system that would allow him to build care management plans for individual patients based on his own knowledge, training, ongoing review of the literature, and web-based clinical decision-support services, and then store them for future application. Each patient record opens with a clinical encounter form based on the care management plan that clearly outlines the interventions, tests, and treatment options to be reviewed during the encounter, preventing the omission of recommended services. Through continuous updating of care plans in a central clinical knowledge database, Dr. Griffin's goal is to improve quality and the consistency of quality for his patients, without having to re-invent ideal care management plans for individual patients.

The latest upgrade of the EHR system at Alpenglow is being used to run disease-specific reports on specific patient populations to identify patients missing recommended services, or responding inadequately to treatment.

d. Other Objectives

Alpenglow constructed the practice and EHR to control time for family and other activities. Not only was this important to Dr. Griffin in his vision of a sustainable medical practice, it is important to reduce staff turnover. By controlling his time with patients, he is also able to keep abreast of current literature, serve on hospital and other committees, and pursue leisure and family activities.

Implementation

e. EHR System

Alpenglow implemented Praxis® EMR by Infor-Med (www.infor-med.com), a system based on Concept Processing rather than structured templates. A Concept Processor is an artificial intelligence software program that learns from its user, and in turn, documents faster and better with each patient encounter.¹ Praxis incorporates UpToDate decision support system and contains thousands of disease specific templates (or "concepts"). Patient concepts can be built by the individual practitioner based on review of the literature, experience and personal preference, or imported directly from decision support software. The screen that first appears when accessing the medical record during the patient encounter opens with preset fields based on the concept, and displays the current problem and medication lists, elements of the plan from the previous visit, including standard recommended interventions per diseases state, lab and other test results, and any other aspects of care that the practitioner chooses to view to accommodate personal practice style. These features were very important to Dr. Griffin in his selection of the Praxis system, as he believed it most closely mirrored his own thought processes and documentation style. Praxis also allows for free text or speech recognition to capture data on unique patient histories.

Alpenglow uses a non-integrated billing system, Medisoft. This requires staff to perform re-entry of patient demographic information from the EHR into the billing software. The staff has experimented with integrating these two systems, but discovered that the billing staff used more time when the systems were integrated, and tended to not capture the provided services as comprehensively.

The main benefits of Praxis over other EHR systems as used by Alpenglow are:

- Charting and real time documentation

¹ Infor-Med Medical Information Systems Inc. 2006, *Praxis Electronic Medical Records, Praxis EMR Clinical Practice Guidelines and Queries*, 2006, viewed 23 April 2006, <http://www.infor-med.com/downloads/why_praxis_downloads/Praxis_Clinical_Practice_Guidelines.pdf>

- The ability to automate multiple tasks such as prescription writing, test ordering, generating billing information, and facilitating scheduling of return visits
- Individual physician knowledge database accumulated by customized disease-specific concepts
- Lack of pre-loaded disease-specific templates
- Clinical encounter interface mirrors typical physician workflow/thought processes

Core Functions

Scheduling – Alpenglow uses the Office Hours module of Medisoft that includes a color-coded schedule that displays daily appointments color-coded by type. Appointment types include scheduled, same day acute, physical exam, or lab recheck. Color codes also indicate whether or not nursing assistance is required, and whether or not the patient is new to the clinic. The scheduling system allows providers and staff an easy visual cue to indicate what is in front of them for the day, and helps to manage prep work required prior to appointments.

History and Exam – History and physical exam are captured by a modifiable physical exam concept. Elements entered into a specific patient record, such as routine tests required, typical follow-up schedule, and medication lists can then be stored in a disease-specific concept. Concepts can be saved for very general disease states (“diabetes”) or very targeted disease states (“type II diabetes complicated by stable angina”). All are available for incorporation into future patient records as applicable. Dr. Griffin does not use structured screens containing recommended care interventions per disease state, because this format constitutes an interruption to his usual way of thinking.

Problem list – The patient’s problem list automatically incorporates items entered into the assessment section of the physical exam form. Additional items can be entered free-text into the problem list screen as well. These can be then classified as resolved, chronic, active or removed from the list entirely.

Lab Orders – Dr. Griffin orders labs within the indicated section of the patient encounter form and lab orders print automatically to the front desk. Any lab ordered is pre-populated into the opening screen of the next patient visit note, to prompt physician review.

Lab Interfaces – The EHR interfaces with Quest, Labcorp, PVH (the local hospital) and has a manual interface for entering and converting to electronic format any results from smaller local labs in Fort Collins, or reference labs that are not interfaced. Alpenglow receives electronic lab results daily from Quest, Labcorp and the local hospital via an Internet and modem connection. Lab results are placed directly into the physician’s inbox and the patient’s chart after review.

The EHR sends a note to the medical assistant to check for returned lab results in cases where an office visit has not been scheduled to review the results. This note is set to activate based on a specified time interval and is sent to the medical assistant’s inbox when the timer is activated.

Medications – Praxis is linked to First Data Bank, National Drug Data File Plus, a national medication and clinical information database that allows providers to select medications and obtain detailed information including drug-drug and drug-disease interactions. Medications entered into the medications section of the patient encounter form print automatically to the front desk.

Referrals – Referrals are ordered within the patient encounter and print automatically to the front desk.

Information from outside the practice – The EHR imports, stores and displays laboratory, radiology, and referral reports and stores media files.

Patient Information – The EHR produces patient education materials and instruction sheets and can interface with several different web-based sources of information (i.e. AFP or any private supplier). The EHR also allows providers to generate or customize their own informational materials.

Reporting – The EHR currently has the ability to report on multiple disease-specific and overall practice criteria. For example, Alpenglow generates regular reports of all diabetic patients with Hemoglobin A1c > 7.0 % for the purpose of tracking and follow-up.

EKG/Spirometry Interface – The EHR has the ability to interface with EKG and spirometry equipment. All EKG and spirometry data is currently stored electronically, and Dr. Griffin is in the process of setting up an interface.

Billing Interface – The EHR is not currently interfaced with the billing system. Alpenglow has tried interfacing the billing system with the EHR, but the billing staff prefer the separate systems and feel this is a more efficient way to operate. All demographic and insurance information is available within the EHR system.

Dr. Griffin manages the interfaces with ongoing assistance and support from Praxis. If he has a problem or request, he calls Praxis and they promptly dial into his system via the Internet to troubleshoot and resolve any issues.

f. System Implementation

Dr. Griffin spent over a month selecting Praxis. Once he selected a system, Dr. Griffin hired a local IT consultant to assist with hardware purchase and installation. The IT consultant worked through a re-seller and Praxis to obtain recommendations for the purchase of hardware. Dr. Griffin purchased Dell hardware via the Dell Website and was part of the installation team. The team consisted of Dr. Griffin, the re-seller, a Praxis representative and the local IT consultant. The team set a goal to complete training and testing in one week of dedicated work prior to opening the practice to patients.

Dr. Griffin was committed to hiring staff that were open to and interested in working with an EHR, open to an environment based on open communication and continuous improvement, and interested in continuing education. Dr. Griffin hired a nurse and office manager and scheduled a week for the training.

The re-seller sent two trainers to work with the entire Alpenglow team, which consisted of Dr. Griffin, an office manager, and a nurse, for a full week prior to opening the practice. Users were responsible for looking critically at the areas of the EHR that they would be using and bringing questions, suggestions, and feedback on the EHR system back to Dr. Griffin and the trainers. Testing included dry runs of complete patient encounters to test the system and set reasonable patient volume goals for the first week of actual patient care following implementation.

Dr. Griffin supported users during the implementation by encouraging an environment of open communication and requiring feedback from all staff throughout the implementation process. The Alpenglow team attends ongoing live Praxis Web training to keep updated with new versions and upgrades and to ensure the team is comfortable with the system. The practice closes several days per year to allow full participation in update trainings.

Throughout the implementation of the EHR and the opening of the practice, Dr. Griffin remained committed to the goal of never allowing a patient to wait. At the end of the training and testing week, the Alpenglow team determined that they could see 6 patients per day successfully without falling behind on the day's schedule, thus the team scheduled six patients per day for the first week. Reassessment at the end of that week indicated that they could see twelve patients per day the second week, and were up to twenty by the third week. Refinements to the EHR and workflow made during the first few weeks included: customization of forms generated by the EHR and redefinition of staff roles as compared to other practices.

Dr. Griffin was responsible for customizing the clinical content of the EHR, with feedback from the staff. If he ran into a problem, he contacted Praxis for support and received prompt assistance. When he quickly realized the need for lab interfaces, he contacted Praxis directly and they set-up and tested the interfaces. Dr. Griffin believes that open communication among staff, the EHR vendor, and the re-seller were critical aspects of his implementation.

Although Dr. Griffin opened Alpenglow with an EHR system in place, he has acquired 3 additional practices over the past seven years, and has transferred the paper charts from these practices to his EHR system. Dr. Griffin did not believe in scanning the entire paper chart, as he felt this would devalue the EHR and fill it with unwanted 'noise' that could serve as a distraction from relevant information. Dr. Griffin and his staff spent a great deal of time identifying what information should be transferred from the paper chart to the EHR. They held a meeting to review what was actually in an 'old chart' and discuss what information was relevant to an internal medicine practice (as 'relevant' information would clearly vary by specialty), and what information providers and staff would access and use.

Alpenglow scheduled 30-minute visits with each new patient. Dr. Griffin brought their paper chart to the first visit and entered relevant information from the paper chart into the EHR system. He also pulled any additional relevant information and gave to staff for scanning. After the first patient visit, the chart was placed in off-site or attic storage.

Lessons Learned

- Reduce the number of patients seen for the period of implementation. The staged implementation of patient visits instead of EHR functionalities was a successful experiment.

Dr. Griffin aimed to eliminate patient perception of the EHR as an inconvenience and felt he could do so with a short period of decreased visits. He also felt that this method would make the implementation process much more pleasant for providers and staff.

Dr. Griffin was concerned that the typical model of chaos during patient visits while implementing a paperless system would distract from learning the system, and encourage work-arounds that could take months or years to discover and reverse. With a staged patient implementation, the adaptive work focused on increasing the efficiency of using the system fully. Dr. Griffin believes that the success of this model is largely dependent on staff participation, and he was able to achieve this participation through his hiring criteria, creating individual buy-in, and requiring an open communication style on the part of every staff member. Success of implementation was measured initially through direct positive staff and patient feedback.

- A culture of teamwork is essential to accept the transition from the "traditional" clinic design and roles. At Alpenglow this extends far beyond implementation and/or use of an EHR. See Section j "Critical Success Factors".
- Interfaces, when available, are very important to fully using the EHR for efficiency.

g. Current State

Praxis EMR is fully implemented at Alpenglow. All intended users (physicians, MA, office manager and receptionist) are using the EHR to accomplish their work. A typical office visit begins with Dr. Griffin and the patient entering the exam room together, and then accessing the electronic system. The opening screen shows a picture of the patient, all demographic and insurance information, current lab and x-ray reports, prompts from the disease-specific concept, and current problem and medication lists. The interview is conducted with the patient and Dr. Griffin viewing the screen while Dr. Griffin enters relevant notes. Medication reconciliation is a routine part of every visit. Following the examination, the patient and Dr. Griffin return to the computer to enter further information as needed. Dr. Griffin verbalizes all entries into the system while typing to ensure accuracy, to allow for corrections or additional patient input, and to serve as an educational intervention. Dr. Griffin places a high priority on fully answering patient questions, and

schedules appointments with that goal. After the concurrent visit documentation is completed, Dr. Griffin and the patient leave the examination room together and go to the front desk where prescriptions, test and referral orders, and billing information is printing. The front office staff has access to the follow-up recommendations section of the clinical encounter and schedules the next appointment before the patient leaves whenever possible. At the conclusion of the visit, all documentation is completed, with no pending data entry.

The medical assistant enters vitals, updates the current medication list, and enters the chief complaint and any secondary complaints into the EHR system. The medical assistant also manages an electronic tickler system that sends messages alerting when to check for lab results.

The receptionist and office manager are responsible for scheduling patients, either based on phone call requests, or when present in the clinic, typically after a preceding physician appointment. Patients are scheduled according to type (acute, chronic care needs, lab follow up, physical exam, etc.) and are put into the schedule with color-coding. Standard appointment time allocations are based on Dr. Griffin's estimation of the time required, plus a buffer of several minutes in order to assure adherence to the no waiting policy. If an unusual number of patients request same-day appointments, office protocols guide the staff in placing additional visits into the schedule, or they are individually cleared by discussion with Dr. Griffin.

Every scheduled appointment includes nursing pre-work listed on the master schedule, and an empty box in the upper right hand corner. When the patient enters through the front door, whoever is at the front desk puts an 'X' in the box, which is the visual cue that the patient is ready for rooming. Physicians and MAs always have the schedule open on their computer, even if they are working within an individual medical record, or are seeking other electronic information.

When a plan is generated from within an examination room that indicates need for scheduling or arranging, such as for laboratory or consult intervention, a pop-up appears on the front desk computer, and the receptionist or office manager begin calling to arrange these appointments, printing any required instructions and/or physical directions, and indicated patient education materials. Prescriptions automatically print to the computer behind the front desk and are added to the paper information given to the patient.

The physicians at Alpenglow routinely use UpToDate, an evidence-based clinical decision support tool, to access clinical information at the point of care. In addition, Alpenglow recently incorporated First Data Bank, National Drug Data File Plus into their EHR system, which allows providers to access drug screening information as they prescribe.

Value

h. Success in Meeting Objectives

- Gross revenue: Exceeded goal of \$400,000 per year. See Table 1.

Table 1. Alpenglow Gross Revenue 2002 - 2005

	2002	2003	2004	2005
Alpenglow Gross Revenue	\$794,011	\$899,869	\$870,241	\$968,309

- Personal profit: Exceeded personal profit goal of \$200,000. Current personal profit is \$300,000 per year.
- Collection rate: Exceeded goal of 90%.

Any Alpenglow patient who does not provide insurance information is asked to provide a credit card and sign an authorization allowing a charge to their card. If there is ever a payment issue with a patient, they arrange for a payment plan, give credit card information and agree to this

policy or they can leave the practice. In cases of financial hardship, which for some is temporary and for others permanent, Alpenglow will always work with patients and will at times write off all charges. Dr. Griffin has made a decision that Alpenglow will never refuse care based on an individual's inability to pay. They will refuse to provide care, however, based on a patient's decision not to pay when they can. Dr. Griffin believes that a certain amount of pro-bono work is morally appropriate and something one can afford in a well-run practice.

- Increased staff: Alpenglow had 1 FTE MD, 1 FTE MA, and 1 FTE office manager when the EHR was installed. Currently they have 2 FTE MD, 1 FTE MA, 1 FTE office manager, 1 FTE receptionist, and .75 FTE billing staff.
- Staff participation: \$1,000.00-\$2000.00 per staff member budgeted and used each year for continuing education.
- Staff turnover: 0 turnover (due to staff choice) since opening. Several staff members have been asked to leave due to incomplete commitment to the innovative model of patient care.
- Quality of life: Physicians and staff begin seeing patients at 9:00 am, (8:00 am after rounding at the hospital starting at 7:00 am).
- Quality of life: Physicians and staff leave the office every day by 5:15 pm.
- Quality of life: Physicians work 4 days per week and staff work 4.5 days per week.
- Workflow management:

Documentation: Achieved 100% concurrent documentation.

Overall time spent in examination room: 88%

Time out of the examination room with pending documentation: 0

Recent literature shows that only 55%-61% of physician time is spent in the examination room or in direct patient contact activities^{2,3,4} and that documentation consumes the majority of physician time outside of the examination room. Structured observations of physician work confirms that documentation can occupy more than one fourth of total physician time while at work^{5,6} with published estimates of total proportionate physician time spent documenting varying from 13% - 28%. CFMC, the quality improvement organization (QIO) for Colorado, performed timed observations of physicians as a part of DOQ-IT project work to assist practices in understanding potential workflow efficiency improvements. CFMC staff observed Dr. Griffin's activities during a series of patient visits, and used timed measurement to describe his workflow processes and time distribution. Each visit began with the patient and Dr. Griffin entering the examination room together, all documentation was completed during the encounter, and the visit ended with both leaving the examination room at the same time leaving no pending information needs requiring a return to the patient's medical record. Alpenglow's workflow was recognized as remarkable by

² Bratt JH, Foreit J, Chen PL, et al. A comparison of four approaches for measuring clinician time use. *Health Policy Plan.* 1999;14:374-381.

³ Gilchrist F, McCord G, Schrop SL, et al. Physician Activities During Time Out of the Examination Room. *Add Fam Med* 2005;3:494-499.

⁴ Gottschalk A, Flocke SA. Time Spent in Face-to-Face Patient Care and Work Outside the Examination Room. *Ann Fam Med* 2005;3:488-493.

⁵ Work Interrupted: A Comparison of Workplace Interruptions in Emergency Departments and Primary Care Offices. Chisholm CD, Dornfeld AM, et al. *Ann Emerg Med.* 2001;38(2):146-151.

⁶ Can a Senior House Officer's Time be Used More Effectively? Mitchell J, Hayhurst C, Robinson SM. *Emerg Med J* 2004;21:545-547.

measurements taken from the observation as compared to other practices, and as compared to similar data reported in the medical literature already cited. No other practice was observed in which physician activity between direct patient care visits was not driven by pending patient management and/or documentation needs. A full description of office processes measured was featured in a national program, “Transformational Grand Rounds” due to his outstanding success in achieving superior efficiency. The recording of this program is available at:

<http://www.medqic.org/dcs/ContentServer?cid=1141844538113&pagename=Medqic%2FMQPresentations%2FPresentationTemplate&c=MQPresentations>

- Patient satisfaction: Achieved 100% patient satisfaction.

All patients are given a patient satisfaction survey on a postcard at the conclusion of their visits, and the staff and physicians review all written comments. Comments are discussed at regular staff meetings and responded to in a timely manner. Customer satisfaction was tracked when Alpenglow first opened, but aggregation of this data has stopped because of 100% performance for many months. The primary use of this survey is to solicit specific requests for improvement through the comments section. All comments are reviewed and discussed at the monthly staff meetings, and a significant proportion is acted upon. Recent improvements made in response to patient comments include installation of a bike rack in front of the building and revision of the previous wheelchair access ramp to the front door, which was too steep for some caregivers. Most recently the practice has received further negative comments about the ramp, and Alpenglow is now securing a loan to install an elevator.

- Patient retention: Achieved near 100% patient retention.

Any patient requesting a transfer of medical records from the practice receives a phone call from Dr. Griffin to explore the possibility of unexpressed dissatisfaction. Dr. Griffin estimates that about 1 – 2 patients per month transfer care due to change in insurance status or relocation. A patient leaving Alpenglow for other reasons is uncommon (3-6 patients per year on average, an example being a patient who wanted frequent house calls that Alpenglow could not provide). Dr. Griffin hopes that Alpenglow’s successful patient retention is due to their listening to and providing patients with the care and experience they hope for. He feels that it is realistic that the chemistry will not be there with every patient, and in these cases he may be the one to suggest that a patient might fit better at a different practice.

- Patient waiting: Eliminated unnecessary patient waiting time (total average wait time: 2 minutes 12 seconds)

As a part of the DOQ-IT project for CFMC, external observers collected data on 10 complete patient encounters in each of a series of outpatient clinics in Colorado. Patients were followed using a stopwatch to measure time intervals associated with checking-in, being evaluated by the MA, being evaluated by the primary provider and checking out. Additionally, intervals of waiting between each process were also recorded. Data were used to calculate patient value-added time (VAT), which is the proportion of the total time the patient spent in the clinic that was used for one of the above processes. Patient VAT is the inverse of proportion of time waiting.

Patient value added time at Alpenglow was 91%, averaged over 11 patient encounters observed (See Table 2.). As a comparison, the range of VAT measured in Colorado at other practices was 45 – 79%.

Table 2. Average Process and Wait Times at Alpenglow Medical

Average Time (min)	Check-in (n=11)	Interval 1 (n=10)	MA Evaluation (n=10)	Interval 2 (n=9)	MD Evaluation (n=11)	Interval 3 (n=6)	Check-out (n=11)
Low	00:00	00:00	00:43	00:00	05:39	00:00	00:00
Average	02:08	00:09	01:55	01:03	16:16	01:00	02:03
High	08:49	00:50	03:13	02:37	51:06	01:19	06:46

Total Average Time: 24:24, Total Average Processing Time: 22:12, Total Average Wait time: 02:12
 Patient VAT=22:12/24:24=91%

- Patient access: Eliminated treatment delay through successful implementation of open access model and same day appointments for all acute problems.
- Clinical outcomes: Successfully implemented electronic disease management system. Dr. Griffin runs disease-specific reports on a regular basis and meets with providers and staff to review the results. The following are examples of the reports:
 - Percent diabetic patients with HbA1c > 7.0 % (currently 20% of diabetic patients with HbA1c > 7.0 %)
 - Report of all patients with HbA1c > 7.0 %. Clinicians have discussed and created an action plan for each of these cases.

Analysis of Alpenglow’s Medicare Fee-for-service population data shows that Alpenglow patients have much higher rates for diabetes and mammography screening than both Colorado statewide and national rates. (See Table 3.)

Table 3. Alpenglow Medical, Colorado Statewide, and National Diabetes and Mammography Rates

	Alpenglow	Colorado	National
Biennial Eye Exam	80% (n=25)	68.4% (n=20,537)	69.2% (n=2,892,197)
Biennial Lipid Profile	100% (n=25)	84.0% (n=20,537)	85.5% (n=2,892,197)
Annual HbA1c	100% (n=25)	81.9% (n=20,537)	83.3% (n=2,892,197)
Mammography	90% (n=20)	57.9% (n=34,373)	59.1% (n=3,461,256)

Based on Medicare fee-for-service claims data submitted 10/2002-9/2004. Diabetes rates based on diabetic Medicare beneficiaries age 18-75. Mammography rates based on female Medicare beneficiaries age 50-67.

- Coding accuracy: Achieved 100% coding accuracy assessed through frequent coding reviews with providers and coders. Both providers and coders are sent to continuing education activities to keep coding knowledge at a high level.
- Medication accuracy: Achieved 100% medication accuracy since implementation of First Data Bank system.

i. Costs and Benefits Offsetting Costs

Table 4. Cost of EHR Effort

Cost	Initial Investment	Ongoing Investment
Software	\$10,000	None (all support and upgrades included)
Hardware	\$15,000	Approx \$4,000/year (flat screen monitors, fast printers, etc.)
Installation	\$3,000 (this includes quantum network cabling which is faster than category 5)	Minimal (Praxis does all EHR installation for free); cost when adding workstations
Implementation and Training	\$2,000	None
Lab interfaces	None (Praxis responsible for set-up and testing at no charge)	None

Dr. Griffin did not do a formal ROI, because his decision to purchase the EHR was not a financial decision but an integral part of the vision for the business and quality model that led to the establishment of Alpenglow. It is clear that the EHR provides a significant financial benefit, improves productivity and allows Alpenglow to see more patients.

Cost Benefits from the EHR:

- Only 1 MA needed for 2 clinicians (annual cost savings of \$30,000)
- No need for medical records staff or transcription (annual cost savings of \$20,000)
- Ability to see more patients per time spent in the office with increased profitability (1 extra level three return per day adds \$10,000 a year in profit)

Lessons Learned

j. Critical Success Factors

- Focus on the patient experience of care for structuring your service and deciding what needs improvement. This includes what features of the EHR you need most.
- Value and reward staff - An environment of open communication is essential to retain staff. If the clinic staff is well trained, it is disruptive and expensive to lose them. Alpenglow has very high expectations of the staff but rewards them well, and provides (requires) ongoing education both on the EHR and other areas necessary for superior performance.
- Vendor support and responsiveness after purchase/implementation is critical. This should be part of the initial purchase contract.
- Purchase updates and train on them as available. They are worth paying for because otherwise the investment already made is not producing maximal benefit.
- Hardware can be purchased inexpensively, but never skimp on hardware. The system needs to be as fast as necessary to keep up with the pace of clinical thought/practice. A seemingly common error is to save on functionality that results in the clinical encounter being modified by needs of the electronic system, as opposed to the electronic system serving the needs of the clinical encounter. If borrowing money is necessary, this should not be a relevant barrier.
- Design the clinical space to accommodate the EHR and the clinical practice style.
- Total commitment to the concept that the only rational business decision is to set up practice with the best information management available.
- In line with that commitment, it works well to begin by training on and using the entire functionality of the system selected, and phase in patient visits. This keeps the focus of implementation on improving work efficiency, not creating work-arounds.
- Teamwork is ongoing and the most important element predicting success. The physician can require teamwork and learning as part of the job expected of staff, and hire, promote or terminate employees based on this expectation.