

# NxSTAGE: BRINGING DIALYSIS HOME

*Developing technology to perform hemodialysis easily at home has proven to be difficult. NxStage has created a home system that may improve the lives of many dialysis patients and improve the market's economics.*

## BY STEPHEN LEVIN

- After years of steady growth, the dialysis market is predicted to increase dramatically.
- This growth will severely strain the current system of dialysis clinics where most of these procedures are performed.
- Home hemodialysis could help relieve this bottleneck but has not been a viable alternative to date because of the lack of effective device innovation.
- NxStage Medical has developed a system that makes home hemodialysis a therapeutic option, which could dramatically improve both the health and lifestyle of patients, along with the economic future of the dialysis market.

THERE ARE A FEW SIGNPOSTS ALONG the medical device development path that are generally accepted as indications of a market well-suited for innovation. Among the two most common are "large, growing market" and "established reimbursement." The renal dialysis market boasts both of those attributes: it's a \$2 billion market growing at around 6% annually with greater growth predicted soon, and has reimbursement so reliable that it has been a Federal entitlement program for nearly 35 years. Yet dialysis has seen little in terms of product innovation, and the system of dialysis clinics through which most of this therapy is delivered has remained largely unchanged during that time.

The current system, however, is about to face a crisis in care

delivery. The number of dialysis patients is predicted to increase dramatically over the next few years as a result of a number of factors, including the growth in the number of hypertensive, obese, and diabetic patients, all of whom are at increased risk for chronic renal failure or end-stage renal disease (ESRD)—the primary condition dialysis treats. At the same time, the number of nephrologists and, more importantly, nurses who treat dialysis patients is shrinking. And reimbursement, while remaining steady, has failed to keep pace with the cost of care, so it becomes less cost-effective to build more dialysis centers to treat the impending patient boom, while the current clinics are running at maximum capacity.

One option for potentially relieving this bottleneck is the development of an effective home hemodialysis treatment option. This, however, has proven to be a complex technology challenge. Several companies have attempted to develop a system that is an effective home alternative to treatment in a dialysis center without success, and dialysis remains primarily a clinic-based therapy.

In the late 1990s, a group of experienced dialysis industry executives got together with the goal of solving the home hemodialysis challenge, eventually founding **NxStage Medical Inc.** Seven years later, the FDA approved NxStage's *System One* for home hemodialysis. The company believes that this device can finally offer patients a viable home treatment option, while also providing a timely product innovation that can ease the burden on the current dialysis delivery system in an economically viable manner.

## YOUNG COMPANY, OLD HANDS

Lawrence, MA-based NxStage is actually a spin-out of **Vasca Inc.**, which was primarily focused on developing an implantable subcutaneous vascular access device for dialysis patients. Jeffrey H.

Burbank, NxStage's president and CEO, founded Vasca after a career in the dialysis industry, and it was at Vasca that the home hemodialysis idea was first developed. "We incubated the *System One* technology at Vasca for a few years and then decided it ought to stand on its own, so we split up the companies, and I came over to head NxStage," Burbank explains.

The group of executives that formed NxStage brought an extraordinary level of experience in the dialysis industry. For example, Dennis Treu, the company's VP of R&D, who was actually the company's first employee (while Burbank was still over at Vasca), has more than 20 years of dialysis industry experience, having previously worked at Cobe (where he met and worked with Burbank), until it was acquired by **Gambro AB**, and later **Aksys Ltd.**, another dialysis start-up, and then joining NxStage. "This is the fifth dialysis machine I've designed," Treu says.

Starting with a group of dialysis industry veterans was a real advantage for NxStage. For while it is always helpful to launch a start-up with executives who have previous experience in that industry, experience is particularly valuable in the dialysis space, which operates differently than most other medical device areas in a number of ways. For one thing, the dialysis industry is largely vertically integrated: the companies that build the machines that administer treatment also own the centers where the therapy is delivered, which means they also hire the doctors and nurses who administer care. In addition, the industry operates in a unique reimbursement environment, with ESRD a separate Federal entitlement program within Medicare that covers roughly 85% of all dialysis patients.

Dialysis is not a single market; rather it can be divided into two

segments—chronic ESRD patients, the largest group, and those suffering from acute renal failure. Acute patients are hospital-based, generally in the intensive care unit (ICU), and constitute a much smaller market. NxStage markets systems for both the chronic and acute markets.

Dialysis is also not a monolithic therapy. The treatment embraces two different forms of therapy—hemodialysis (HD), which covers approximately 92% of all patients, and peritoneal dialysis (PD), which includes the remaining group of patients. The differences in the types of dialysis patients and in how the therapy is administered are important factors in how this industry has evolved.

## TIED TO THE CLINIC

More than 1.7 million patients globally, including roughly 500,000 in the US, suffer from end-stage renal disease, which is when the kidneys either no longer function or operate at such a diminished capacity that they are no longer able to effectively rid the body of dangerous toxins. The annual cost of care for an ESRD patient can approach \$70,000 in the US, with dialysis representing only around one-third of those expenses. The total cost of care for all chronic renal failure patients in the US exceeds \$20 billion.

Jeff Burbank explains that ESRD patients currently have three therapeutic options. The first is to receive a kidney transplant—around 30% of patients are able to receive transplants, a number that is shrinking because the number of patients is increasing much more rapidly than the pool of potential donors. The other two, HD and PD, offer patients the opportunity to replace kidney function without a transplant.

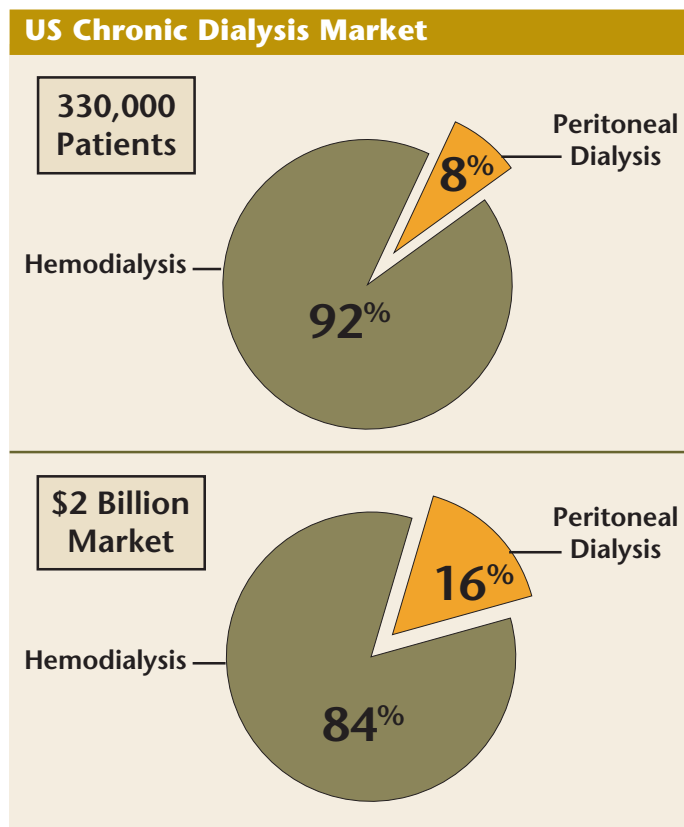
The most common form of therapy is hemodialysis, which is used to treat 92% of ESRD patients, and accounts for 84% of the \$2 billion chronic dialysis market. (See *Exhibit 1*.) Hemodialysis is generally performed at a dialysis center (fewer than 1% of hemodialysis treatments are performed at home), and involves connecting the patient to a machine that removes blood from the body, filters it through a membrane using a chemical solution called a dialysate, and returning the blood to the body. The clinical objective is to perform the kidney's function of removing toxins and maintaining proper fluid balance in the body.

Hemodialysis is typically performed three times a week in treatments lasting three-and-a-half to four hours. While studies have found that administering HD therapy at these intervals produces positive mortality outcomes, the contrast with the body's natural process of constantly filtering toxins has a dramatic impact on a patient's quality of life. Instead of gradually getting rid of toxins as they are produced, the body goes through periods in which toxins accumulate and then are rapidly removed. The result is that the patient often experiences anemia and other imbalances resulting from the sudden fluid exchanges. Jeff Burbank notes, "Patients often don't feel very well going into dialysis, and they frequently feel even worse once they are finished."

The other factor that severely restricts an HD patient's quality of life is that he or she is required to conform to a regimen of thrice-weekly therapy that must be administered in a dialysis center. This significantly cuts back on a patient's ability to work, travel, or otherwise enjoy a normal daily lifestyle, even if he feels physically capable of undertaking such activities.

A small number of ESRD patients—estimated at around 8%—are able to administer treatment at home through PD, and this is the option that NxStage is attempting to replicate for HD patients. The peritoneal membrane is the body's natural abdominal filter,

Exhibit 1



SOURCE: NxStage

and PD involves connecting the patient to a machine that controls fluid exchanges through that membrane using a dialysate solution to eliminate toxins without removing blood from the body.

“Peritoneal dialysis is appropriate therapy when patients still have residual kidney function or are at an earlier stage in their disease and are healthier overall,” Burbank points out. Accordingly, PD tends not to be a viable therapy as patients progress along the continuum of chronic renal failure, either because their peritoneal membrane functionally degrades or because the patient is of a certain size that, once they lose all kidney function, they can’t remove sufficient amounts of toxins through PD, which is a weaker and gentler form of therapy. Because it is not as harsh as HD, peritoneal dialysis can leave a patient stronger and not as prone to anemia and other fluid imbalances, but PD also is not able to eliminate as many toxins.

Peritoneal dialysis does not require the patient to have a partner who is capable of assisting in administering this treatment. Unlike the thrice-weekly administering of HD, PD is effectively continuous therapy, which more closely mimics the body’s natural kidney function. Patients can choose when they want to administer peritoneal dialysis, with many undergoing the treatment at night, leaving their days freer for normal activities. Since they are using their peritoneal membrane as a natural filter, PD patients retain several liters of fluid even when they are not connected to the dialysis machine, which produces the continuous treatment.

The long-term clinical outcomes of PD are, in some cases, inferior to those associated with HD. However, for many patients who are candidates for PD, the advantages in terms of quality of life and lifestyle, such as not feeling constantly fatigued and being able to work, travel, and engage in many normal activities, make it worth the trade-off to remain on PD for as long as possible. Those are the patient advantages that NxStage sought to achieve in developing its home hemodialysis system.

**CHANGING THE ECONOMICS**

In addition to the patient benefits that a home HD system can provide, NxStage also believes that shifting some patients to home therapy can provide an economic benefit to the dialysis centers that will make this system attractive to providers as well as patients. The company argues the *System One* offers an economically viable alternative for dialysis clinics, which are already under severe economic strain—a strain that will only get worse as a result of a rapidly growing patient population and historically flat reimbursement rates.

As noted, the anticipated patient growth results from the increased number of people suffering from the conditions that contribute to renal failure, including hypertension, obesity, and diabetes. “There is an expectation that the number of chronic dialysis patients will double by 2012,” says Burbank.

This huge increase in patient load will fall on a system that is already operating at close to maximum capacity. Most dialysis centers operate on a six-day-a-week basis, allocating four patients per treatment chair for therapy three times a week. And most of those chairs are full, Burbank reports.

But the bigger impending problem is not capacity—it’s finding enough nephrologists and nurses to operate the centers. “Each year, the industry builds about 200 new dialysis centers, and it’s been easy enough to find the capital to do that. It’s staffing the centers that’s becoming the challenge,” he says.

NxStage believes it is offering dialysis clinics a way to meet this growth challenge at least part way. No one is suggesting that home hemodialysis is the complete answer to the industry’s growth problem, particularly since only a portion of ESRD patients will ever be candidates for home HD therapy. (Estimates range from 10% to 25%.) (See Exhibit 2.)

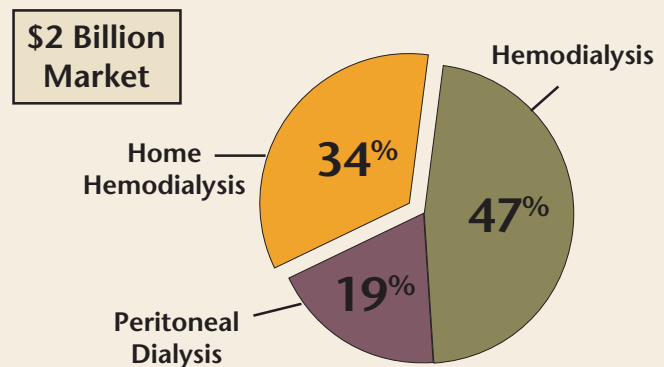
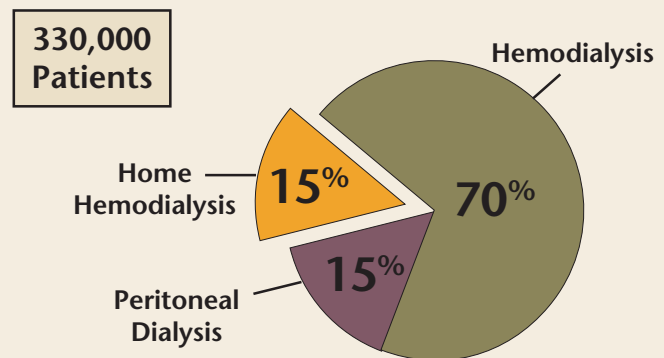
Joseph Turk, Jr., NxStage’s SVP of commercial operations, notes that there are a number of factors that go into determining whether a chronic renal failure patient can administer home hemodialysis. “In addition to a patient’s clinical condition, the other important question is whether that person is willing, with a partner, to take control of his or her own care, because this requires a lot of patient involvement,” he explains. “Those factors essentially provide a natural cap for home therapy. So while it’s still a huge opportunity, it’s not going to take over hemodialysis.”

But NxStage suggests that there are two ways in which the company’s home HD system can help improve the economics of dialysis centers: first, by enabling patients to receive treatment at home, the clinics can be reimbursed without having to provide the overhead costs of in-center care, and, second, because NxStage tends to attract a higher percentage of private pay patients. Both of those factors are helpful to clinics largely because of the Byzantine economics of the dialysis industry.

In 1972, Congress mandated that Medicare create a separate ESRD entitlement program—legislation whose passage was spurred by a live dialysis demonstration on the floor of the Senate. Under this program, Medicare covers dialysis therapy for all ESRD pa-

Exhibit 2

**US Home Hemodialysis Opportunity**



SOURCE: NxStage

tients, regardless of age, after a 30-month waiting period for those with private insurance coverage, during which time private payers are responsible for reimbursement. The result of this mandate is that the actual costs of the ESRD program have far exceeded the original estimates. This program currently costs Medicare approximately \$20 billion annually, and while it only includes around 1% of all Medicare beneficiaries, ESRD comprises roughly 7% of the entire Medicare budget. Burbank calls chronic renal failure “the only disease with universal reimbursement.”

The so-called composite rate system that CMS uses to calculate dialysis reimbursement last underwent a major overhaul in 1984, and has increased only incrementally since then. As a result,

dialysis centers claim they can barely break even in treating Medicare patients and that their profits really come from the private pay population. **DaVita Inc.**, the second largest operator of dialysis clinics (behind **Fresenius AG**, which is also a major provider of dialysis equipment, reflecting the industry’s vertical integration), claims to lose 6% on each Medicare patient it treats, Burbank notes.

### PRIVATE PAY PAYS

NxStage’s team of founding executives, particularly Jeff Burbank, were well acquainted with the economic intricacies of the dialysis

## A FISHER-PRICE DESIGN

In designing the *System One*, NxStage emphasized the importance of ease of use in an effort to come up with a device that could be operated by the broadest possible range of prospective patients. “In trying to fit our product into a PD model, we had the ability to start with a clean sheet of paper since we didn’t have any existing products,” recalls Denny Treu. “We wanted to create a small device that would be portable, both from a patient and a service perspective; it also had to be easy to load so that all the patient had to do was drop in a cartridge and close the door, and the machine would do the rest.”

NxStage also had to avoid the problem of information overload: company officials knew that if its console resembled an airplane cockpit, it would be intimidating to most patients. (For its acute care system, the company adds an additional flat panel monitor to provide ICU nurses with the additional patient information that they need, but which would not be necessary for home use.) Indeed, the *System One* automatically records all patient data, including every button that a home user pushes, in what Treu calls “a flight recorder-type file” and is able to remotely transmit that information to NxStage each night, while displaying a simpler control panel for patients to follow.

In addition to helping physicians and nurses track a patient’s treatment, the system’s design also is intended to avoid costly and time-consuming house calls by a technician to service the device. By designing the unit with a plug-and-play design, Treu points out that a patient can easily send it back to the company (which has 24/7 technical support), and receive a replacement in the mail the next day, resulting in no lost treatment time. Joe Turk recalls that someone once referred disparagingly to the *System One*’s user-friendly operation as “a Fisher-Price interface, but we took it as a compliment because that’s how easy we want this to be.”

To understand how the NxStage system operates, Jeff Burbank compares the *System One*’s dialyzer unit to the function of the peritoneal membrane in PD. Indeed, company executives refer to the unit as a cyclor, drawing on PD terminology. In peritoneal dialysis, the dialysate solution flows into the abdomen and, through diffusion, the toxins are removed and flow back out. The NxStage system operates much the same way, he explains, except that the dia-

lyzer serves the same function as the peritoneal membrane in filtering the toxins from the patient’s blood, causing patients to often refer to the machine as an artificial kidney.

The system uses a disposable single-use treatment kit that contains the filter, which the patient drops into the machine. The kit comes pre-sterilized, connects automatically in the machine to the treatment fluids, and then once the patient turns the system on, the unit primes itself and begins the therapy, which is conducted six times a week for two-to-three hours per treatment. Conventional wisdom is that more frequent dialysis produces improved clinical outcomes, a hypothesis currently being studied in clinical trials.

The patient is connected to the NxStage device through one of three possible access points: a catheter inserted into a patient’s neck, a synthetic subcutaneous graft connecting an artery and a vein in the arm, or a native fistula, also in the arm, which is recognized as the best and is the most common in home HD patients. “The industry has made great progress in improving how they create native fistulas, which is why they are becoming much more prevalent,” Burbank explains.

An important technical challenge for NxStage’s system is maintaining the fluid balances with great precision. “We have to manage both the blood flow and the dialysate flow precisely to make sure the patient is not adding or removing too much fluid, which could have negative side effects,” he says.

Perhaps the most noticeable advantage of the *System One* for patients is its relatively small size, particularly compared with competitors’ products. Aksys is the only other company with an FDA-approved device for home use, but Fresenius has a system that is occasionally used to treat patients at home. The size of the *System One* is three cubic feet, and it weighs 75 pounds, while the Aksys device is 21 cubic feet and 300 pounds, and Fresenius’s systems is 16 cubic feet and 170 pounds. NxStage’s system also uses much less fluid—five gallons as opposed to 200 for the Aksys and 150 for the Fresenius.

The advantage of NxStage’s smaller design is that it enables patients to maintain much of their normal lifestyle, including travel. “A soft, luggage-like roller bag is available that easily fits in the trunk of a car, and a hard case conforms with airline size and weight restrictions so that it can be checked aboard a plane,” Joe Turk says.

industry, and one of the driving forces behind the company's creation was to come up with a technology that could succeed within these financial parameters. "If we could come up with a therapy that was viable in the then-current and future dialysis economic environment, and that delivered better treatment, we thought we'd have a winner," Burbank recalls.

And NxStage's economics are driven by Medicare reimbursement. Medicare reimbursement for ESRD is established on a three times a week clinic-based treatment model, which amounts to roughly \$18,000 annually. Robert C. Faulkner, a managing director and senior analyst with JMP Securities who covers the company, points out that "What NxStage has done is estimate the operating margin for a clinic and offer that clinic roughly the same operating margin on the NxStage device as they would have on a patient in their clinic."

The "better treatment" component that Burbank refers to assumes, as is generally accepted, that more frequent dialysis would produce better patient outcomes and that the *System One* is designed to administer treatment not only three but even five or six days a week. His stated goal of an economically viable therapy was achieved through a two-tiered approach.

"A simple way to look at NxStage is that we knew there already is a successful home therapy from an operational and business perspective—peritoneal dialysis," Burbank explains. "Where PD isn't successful is because patients can't stay on it forever due to clinical limitations. So what we really wanted to do is figure out how we could replicate that business model, but solve the clinical challenge. In other words, how close can we get HD technology to mimic the PD business model?"

It appears NxStage has gotten pretty close. Roughly 40% of all dialysis centers (1,800 out of a total of 4,500 in the US) offer home PD programs. Those programs can be run with fewer doctors and nurses since personnel is needed only to train these patients to administer the therapy at home, not to manage their actual treatment in the centers. This produces less demand on overhead and higher margins. If that could be coupled with the greater patient benefits and improved outcomes that home HD therapy is thought to produce, then NxStage's treatment would be a winner for both patient and provider. "It's a huge opportunity for the provider infrastructure to give equivalent or better care that is less labor and less capital intensive," Joe Turk suggests.

In addition, it turns out that NxStage's system attracts a much higher percentage of private pay patients, who are largely responsible for dialysis centers' profitability. The industry model is that while typically 85% of a clinic's patients are Medicare, with the remaining 15% private pay, private pay patients account for 100% of the center's profitability. While the data on private pay patients is still early—NxStage has treated just over 550 patients with the *System One*—it appears that the device has generated significant interest from patients in the early stages of dialysis (still

within that 30-month private pay window) who are interested in maintaining a normal lifestyle and the quality of life benefits that the company's product provides. On both economic counts, NxStage's approach appears to be a win-win for the company and the clinic.

## THE MORE DIALYSIS, THE BETTER

While the economic benefits for both NxStage and the dialysis centers, as well as the improved patient ease of use and convenience, are significant advantages of *System One*, Jeff Burbank acknowledges that the most important driver of adoption will come from NxStage's ability to demonstrate improved clinical outcomes from home HD therapy. Indeed, it is intuitive that more frequent dialysis will produce better patient outcomes, if only because natural kidney function is constant. Yet, NxStage has been criticized for touting these clinical benefits without having conducted a major randomized trial.

John Moran, MD, a nephrologist who is the chief medical officer of WellBound Inc., a California company that operates training centers for home dialysis facilities that use *System One*, and a member of NxStage's clinical advisory board, points out that "there have been hundreds of studies of more frequent dialysis, and they all show the same thing—that patients do better than when they receive treatment only three times a week." Moran is currently treating more than 50 patients who undergo home HD five or six times a week,

each of whom "feels better and has more energy" than in-center patients.

NxStage is looking to address skeptics who point to the lack of a major randomized trial by conducting its own clinical study to prove the benefits of more frequent dialysis. In addition, the **National Institutes of Health** is also conducting a randomized trial to assess the benefits of increased home hemodialysis compared with three-times a week clinic-based therapy.

Pending the results of these studies, Jeff Burbank points out that there are encouraging signs that NxStage's approach is, in fact, generating better outcomes. Dialysis patients tend to be on a regimen of drugs, particularly anti-hypertensive agents, to compensate for the fact that dialysis performed three times a week produces results inconsistent with the body's natural physiological method of removing toxins. "As patients receive more frequent dialysis, you see a reduction in the need for anti-hypertensive medication, as well as reduced swings in levels of urea and creatinine, which appear to indicate the benefits of this approach," Burbank suggests.

“It’s a huge opportunity for the provider infrastructure to give equivalent or better care that is less labor and less capital intensive.”  
— Joe Turk

## JUST LIKE ON THE WHITE BOARD

NxStage didn't originate the idea of home hemodialysis and they are not the only company working in this area. In addition

to Aksys and Fresenius, a start-up called **Renal Solutions Inc.** is also developing a home HD system. Judging by NxStage's experience, it is easy to understand why, up until now, no

## NAVIGATING A CHOPPY PUBLIC MARKET

When NxStage Medical went public in October 2005, even its president and CEO acknowledged that the company went out earlier than many expected. "We had just received FDA clearance to market our system in June of 2005, so we were on the very early side of what conventional wisdom would tell you is the right stage in a company's life cycle to go public," says Jeff Burbank. At the time, NxStage was only generating a small amount of revenue and still wasn't profitable, financial measures that the public market is supposedly looking for in device offerings.

Yet NxStage believed the company had a couple of factors working in its favor, according to Burbank. First was that, because its business was tied to a razor/razorblade, rather than a procedure-based model, the company thought its business was more predictable, a fact that has been borne out as the company has consistently hit its sales numbers.

Burbank also claims that there weren't a lot of business models that had the kind of power that NxStage's did. "Dialysis is a huge market that doesn't require tremendous market share movement to create a large company," he says. Potential investors could quickly see how this model would work, and the company already had some early positive data showing that it would work. There were also several components to NxStage's story that intuitively sounded right, including the benefits of performing dialysis at home on a patient's own schedule. According to Burbank: "People got it."

From the company's perspective, NxStage was looking to raise capital in order to give their customers the confidence that the company had the financial strength to execute on its business plan. Because of the rental model that NxStage employed in the ESRD market, each *System One* placement required the company to purchase the equipment up-front.

Also, the company had just been through its Series F-1 private financing round several months earlier, and Burbank wasn't looking to raise another significant round in the private markets. "A lot of factors came together, and since the IPO window was open, we thought it was a good time to capitalize on that," he says.

For NxStage, the IPO was very much a strategic financing, not an exit. The company was looking to go out in the \$13-to-\$15 range, but ended up closing at \$10, thus raising around 30% less than anticipated. The shortfall led the company to go out again in June 2006 to do a follow-on offering. At the time, NxStage was trading just above \$10 per share, but ended up closing at \$8.75, as the company got caught in the general market downturn that has hurt several recent device IPOs, including **Volcano Corp.**, which went out at around \$8, below its expected range, and caused other companies, such as **MedicalCV Inc.** to pull their financing filings. (See *Valuation Watch in this month's START-UP.*)

"The IPO windows are getting much smaller in duration," says Jeff Burbank, "and the ability to time the window has dramatically changed. It used to be that when you would see the public market coming open, by the time you would get through all your work and the road show, the window would still be open, but that no longer seems to be the case."

Rob Faulkner, a medical device analyst with JPM Securities who follows NxStage, says the company went out at the right time for them, though he agrees that many thought the company's offering was early by current public market standards. "It was a financing event and the company needed to raise money to solidify their capital-intensive business model," he notes.

Faulkner doesn't attribute the downturn in NxStage's share price since the IPO to any loss of confidence by investors in the company's story. (At this writing, NxStage is trading in the \$9 range.) Rather, he sees it as a reflection of the forces that have driven down the whole market. "It's important to note that there was a lot of demand for the follow-on deal, with investors increasing their positions, which tells me that investors felt the company had delivered on their promises," he says.

NxStage's follow-on offering also took place earlier than Faulkner and other industry observers had expected. For example, he suggests the company might have waited until the launch of the *PureFlow SL*, which Faulkner sees as an important addition to the NxStage economic model.

But the timing of the FOPO is also somewhat of a chicken-and-egg scenario, making it hard to determine the right time for such a deal. Investors knew that NxStage did not raise as much money as it wanted to in the IPO, and recognized that the company would be looking to raise additional financing. The company also obviously knew there was an overhang on the stock. Investors tend to be unwilling to purchase stock in the open market if they know that there's a good possibility there's going to be an upcoming deal, and the prospect of such a deal also put pressure on the stock.

NxStage made the decision to go ahead and remove the overhang by doing the follow-on offering at a time when, choppy markets notwithstanding, in Burbank's view, the market looked good for raising more money. "The company also had confidence that they would be able to deliver on the market's expectations," Faulkner adds. As it happened, the market was not good at the time NxStage went back out, and the stock dropped under increased pressure. Again, as with the IPO, the company was able to raise capital at a slightly lower price than they intended. For those bullish on NxStage, the softer financing doesn't dim the company's long-term prospects. Notes Rob Faulkner, "Ultimately what turned out to be a tactic driven primarily by what appeared to be a good capital market didn't work because the capital markets changed, but not because anything had changed with the company."

company had successfully solved this technological challenge. NxStage already has 19 issued patents and nearly 60 others working their way through the system.

Even NxStage, with its wealth of industry background, took seven years to get the *System One* approved, receiving FDA clearance of its 510(k) application in June 2005, just a few months before the company's IPO. (See *sidebar*.) And it took that long without any major design changes. Indeed, Jeff Burbank recalls that "The core technology is amazingly similar to what we sat down and drew out on a white board on the very first day. It's almost freakish how close it is to what we actually conceived." But, he goes on, "What we didn't realize was how much harder it would be to go down the path we selected. We definitely underestimated how massive the complexity was because we were thinking in terms of individual technologies, but when you start putting them together, the difficulty increases exponentially."

The challenge for NxStage now becomes one of execution. The company needs to produce positive clinical data, with the assumption being that the NxStage and NIH trials will provide that by confirming the many smaller studies showing the benefits of more frequent dialysis.

The company is focusing its sales and marketing efforts exclusively on the US, where Joe Turk explains they have adopted a "train the trainer" approach to working with dialysis centers. NxStage has assembled a team of 15 salespeople (who average 15 years of industry experience) and 15 nurses who train the nephrologists and nurses at the clinics who, in turn, train the patients. The company is first targeting the 1,800 centers that already have home PD programs, and has 104 current clinic customers, which are located within 60 miles of 70% of the US dialysis population, and expects to be in 200 centers by the end of this year. (It has a separate sales team for the acute care market.)

NxStage employs a classic razor/razorblade business model with the *System One*, which it rents to dialysis centers for \$1,500 per month inclusive of disposables. Turk estimates that around 70% of the company's income comes from disposables revenues, which he expects to increase to 95%.

"What we do is develop the relationship with the dialysis center so that we are producing an annuity for them and for us," he explains. NxStage looks for a clinic to grow their home HD program to 20-25 patients over a three-to-four year period. Every 10 patients are worth approximately \$180,000 per year to NxStage, and as much as \$350,000 for the center.

Approximately one-third of the dialysis center base, those owned by industry leader Fresenius, is vertically integrated. DaVita is number-two with around 30% of the clinic market, and while DaVita is not a product company, it has a long-term deal with Gambro. There are around ten other smaller clinic chains that comprise the next 20% of the market, with the remainder taken up by local centers. (The dialysis product company leaders are Fresenius, Gambro, **Baxter International Inc.** and **B. Braun Melsungen AG.**)

NxStage is supporting the roll-out of the *System One* with product improvements designed to make home HD simpler for the patient to perform. The company recently introduced the *PureFlow SL*, which is a module that automatically purifies tap water and adds it to dialysate concentrate. This reduces the amount of supplies that a patient needs by allowing the patient to use the concentrate, rather than the pre-mixed dialysate solution.

Beyond product enhancements, NxStage's major challenge lies in building the business to the size at which it becomes gross margin positive, which analysts expect will occur around the end of this year. "After that, we're looking to lay a path to profitability," Burbank says.

In addition to the basics of building the business, Rob Faulkner points out that NxStage also must successfully execute its growth strategy without suffering any major patient setbacks. "Their task is a difficult one," he notes. "The company is enabling patients to perform a complex procedure at home by themselves, and to do that consistently without major complications is not a trivial undertaking. So far, NxStage has accomplished this quite well; the next step is to keep it up for the long run." Faulkner's concern is based on experience: the dialysis industry has had more than its share of product mishaps over the years.

That said, he also notes that NxStage is in a position to create a large new market and build a leadership franchise. At a time when most small device companies are thinking only in terms of being acquired, this type of opportunity is rare. Jeff Burbank agrees, noting, "There aren't many markets in medical devices that can create this kind of revenue opportunity, and we believe we have a business model that lets us exploit that opportunity by creating a sustainable company."



COMMENTS: Email the author: [slevin@windhover.com](mailto:slevin@windhover.com)