BACKGROUND
Over the past two decades, the health care industry has increased in size and scope, with expenditures for health care rising by 530%, from $245 billion in 1980 to more than $1.5 trillion in 2002. Over the same period, per capita health care expenditures rose by 275%, from $2,800 to nearly $10,500,1 but the mean household income rose by only 175%, from $21,063 in 1980 to $57,852 in 2002.2 As a percentage of the gross national product, health care expenditures increased from 8.8% to 14.9%. The cost of prescription medications has grown more rapidly than general health care costs, increasing from $12 billion in 1980 to $162.4 billion in 2002, a 1,250% increase.

Despite these changes, the ability to afford the rising costs of health care is not equally shared among consumers. Nationally, nearly 45 million citizens (16% of the U.S. population) do not have health insurance. An additional 25% of Americans are dependent on government insurance programs through Medicare and Medicaid.

Nearly 25% of all adult Americans read at or below a fifth grade level. This low level of literacy has resulted in increased health care expenditures. Many patients are unable to decipher instructions and warnings accompanying medical prescriptions; as a result, nearly 50% of patients are not taking their medications as directed.

Initially located in the center of an old textile mill city, Thundermist Health Center, in Woonsocket, Rhode Island, was founded in 1969 as a private, not-for-profit family-planning clinic. The center’s original mission was to provide comprehensive primary medical care in an affordable manner to a diverse local patient population. Over time, program offerings have increased to serve the needs of the local community. Adult medicine, pediatric care, and dental care were added to the mix of services. Partnerships with local health organizations and local schools were developed. In 1998, the organization achieved national accreditation from the Joint Commission on Accreditation of Healthcare Organizations.

Thundermist is driven by the needs of the community, most specifically those of underserved citizens. Its mission is predicated on the philosophy that health care is a right to be enjoyed by all. To adhere to its mission, Thundermist believes that it must supply underserved local citizens with health care services that are of the same quality as those services bought by others with greater financial means.

Thundermist has grown to become one of the largest community health centers within the state of Rhode Island, providing medical, dental, and social services to nearly 25,000 patients. It is part of the federal community health center program and offers a comprehensive array of primary care services. Staff physicians who have admitting privileges to local hospitals provide primary medical care. Thundermist employs dentists and dental hygienists, and it is the only health center in the state to offer mental health services.

The organization employs multilingual staff members who can communicate with patients speaking Spanish and Portuguese and with those of Asian ancestry. A large team of social workers assists clients in overcoming social barriers. Through partnerships with other agencies, Thundermist provides food...
assistance through a food pantry, nutritional counseling, psychological counseling, social service case management, extended support services to people living with human immunodeficiency virus (HIV) infection, home visits, patient education, and disease-prevention programs. These personnel assist patients in obtaining services from public assistance programs and other social service agencies and facilitate participation in a wide range of preventive health programs.

Thundermist targets clients throughout the state who are living in poverty, who have no health insurance, and who are descended from minority populations or from a cultural or socioeconomic status that creates a barrier for obtaining primary health care services. Its patient population is disproportionately poor, with 29% from nonwhite ethnic origins. More than 85% of clients in the northern sector of the service area and 73% of clients in the southern part of the service area are at or below 200% of the federal poverty limit.

Within the targeted market served by Thundermist, nearly 17% of patients are without any type of health insurance; an additional 29% are dependent on Medicare or Medicaid.

THE NEED FOR HEALTH CARE
Thundermist has identified several significant health needs and concerns of the medically underserved and has responded with a variety of service options, including:

- **increased health services for its targeted patients.** To address the lack of these services in the community, Thundermist implemented a mental health program, including psychotherapy, evaluations, crisis intervention, and psychopharmacological medication management.
- **chronic disease–prevention efforts among targeted patients.** Roughly 25% of all pediatric patients at Thundermist have asthma; this is a much higher rate than the statewide average. As a result, Thundermist is participating in the Asthma, Diabetes, and Diabetes Prevention Collaborative.
- **adult medicine.** More than 10% of the center’s adult patients have diabetes. Thundermist has reshaped its care and treatment of diabetic patients, extending lessons learned from the work of the collaborative to the management of other chronic disorders (e.g., substance abuse), which is also a major health problem among these patients.

Uninsured adults have little access to affordable medications, and they must rely heavily on the local community health centers for relief. Most of Thundermist’s elderly medical patients fall below 100% of the federal poverty level and have various health and social service needs. The largest unmet need among older patients is their inability to afford prescription medications. One third of all elderly adults in the northern sector of their service area have low incomes (below 200% of the federal poverty limit).

PLANNING
In order to expand services to clients by providing access to low-cost pharmaceuticals, the Chief Executive Officer (CEO) of Thundermist decided to create an in-house pharmacy. The CEO performed preliminary background research by communicating with the federal Office of Pharmacy Affairs, a branch of the Health Resources and Services Administration (HRSA), and by visiting other health care centers that had in-house pharmacy operations. This planning process began in the fall of 2000.

In January 2002, Thundermist hired a consultant, trained in both pharmacology and business, to provide expertise in pharmacy operations and to supervise federal and state licensing requirements, the contracting of third-party payment plans, and the design and operations of the in-house pharmacy. In June 2002, the consultant was hired as the in-house Director of Pharmacy Operations. The Director supervised final construction of the pharmacy, initiated contracts with drug wholesalers, completed state and federal pharmacy licensing, and acquired the necessary hardware and software for pharmacy operations.

The Director of Pharmacy Operations filed the necessary paperwork to create the pharmacy as a 340B entity, which meant that Thundermist was able to purchase medications at deeply discounted prices. This status allowed savings to be passed on to uninsured and low-income patients. The Director also initiated contracts with the Texas Association of Community Health Care Centers, a large national buying association of not-for-profit community health care centers. This group allows members to buy drugs from manufacturers at a very low cost, often below the price available through the 340B federal program.

The pharmacy was constructed within Thundermist’s medical facility, located in Woonsocket, Rhode Island (the northern section of the state), at a cost of approximately $18,000. Construction of the pharmacy was completed in October 2002.

To inform the patients about the new service prior to startup of pharmacy operations, Thundermist began limited promotions focused on internal service providers. Physicians were given fliers to distribute to patients during office visits. The fliers, announcing the opening of the new pharmacy and the services offered, and an accompanying public relations release to the local media were the only promotional activities used to support the introduction of the new center and the services to the community. The targeted market for pharmacy operations was active patients of Thundermist, because only prescriptions written by Thundermist physicians could be filled by the in-house pharmacy.

Table 1 describes pharmacy usage from October 2002 through the most recently available data. During the first three months of operation, 569 total prescriptions were filled for 315 patients. Over the next three months, the total number of prescriptions grew to nearly 1,600, and the number of patients increased to 761. By the end of the fourth quarter of 2004, the total number of prescriptions filled had reached 4,963, and 1,787 patients were served.

THE SATELLITE PHARMACY NETWORK
In early 2003, during the planning for the initial in-house pharmacy, Thundermist began formulating plans to expand the availability and access of integrated pharmaceutical care to other underserved sectors in the state. To keep costs as low as possible, the organization began to seek nontraditional ways to accomplish this goal. While attending several health care conferences throughout the country, the CEO became
familiar with remote dispensing technology, which was being tried at other health centers nationwide.

Telemedicine (providing health care at a distance) was identified as a possible alternative to on-site, full-service pharmacy operations. Telemedicine has been used and studied for a number of years; it encompasses all educational, diagnostic, administrative, and therapeutic services that can be made available by some means of telecommunications technology when providers and patients are at different locations.

The newest usage of telemedicine is the practice of telepharmacy, in which pharmaceutical care is delivered through telecommunication and information technologies to patients at another site. Preliminary research discovered other locations where telepharmacy solutions were being tried, including sites in Iowa, Michigan, Georgia, Minnesota, and Alabama.

The telepharmacy option offers an alternative to creating other pharmacy facilities staffed by licensed pharmacists on location, as required by law. Plans were formulated to incorporate the telepharmacy technology into a satellite distribution system. This alternative uses a hub-and-spoke system by which Thundermist controls at the central site. The system is ware, communication links, a scanner, a printer, and a drug database, consisting of a standard personal computer, pharmacy software, communication links, a scanner, a printer, and a drug-dispensing system. Minimal space is needed for the system, which Thundermist controls at the central site. The system is able to interface with prescription software, allowing the pharmacist to implement the process from the central pharmacy.

The process for approving and dispensing prescriptions is performed as follows:

1. Prescriptions are faxed to the central pharmacy.
2. The pharmacist reviews and approves the prescription.
3. The pharmacist selects the “dispense” option and indicates the site to which the prescription is to be sent.
4. A technician performs a biometric fingerprint (password) access to the approved prescription-dispensing queue at the remote site.
5. The prescription is selected from the queue by the technician for release at the point of care.
6. The technician verifies and applies the bar code and to check the released drug for accuracy.
7. The technician releases the selected drug from the unit. The system then prompts the point-of-care staff (i.e., the technician) to add a bar code and to check the released drug for accuracy.
8. The technician collects the drug and bar monograph are printed.
9. The technician verifies and applies the bar code, and the medication and patient information are delivered.
10. A video connection is established with Thundermist, allowing for a face-to-face patient consultation with the pharmacist (optional). If a video option is not available, the pharmacy technician calls the pharmacist and the patient can speak directly with the pharmacist.

IMPLEMENTATION OF THE SYSTEM

Thundermist began to implement the satellite distribution system by seeking the state’s approval for remote dispensing of pharmaceuticals. One major challenge was the licensure of the remote dispensing system through the Department of Health’s Board of Pharmacy. The Board members were concerned about the newness of the technology and the security of the system, wondering who would be releasing the medication at the remote facility. Because of a lack of experience with

| Table 1 Pharmacy Usage within the Satellite Distribution System |
|---------------------------------|----------------|----------------|----------------|
| Total No. of Prescriptions | No. of New Prescriptions | Third-Party Payments | Total No. of Patients |
| Oct. 2002 | 79 | 79 | 0 | N/A |
| Nov. 2002 | 171 | 171 | 1 | N/A |
| Dec. 2002 | 319 | 281 | 145 | 315 |
| 1st Qtr 2003 | 1595 | 1,265 | 722 | 761 |
| 2nd Qtr 2003 | 2350 | 1,468 | 912 | 999 |
| 3rd Qtr 2003 | 2667 | 1,419 | 913 | 1,085 |
| 4th Qtr 2003 | 3149 | 1,762 | 1,183 | 1,270 |
| 1st Qtr 2004 | 3370 | 1,895 | 1,391 | 1,342 |
| 2nd Qtr 2004 | 4096 | 2,379 | 1,429 | 1,616 |
| 3rd Qtr 2004 | 4458 | 2,417 | 1,279 | 1,638 |
| 4th Qtr 2004 | 4963 | 2,765 | 2,448 | 1,787 |

N/A = not available.
Data from internal records of Thundermist Health Center.
Satellite Distribution of Pharmaceuticals

this technology, few statutes and regulations applied to remote dispensing. This impediment resulted in a five-month delay. The Board of Pharmacy eventually granted approval with a one-year probationary period.

Another problem involved staffing. As a result of the regulations imposed by the Board of Pharmacy, an employee releasing medication at a remote site had to become a “licensed pharmacy technician in training” under the direct supervision of the pharmacist in charge—in this case, the Director of Pharmacy. Although the system itself is user-friendly, finding the opportunity to properly train these employees as technicians was difficult and time-consuming, because many of them had no previous pharmacy experience.

Adhering to the requirement to repackaged medications was challenging. The manufacturer of the dispensing units recommended that the drugs be prepackaged before their insertion. The pharmaceuticals were ordered and shipped to the pharmacy, where the pharmacist verified and repacked all medications. The medications were then shipped for repackaging in the dispensing units, creating an additional three-week turnaround time.

Equipment was installed in the state’s southern sector at the end of May 2004, and operations began during the first week of June. Equipment was installed in the central site of the state during the second week of June and in the northern location of the state in the first week of July. Table 2 describes customer usage of the satellite distribution system.

Limited promotion accompanied the introduction of the remote dispensing units at the satellite locations. Internal memos were distributed to the medical staff members who were responsible for writing prescriptions, and other personnel were informed of the expanded services. After the new system was implemented, several local newspapers featured articles based on news releases that described the technology.

THE FUTURE

After reviewing the performance of the satellite dispensing system, the CEO and the Director of Pharmacy Operations became concerned that penetration into the market was not as extensive as they had initially hoped. To increase penetration, particularly among low-income, uninsured clients, they are considering adopting an aggressive promotional campaign. Instrumental to this campaign is the need to address concerns about which promotional outlets would be most appropriate to reach the underserved market they are targeting. However, some staff members are concerned about the ethics of medical advertising and they have questioned spending what is perceived as scarce resources on advertising and other promotional activities. These personnel have pointed out that their patients are primarily undereducated, live in low-income housing, and are not readers of many traditional advertising media, including major newspapers.

Another more immediate concern is the imminent loss of the temporary license granted by the Licensing Board. A condition of the temporary license was documentation of the security and safety of the dispensing system. In particular, the Licensing Board wanted to ensure that patients received the proper medication. The CEO and the Director of Pharmacy Operations were uncertain as to what information they could give the Licensing Board that would address their security concerns.

To date, no patients have complained about not receiving their medications, and the system has indicated that no prescriptions are missing. The executives do not wish to conduct an entire system audit, because this would require the system to be shut down for two to three days—a step that would possibly cost thousands of dollars. They are sure, however, that the Licensing Board will question the use of “licensed pharmacy technicians in training.”

Thundermist is also considering the option of expanding the network into other underserved areas of Rhode Island and into neighboring states. However, before any resources can be allocated to either program, the Board of Directors must grant approval. The CEO and the Director of Pharmacy Operations are contemplating how to assure the Board of Directors that the current program is working; however, they hope to learn why more patients are not using the satellite system.

During the last two quarters of 2004, more than 9,500 prescriptions were filled in the health center’s pharmacy, yet only 778 prescriptions were filled in the satellite system. Was this just a case of slow adoption, or were there more fundamental issues surrounding patients’ acceptance of remote dispensing units? Before the Thundermist executives go back to the Board of Directors, these questions must be answered.

REFERENCES


Table 2 Satellite Distribution System Dispensing

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N/A = not available.
Data from internal records of Thundermist Health Center.