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Communications of the Association for Information Systems



Greenway Medical Technologies: The Pace-Setting David of Electronic Health Records

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Abstract:

This teaching case updates a previous study of Greenway Medical Technologies, a software company delivering electronic healthcare record (EHR) solutions to physicians. The current EHR marketplace is considered, including global trends as well as the impact of U.S. government funded monetary incentives. Greenway continues to build on its best-in-class software application and find ways to provide new enticements to medical practices and improvements to the broader medical community. The case also describes the EHR systems industry and explores the reasons for Greenway's continued success and growth that surpasses its competitors.

Keywords: Information Systems in healthcare, electronic health records, IT strategy, competitive advantage, teaching case study

Editor's Note: A teaching note for this case can be obtained from claggett@gmail.com. Only active faculty who are currently listed in the AIS Faculty Directory are eligible to receive the teaching note. Greenway Medical Technologies was previously reported in a case entitled "Greenway Medical Technologies: Challenging the Goliaths in Electronic Medical Records," published in *Communications of the Association for Information Systems* in March 2007, Volume 19, Article 2.

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I. INTRODUCTION: AN UNHEALTHY PAPER SYSTEM

When you walk into a local doctor's office, 80 percent of the time [CDC] you are faced with a familiar sight—walls and walls of physical patient folders, each containing a plethora of paper documents describing medical histories. In the digital era, when you can easily check the local movie times from a cell phone, do all of your banking on your laptop at a corner coffee shop, and search through 113,000 strangers' kung pao chicken recipes on the Internet, it seems unbelievable that most medical practices do not use technology to better manage something as important as patient health records.

Yet, electronic health records (EHR) [Bashshur, 1995] are not a new concept. The idea is simple—use a database driven system to store digital health records for each patient in a physician's practice. Instead of paper files and handwritten notes, medical records are accessed and altered by physicians and staff using computers. An EHR system can assist physicians and other care providers with documenting patient visits, providing clinical decision support, writing prescriptions, ordering tests, and capturing charges.

EHR systems not only help the physicians and staff to efficiently maintain patient history, but many sources predict they will save lives. Missed, delayed, or incorrect diagnoses account for more malpractice claims than any other, beating out surgical errors and medication mistakes [CRICO, 2010]. A *New England Journal of Medicine* article highlights numerous ways a well-designed and used EHR system can prevent diagnostic errors [Schiff and Bates, 2010], but if you have ever attempted to decipher a physician's handwriting, you do not need the article to convince you. In addition to alleviating legibility and missing information problems, a well-designed system can provide fast access to current medical literature at the physician's fingertips during the patient's visit.

In spite of the apparent benefits of having health records available electronically, adoption has been slow until recently. Governments around the world are driving EHR adoption through incentives and new regulations. Many companies are offering EHR software solutions to medical practices, and most are large, publicly traded corporations. Despite its small size and the competition, Greenway continues to grow at an accelerated pace and lead the competition in many innovations. What is it about Greenway's past decisions, particularly with regard to information systems, and current strategy that have given it a competitive edge?

II. UNDERSTANDING ELECTRONIC HEALTH RECORDS

The need for electronic health records has fostered initiatives in many countries. In the United Kingdom, the publicly funded healthcare system, the National Health Service (NHS), has developed an EHR system called *Summary Care Records*, which is to go into service in 2012 [NHS]. This voluntary service will allow digital records to be stored at a central location and accessed by medical professionals as needed instead of locally stored paper copies.

France has been working on the development of its electronic health record system since 2004, named *dossier médical personnel* (DMP). DMP is being tested in many regions and has accumulated over a million medical records, which include full details of diagnoses and treatments given by health professionals working at hospitals, clinics, or other health centers. Patients have Internet access to their medical records and own a green plastic card with an embedded chip that includes their medical history. From December 2010 through 2011, the system will be rolled out nationally [LeMonde.fr, 2010].

HealthConnect is Australia's change management strategy to embrace a new EHR system. Pilot studies took place in various areas of Australia in 2004 and a second round of testing occurred in 2007 [Health Connect]. In 2010, the Australian Department of Health and Ageing announced that personal health records would be available for all citizens to check their medical history online, in addition to being available to medical professionals. Additionally, every Australian has a 16-digit electronic health number [Department of Health and Ageing].

Similar to Australia's HealthConnect, Canada invested in a federally-funded nonprofit organization called *Canada Health Infoway* beginning in 2001 to speed EHR adoption [Canada Health Infoway]. Infoway estimates that for every 1,000 Canadian patients without an EHR system, seventy-five of them will suffer an adverse drug event and there will be 150 unnecessary laboratory tests performed. Progress to adopt the EHR system at a national level has been slow, and the Canadian provinces and territories are at different stages of development.

Electronic Health Records in the United States

The U.S. federal government has also taken note of the many benefits EHR systems provide. In 2004, by executive order, the Office of the National Coordinator for Health Information Technology was created. In early 2009, President Obama signed the American Recovery and Reinvestment Act of 2009, and one component specifically authorizes funding for physicians who implement meaningful use of certified EHR technology [Health Information Technology]. The average physician is eligible for approximately US\$44,000 over five years in stimulus money by adopting and meaningfully using a certified EHR system. This new set of monetary incentives is driving demand for EHR systems, thus strengthening the position of the providers already established. In 2011, health IT was a recurring theme in President Obama's State of the Union Address as he praised the benefits of an EHR system used by the Department of Veteran Affairs and called for more innovation and expansion of health IT.

However, the Department of Health and Human Services has made it clear that the opportunity for stimulus money is not indefinite. The last year to participate in the Medicare EHR Incentive program is 2014 [Centers for Medicare and Medicaid Services]. Medical practices that have not adopted EHR technologies by 2015 will have Medicare reimbursements negatively adjusted for failure to comply.

The 2009–2010 stimulus money from the U.S. federal government is awarded only for “meaningful use of a certified EHR system” to Medicare eligible professionals. Although the phrase appears vague, the government provides a definitive checklist of required software capabilities and what features physicians and other eligible professionals must use to prove they are “meaningfully using” their new EHR system. Greenway has attained the necessary certification from CCHIT and provides a guarantee to its customers that PrimeSuite will provide them all the specified functionality to receive the adoption stimulus funds.

The Electronic Health Records Market

In the United States, there are hundreds of EHR vendors, but most are small start-ups serving isolated pockets of customers. There are six major players in the EHR field (Table 1). Greenway Medical Technologies is the smallest in terms of revenue and employees and one of only two privately owned companies.

Table 1: Major EHR System Providers

Company	Type	Revenue (US\$ Millions)	Number of Employees	Headquarters
Allscripts ¹	Public	548	2,500	Chicago, IL
Athena ²	Public	189	1,000	Watertown, MA
E-Clinical ³	Private	~112	1,000+	Westborough, MA
GE Healthcare ⁴	Public	17,000	46,000	United Kingdom
Greenway ⁵	Private	63	330	Carrollton, GA
NextGen ⁶	Public	246	1,200	Horsham, PA

In addition to companies that develop EHR solutions for medical practices, there are several new products that are designed to help patients manage their data. Google has launched a Web application called *Google health* that allows consumers to build their health profile, import records, search for doctors, research symptoms, and share records with other parties [Google Health]. Microsoft's HealthVault offers similar services, as well as inviting healthcare solution providers (e.g., inventors of a new medical device or application) to join the community [Personal Home–HealthVault].

III. GREENWAY MEDICAL TECHNOLOGIES

Greenway Medical Technologies was forged as a joint venture between a medical consortium and Greenway Corporation [Dunbar, Watson, and Boudreau]. The consortium, made up of medical professionals in Carrollton, Georgia, convinced Tommy Green that although there were large, established companies in the healthcare software market, their products did not meet physicians' needs. Their expert medical knowledge, combined with Greenway's software developers and Internet technology, created a solution that naturally fits a physician's consulting room flow.

¹ Allscripts—Allscripts is traded on the NASDAQ under the symbol MDRX. Financial data from 2009. <http://www.allscripts.com>.

² Athena—Athena Health is traded on the NASDAQ under the symbol ATHN. Financial data from 2009. <http://www.athenahealth.com>.

³ E-Clinical—Estimates provided on <http://www.eclinicalworks.com> (accessed April 2010).

⁴ GE Healthcare—GE Healthcare is an international unit of GE, which is traded on the NASDAQ as GE. Financial data from 2009. <http://www.gehealthcare.com>.

⁵ Personal communication via Greenway Chairman, Tommy Green.

⁶ NextGen—NextGen is traded on the NASDAQ as QSII. Financial data from 2009. <http://www.nextgen.com>.

By better matching work routines, the software empowers tablet-equipped physicians to function at higher levels of efficiency compared to using paper records.

Greenway Medical was originally founded in 1999, with US\$4.5 million⁷ raised from forty-four private investors and approximately \$15 million from Tommy Green's personal assets and sale of a previous company. Two more rounds of private financing secured additional money in 2000 and 2002, as Greenway went from a prototype design to launching its flagship software. In 2006, Greenway secured additional financing from Wachovia Capital partners, bringing the total investment to \$64 million by 350 private investors. See Figure 3 for a timeline of investments and product releases.

Father and son team, Tommy Green Jr. (Chairman and Founder) and Tee Green III (President and CEO) continue the rapid growth of Greenway Medical Technologies, despite the competition. In 2005, they posted revenues of \$10 million; in 2009 they closed the year at \$63 million, and anticipate further significant growth as new products are refined. As seen in Figure 1, the company has been growing more than 25 percent per annum, for the last several years.



W. Thomas Green, Jr.
Chairman of the Board and Founder



Wyche T. Green, III
President and Chief Executive Officer

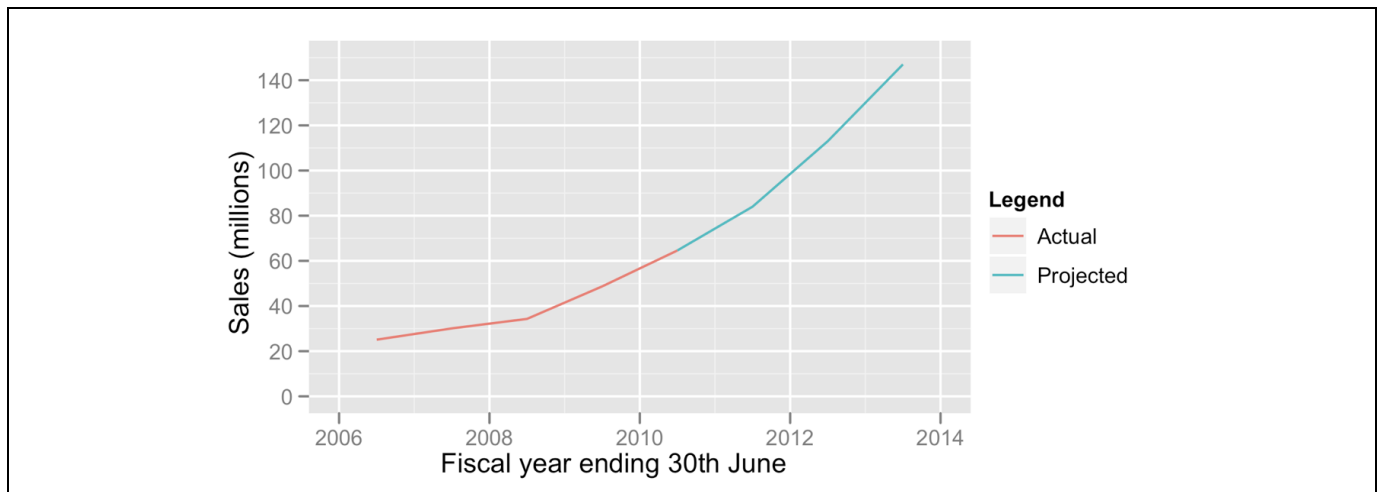


Figure 1. Greenway Sales

The Road to a Superior Product

Greenway's software, PrimeSuite, has won "Best in KLAS" awards⁸ for four years running. The development team that created PrimeSuite followed two principles: First, the software must be easy to use. Second, the encounter between the doctor and patient should not be slowed down. To obtain the necessary subject matter expertise during development, Greenway retained five doctors as full-time consultants at a time when the common practice was to keep only one or two, if any. These physicians' knowledge helped to create a system that mimics the event flow of a patient visit, is completely driven by modules and drop-down menus, offers medical diagnosis suggestions based on entered symptoms, yet allows customization of responses if the symptoms or treatments are not in the menus.

⁷ Unless otherwise indicated, all monetary values are in US dollars.

⁸ KLAS provides impartial ratings of healthcare systems and is considered to be one of the leading judges in ambulatory care products (like EHR systems). In 2010, Greenway Medical won the top award in Ambulatory EMR for physician practices ranging from six to twenty-five doctors, as well as the practice management award for practices with six to twenty-five doctors. <http://www.klasresearch.com>.

Architecture

Greenway made three architectural decisions that provide it the flexibility to act on additional business opportunities.

1. *Web-Based Application:* Greenway's Chief Operating Officer, Greg Schulenburg, initially recruited application developers without Web experience to insure an "application mindset" in a Web-based environment. This infrastructure easily allows the same medical practice to access a single integrated database from multiple locations, on numerous devices. It allows easy migration to new mobile devices. Greenway maintains a skilled programming team, and it continues to leverage this resource.
2. *Open-Standards:* Founded in 1987 and accredited by the American National Standards Institute in 1994, Health Level-7 (HL7) is a nonprofit, global organization headquartered in Ann Arbor, Michigan [Health Level Seven International]. It is committed to developing standards to help exchange electronic healthcare records between systems. By embracing open-standards early in software development, Greenway has been able to capitalize on opportunities involving interoperability collaborations.
3. *Flexible Hosting Solutions:* Greenway offers PrimeSuite for purchase (the practice pays an up-front cost and houses the database on its server) or as a "software as a service" model (similar to a lease option, and Greenway hosts the database for the practice). This flexibility allows practices to choose how and when to structure their investment, and the single database and Web architecture allows easy and seamless transitions between the two choices if a practice desires to change its hosting option. To achieve this flexibility, Greenway works closely with hardware and software partners to achieve the best integration of their products.

Greenway's Strategy

Greenway's products "snap" together cleanly, because it sought from the beginning to create synergy between its initial and future products by developing a flexible system architecture.

It was stopping and saying, even though we've identified this issue in healthcare, which is what we started out to solve.... We paused and said, whoa, wait a minute, what's going to happen to our customers over the next 15, 20, 30 years? Could you build an information source that would address your ever-changing needs of your consumer, the customer? You might have a different dynamic in business than trying to solve a mission critical problem.

Tee Green, Chief Executive of Greenway

At the heart of PrimeSuite is PrimeChart technology, which is the basic EHR solution that allows patient charts to exist in electronic form and for physicians to easily edit them.

The functionality includes:

- *Patient Charts*—tracks every aspect of the patient's history in a single electronic record
- *ePrescribing*—allows prescriptions to be transmitted electronically to the patient's preferred pharmacy
- *Scheduling*—creates patient appointments and provides views of the schedules for the entire organization
- *Patient registration*—speeds new patient registration, and merges patient data with their health record
- *Messaging*—enables staff to effectively track and manage electronic communications

Although essential, these capabilities alone do not make Greenway stand apart from its competitors. Greenway's PrimeSuite includes many other components that add functionality and leverage the nature of EHRs to create additional medical and business value. Five additional products packaged in their complete PrimeSuite solution (see Figure 2) are described next.

PrimePractice: Revenue Cycle Management (RCM)

Patient name, data, and insurance information are part of a patient record inside an EHR. With the easy-to-use Web-based interface, physicians add treatment and examination details during a patient's visit. What is the next phase of the visit process? Invoicing. Al Cochran, newly appointed CFO of Greenway, explains,

The Revenue Cycle Management approach we have is what we call zero touch RCM. Our view is that from the time the encounter is documented in the physician's office, everything exists electronically to generate the claim, transmit it to the payer, get it collected, and get it back into the physician's bank account with minimal human interaction. In the paper world, you have to have coding, bill generating, and a lot of human

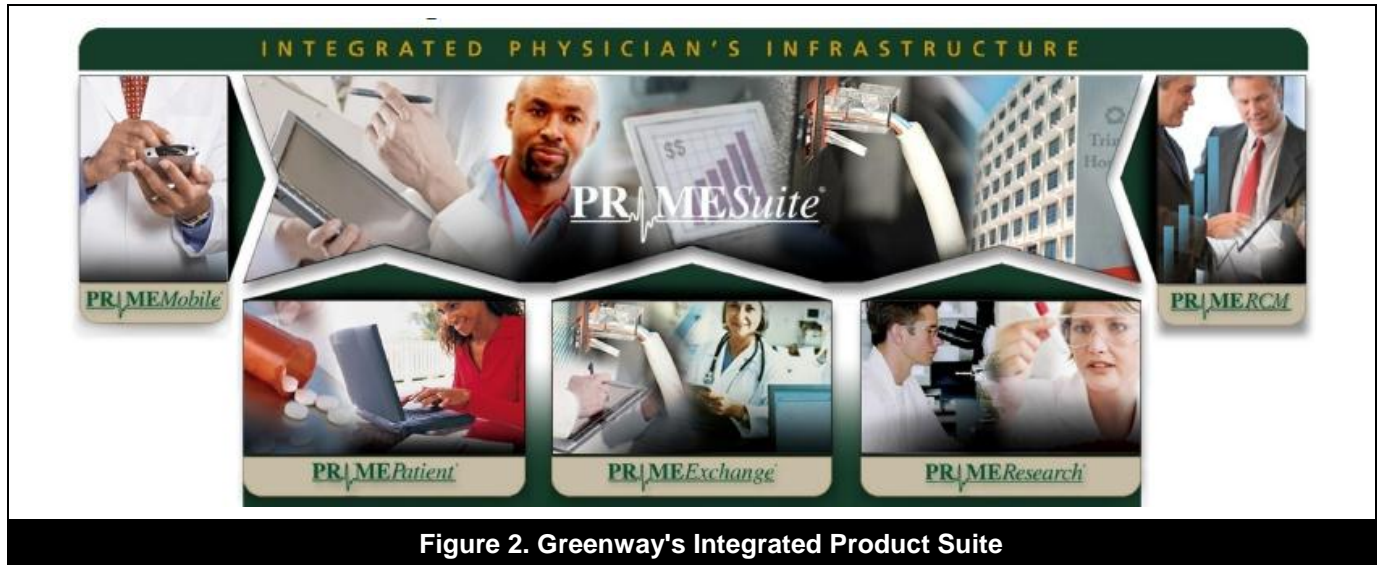


Figure 2. Greenway's Integrated Product Suite

intervention before the claim is ever submitted to the payer. We think that can be done with largely electronic processes.

This means a visit's details are automatically translated into the appropriate billing codes and invoices are sent to the payer, usually an insurance company or the patient. Other software solutions exist to help physician practices bill patients, but Greenway's PrimeSuite's use of the patient visit details entered directly by the physicians into the patient record creates a more efficient process. In essence, this automatic translation from visit notes into billing codes makes it a clinically-driven RCM product and differentiates it from its competitors. The current stimulus EHR adoption incentive is not available for RCM-only implementations, but because the RCM module is embedded inside PrimeSuite with fully-integrated clinical functionality, it adds an extra adoption incentive to physicians.

PrimeMobile

Information appliances are constantly improving—becoming smaller, faster, and offering new ways to interact with applications. Tablets, smart phones, and other devices offer access to the Web. PrimeSuite's original core EHR competency allows for efficient use of small devices inside the patient room during an office visit. Built on a single database and delivered via the Web, Greenway is able to quickly adapt to new mobile devices, allowing physicians 24/7 access to their patients' health records. This option was possible because of the inherent flexibility of Greenway's system architecture.

PrimePatient

PrimePatient includes a new stakeholder group—the patients. Previous functions of PrimeSuite offered enhancements to record keeping inside the practice's office. However, another set of processes important to physicians' practices involves communication with patients, ranging from appointment scheduling to providing patient medical histories. PrimePatient, another Greenway product, provides a Web portal for patients to access their medical records, enhancing communication and efficiency by adding a new set of processes between the patient and the physician's practice. Tommy Green describes a beneficial scenario as, "If you're sending your kid to camp and you don't know what they've been vaccinated against, you pull it up right there at home. If your primary care physician is loading your electronic health record, then those records on every member of your family can become valuable." Not only does this decrease problems and time involved with these processes, but physicians report leveraging this Greenway product benefit in their marketing campaigns to recruit new patients.

PrimeExchange

Greenway executives recognize there is a difference between making data electronic and making it liquid (able to flow between organizations). A common frustration of patients occurs when they need a second healthcare provider, and the new medical facility fails to have a copy of their existing health record describing all previous symptoms, tests, and treatments. HIPAA provides the rules and regulations around personal medical records, including who has access to them and the necessary security surrounding them [Health Level Seven International]. Greenway's PrimeExchange offers a HIPAA-compliant way to transfer records between medical facilities, even if the receiving facility does not use PrimeSuite solution. The Greenway solution utilizes open standards (Extensible Markup

Language—XML, Health Level 7—HL7, and Continuity of Care Document—CCD), thus providing an immediate way to transfer the data contained in an EHR between any systems adhering to these standards. In addition, PrimeExchange supports various vendor-specific formats to increase functionality to its customers.

Tommy Green explains that most EHR solutions are creating communication links between medical practices and other medical facilities on a one-to-one basis. Every time a practice sends a medical record to another organization, a separate network connection has to be opened between the two facilities. In contrast, Greenway's PrimeExchange utilizes a centralized interoperability engine developed on the Microsoft .NET platform. The partnership with Microsoft allows Greenway to streamline its updating procedures and to offer a single, secure, managed network infrastructure.

PrimeResearch

On average, it takes twelve years for a new drug to gain FDA approval [U.S. Congress, Office of Technology Assessment, Pharmaceutical R&D]. After preclinical trials (usually involving animal testing), three phases of human-based testing occur [Center for Drug Evaluation and Research]. The first involves twenty to eighty healthy people and focuses on safety. The second includes between twenty-five to 300 patients using the drug so that preliminary comparisons can be made between this test group and alternate treatments in the field. The third clinical trial involves somewhere between several hundred to 3,000 patients suffering from the target condition, and is usually structured as a large-scale double blind (including a placebo) test. As one might expect, this large-scale test is expensive and time consuming, and a large portion of the cost involves finding and communicating with target patients. Clinical research organizations are neutral entities that conduct the necessary medical testing on new drugs and procedures before regulatory authorities will grant permission for use.

Greenway's EHR system creates the perfect vehicle to facilitate communication among clinical research organizations, physicians, and patients. After a physician enters a diagnosis, PrimeResearch offers current clinical trial information to a physician. If the physician discusses the option with the patient and he or she decides to participate in the trial, PrimeResearch uses the EHR to provide the necessary information for the patient to join the clinical study and electronically communicates the relevant information to the clinical research organization. This module immediately removes two of the largest barriers to clinical trials—finding appropriate subjects and burdening the physician with excess paperwork to participate. Greenway's CFO, Al Cochran, describes the possible benefit as,

We can take the time it takes to put together a study group from months, sometimes maybe even a year, we can compress that down into a very short period of time. We think that that ultimately improves population health long term.

Whether a medical practice chooses to purchase the PrimeSuite solution or enter a "Software as a Service" contract, Greenway Medical can de-identify⁹ all of the patient health records and use them as a vast source of data. Currently, Greenway Medical has access to nearly 20 million patient records, which provides a bridge between the current medical population and medical science research. Imagine the data mining power of finding location trends of various diseases, noting symptom escalation patterns across age and gender groups, or constantly monitoring the effectiveness of several different treatment types. Furthermore, in the case of a pharmaceutical recall or interaction discovery, patients that have been prescribed that drug can be immediately located.

Previous components took advantage of efficiencies that could be realized in existing healthcare processes by applying the digital health record, but PrimeResearch leverages the power of 20 million records, and more in the future, to create new opportunities. This not only involves the inclusion of a new stakeholder and customer, clinical research organizations, but has the potential to impact the entire healthcare society by speeding up and improving clinical trials. Al Cochran explains that it also provides benefits to the physician: "It allows him to practice the latest technology. His patients will view him as having the best, most advanced health care in the community because they, through participation in trials, can access the latest protocols, the latest drug therapies. So, it's an advantage to the physician."

⁹ De-identifying refers to the process of removing all record information that allows it to be traced back to a specific individual. HIPAA privacy regulations do not apply to de-identified data [U.S. Department of Health & Human Services].



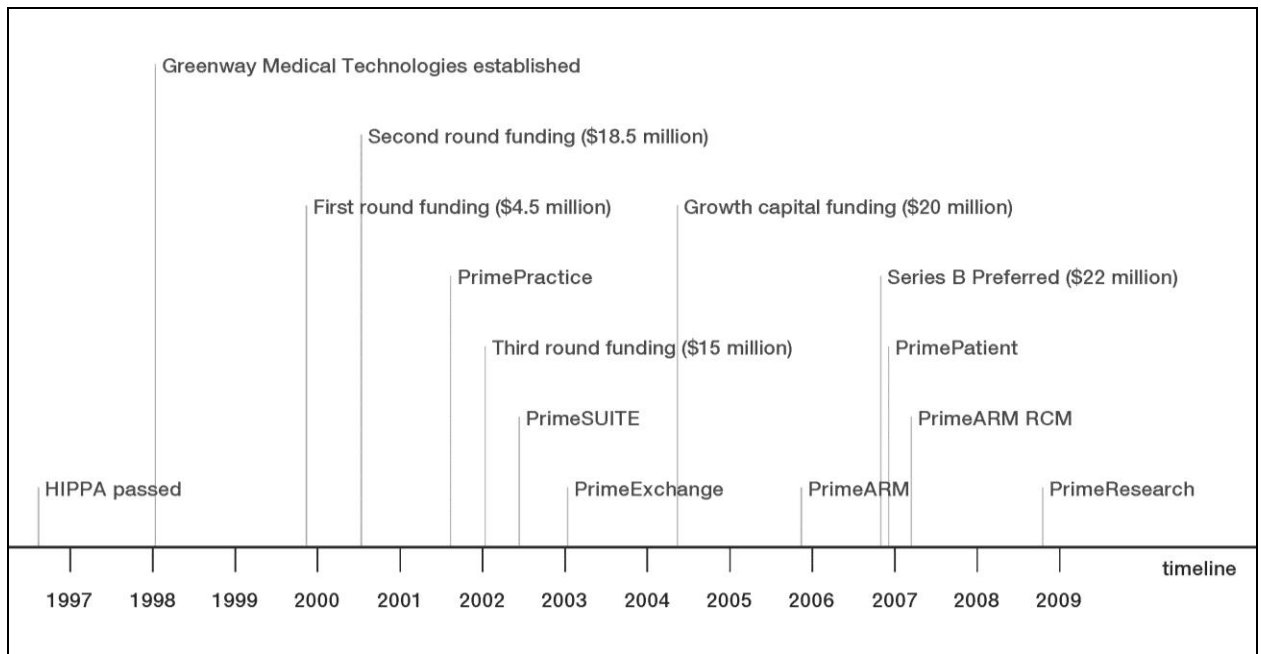


Figure 3. Greenway Medical Technologies Timeline

Sales and Marketing Strategy

Originally, the target market for Greenway was medical practices with one to five doctors, within eight medical specialties.¹⁰ In 2006, the primary focus was obstetrics and gynecology (OB/GYN), which represented 40 percent of its total clients. Four years later, Greenway has expanded into thirty specialties and targets larger practices, with some clients having eighty to 100 doctors in the practice.

Greenway's dedicated sales force of over forty employees spends most of its time targeting larger practices. One of its full-time staff physicians helps the regional sales managers when working with larger practices. Tommy Green explains that, "Doctors receive things better from other doctors. He can say, 'I practiced for twenty years myself, I know about seeing patients,' and he has more credibility."

The government incentives for EHR adoption are driving much of the growth. It is also part of the reason Greenway is now targeting larger practices. The incentive is paid to each doctor, so a practice that has ten+ doctors to transition onto a single instance of the PrimeSuite software could very well collect more from incentives than the cost of the PrimeSuite software.

Small offices make up the majority of medical offices in the country, so they still represent the bulk of Greenway's customers. They are now serviced via a Web sales team, which handles installation and support electronically. Personalized installation service can be provided to smaller customers at an additional cost.

Greenway prides itself on good customer service and fast responses to any technical problems. Their trademark question is "How was your Greenway experience?" and they strive to make sure the transition to a digital file system is as smooth as possible. They also provide training to key personnel in physicians' offices. Tommy Green estimates that deployment and support is the greatest cost the company assumes.

In addition to traditional physician clinics, Greenway has also found business opportunity in large industrial clinic operators, such as Take Care Health. Owned by Walgreens, Take Care Health Systems manages nationwide convenient care clinics, which include centers located on nearly 370 employer campuses [Take Care Clinic]. In 2010, Take Care Health announced a partnership with Greenway as it deployed PrimeSuite to help improve outcomes and drive down costs [PR Newsire].

Between the natural expansion into different sized practices and specialties and the product features that Greenway is developing to entice physicians, generating growth is not a problem. In fact, if adoption of EHR systems continues

¹⁰ Eight original specialties were OB/GYN, General Surgery, ENT, Family Practice, Cardiology, Orthopedics, Pediatrics, and Gastroenterology.

at the current pace, it will be very difficult to keep up with demand. Tee Green, referring to a *Business Week* survey, which stated over half of doctors surveyed are going to move to an EHR system [Mearian], said, "I don't know if that's true, but I've never seen that. Usually, it's like 20 percent out of 1000 physicians would say something like that, and it wouldn't say *we're going to*, it would say *we're thinking about it*." His father, Tommy Green, points out that all the companies currently providing EHR systems could not keep up with such demand.

Future of Greenway

There have been a number of large publically held companies that have shown an interest in purchasing Greenway. However, at this point in time, Greenway's management aspires to concentrate on growing the company organically, possibly purchasing other companies with attractive technology, and/or launching an IPO. One of the companies interested in purchasing Greenway asked Tommy Green what he thought Greenway was worth and then asked his son, Tee Green. Tee Green's number was significantly higher than his father's, and the interested party turned to Tommy and asked why there was such a discrepancy. Tommy Green explained, "He's 37, and I'm 65, you know. [It's the] TR factor ... time remaining."

Tommy Green also recalls that he is friends with many of the initial group of forty-four investors and that they are eager to see the return on their investment. In contrast, Tee Green's eyes light up with passion as he explains the new technologies the company is exploring and the possibilities the future holds.

To help navigate these options and the ideal timeline, Greenway hired Al Cochran as CFO because of his IPO experience. One option is to wait eighteen to twenty-four months to allow several new business initiatives to gain momentum and demonstrate results. One of these is revenue cycle management (RCM), which augments the sales revenue with a recurring revenue base. Al Cochran thinks that if the existing PrimeSuite customers take advantage of the RCM module (Greenway charges a nominal surcharge per transaction) the company could realize a new revenue stream of US \$100 million per year. This would be a significant and steady stream of income to counterbalance the ups and downs of selling software licenses to new practices.

Unlike most companies, generating new business is not a current problem for Greenway Medical Technologies. However, managing the current growth rate and knowing the best future strategy for the company is something the experienced management team will continue to debate. Tommy and Tee Green continue to wrestle, as they have done for several years, with identifying a means of providing their investors with an opportunity to realize their portion of the considerable value that Greenway has created. Should they do an IPO to create a market for investors to sell their shares? Would it be better to sell Greenway as a going concern and then share the proceeds among the investors? Alternatively, Greenway has shown it can build a software and services business to compete with the giants of healthcare systems. As a result, its management team is probably better positioned to exploit growth in the market than anyone else. Greenway could continue as is, and start paying dividends to its investors from its positive cash flow.

ACKNOWLEDGMENTS

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

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2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
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