Spain began its electronic health record (EHR) initiative in the region of Andalusia, implementing EHRs for 8 million people. This effort has since been expanded to other regions of the country, and the regional health records are now being integrated at the federal level. By 2010, more than 95 percent of primary health-care providers across Spain had used the electronic records.

In 2005, the Spanish government began implementing electronic prescriptions as well, and by 2010 more than 250 million prescriptions were being submitted electronically to pharmacies, placing Spain among the top nations in the world for utilization of these technologies. In the regions where these e-prescriptions are employed, visits to primary care physicians have decreased by about 15 percent. “Years ago, a chronic patient had to go to the pharmacy every week, and had to go to the primary care doctor just to get that weekly prescription,” says Pablo Rivero, director of international e-health development for the Spanish Association of the Information and Communications Technology Industry (AMETIC in Spanish). “Now, the patient can simply go directly to the pharmacy.” This change has saved significant cost as well as time.

Managing health-care expenses is a key goal of the Madrid-based consulting company everis; everis is one of the top two companies in Spain in experience with EHR and personal health records, and its solutions cover more than 20 million users. The company’s engineers are now working to improve chronic disease management. “Chronic patients consume about 50 percent of the global health budget,” says everis business director Santiago Martín.

But the management of different diseases demands different plans, so everis has developed solutions for a number of tasks. First, its software segments a population by sufferers from each disease to be managed, such as diabetes, cardiovascular disease, and lung diseases. Then, for a given disease, the software classifies the population further, depending on the level of care required, and defines the care needed and the technology solutions that can help meet those needs. For instance, one diabetes patient may require only an interface that allows her to upload her weight daily; this can be integrated with a tablet or mobile phone. A more seriously ill patient may require additional technologies, such as advanced sensors for evaluating health outcomes. Martín explains that this segmentation avoids the expense of automatically installing a wide range of health-care technologies in every patient’s house.
Everis began implementing its telemedicine and chronic-care solutions in Spain in 2011, and is working with public health administrations to determine the level of cost savings. Martín says thus far the range of savings for chronic patients is 20 to 40 percent over traditional care.

Indra is also investigating the management of long-term chronic patients through a new center in Toledo, near Madrid. The company’s engineers are working with the local health-care agency to define the resources and services its patients need, along with the most useful interfaces for the patient and health-care provider. A pilot project involving some 80 thousand individuals will soon be rolled out.

In Andalusia, the region is moving toward the beginning of the next stage, implementing access to electronic health records on mobile devices. The care providers in an ambulance, for example, will be able to access a patient’s records via a tablet or mobile phone, incorporate the information into the patient’s care, and then update the record for the hospital.

“We believe that international collaboration is key for e-health development, to share information and best practices and to create a real network of international collaborators.”

According to Rivero, the key to Spain’s success has been the integration of clinicians into all levels of planning. “It’s most important to involve health professionals from the very beginning. It’s not a 100 percent technological project; it’s a change in the process of how health care is delivered.”

Madrid-based Oesia has developed specialized software for hospitals and regional and federal health-care administrations, and is moving into the realm of artificial intelligence with a computerized clinical guide. As the doctor types information about a particular patient’s condition, for instance, the guide may suggest that a certain scan is not necessary, based on the experiences of other patients. The doctor can then accept that decision, or override it and explain why, leading the system to learn a new pattern.

Among other tasks, the software will be able to synthesize the data from existing patient records, and point out why a particular medication may conflict with the patient’s other medications. “The doctor still has the final say,” says Arnaud Marivain, director of the Oesia health business unit. “But in an emergency, or perhaps if someone is tired, there can be mistakes. This will help ensure the security of the patient.”

This product has been in development for the past year and should be out by the end of 2012.

TRANSFERRING EXPERIENCE OVERSEAS

The Spanish government and Spanish companies are taking their experience in e-health overseas, according to Rivero. “We believe that international collaboration is key for e-health development, to share information and best practices and to create a real network of international collaborators,” he explains.

Madrid-based Indra proposed to develop and operate a comprehensive system for Bahrain’s entire national health-care system network over the course of the next 11 years. The proposal was accepted based on the company’s IT experience in the Spanish health-care system. The first step, says Diego García, Indra’s director of health, will involve creating and sharing electronic records and clinical and administrative management systems. The second will include adding e-health functionalities such as telemedicine.

In addition, Indra is working with the European Space Agency (ESA) on a telemedicine project in sub-Saharan Africa; the ESA is involved in projects that expand the reach of the agency’s space technology (such as satellite communication) here on Earth. The feasibility study began in Senegal, focusing on basic needs such as the tools for videoconferencing, including a satellite dish, a modem, and electricity (using renewable energy such as wind or solar if necessary). The prototype will allow health-care providers to confer with clinicians around the world, provide a model for e-learning, and facilitate EHRs. The results of the basic needs study were presented in the fall of 2011, and the pilot program has begun in Senegal and Kenya.

GMV has also developed telemedicine for overseas communities, as part of a comprehensive platform for telemedicine that can range from the most simple configuration—a face-to-face consultation via webcam between a rural or homebound patient and a distant doctor—to a complex system that allows data from any type of device to be transmitted and reviewed. This project is the latest for the engineering company, which has decades of experience in the aerospace sector; based on its experience with NASA and the ESA, the company has applied its engineering expertise to health care in products including medical simulations and EHRs.

GMV has set up a telemedicine platform at a soccer stadium in Cartagena, Columbia, which is networked with five hospitals; the company is now expanding in Latin America and Africa.

Through the eventual goal is to offer such services in Spain (and other developed countries) as well, particularly in intensive-care units where there’s a dearth of specialists and a need for immediate specialized care, Carlos Royo, director of business development, expects this will take off first in poor countries. “It’s a paradox, but it’s actually cheaper and more efficient to jump to the best, most advanced technology there,” Royo points out. It’s cheaper than, for instance, building a new hospital, even as telemedicine can afford patients a high level of care.

“In the past, I used to talk about the cost of telemedicine. Now I talk about how quickly a government will receive a return
on investment,” through savings in transportation costs and in overall improved care for citizens, Royo continues.

PERSONALIZING MEDICAL CARE

The adoption of EHRs facilitates the move towards personalized medicine, points out Indra’s Garcia: “We believe that personalized medicine will be used in the future—and what’s required is IT.” Indra is participating in research projects that examine how health records software could gather all relevant information, including the patient’s genetic profile, to tailor a particular diagnosis or treatment. The company has also initiated research into personalized medicine, beginning with an oncology project that analyzes samples and data from 1,000 patients suffering from two types of cancer.

Part of the hope for personalized medicine is to fulfill the promise of matching the correct treatment to every patient. Not every patient will respond to every option, so clinicians at times cycle through a number of potential medications, or combinations of medication, before hitting on one that works.

In response, Vivia Biotech has developed a technology that evaluates the most popular combinations of drugs to treat blood cancers (leukemias, lymphomas, and myelomas). “In blood cancer[s], doctors always give a cocktail of drugs to treat a patient, but there’s nothing on the market to predict how the patients will respond to those four or five drugs,” says Juan Ballesteros, chief scientific officer. “We’re the first to do that.”

The company’s technology, called ExviTech, consists of a platform that can rapidly analyze thousands of biological samples (such as blood samples in combination with medications) in 48 hours. For blood cancers, Vivia Biotech has taken the 18 most popular drug protocols already in use. The patient’s blood is treated with each medication combination, which is then ranked by how many tumor cells that protocol kills. Says Ballesteros, “Our hope is not to cure the disease, but to reduce it to being chronic, by quickly finding the right drugs that kill the most tumor cells.”

The system is undergoing validation testing in Spain and the United Kingdom. The results are positive, according to Ballesteros—though yet unpublished—and as a result one regional health-care agency in Spain has agreed to initiate a pilot project for all diagnosed blood cancers. Though a test might cost $1,000, the savings it offers could leap to the tens of thousands by avoiding unnecessary and expensive drugs. Its cost-effectiveness will also be evaluated during the partnership with the health-care agency, and Vivia Biotech expects the tests to be on the market in 2012.

Barcelona-based AB-Biotics has also developed a technology to determine a given patient’s response to drugs, and has focused on those used most widely to treat psychiatric and neurological diseases.

A DNA chip called Neurofarmagen analyzes the patient’s saliva for genetic variations—published in the scientific literature or researched at the company’s laboratory—that indicate responses to different drugs. “Some of the variations have to do with the metabolism of the drug, or with the therapeutic target, or with the patient’s own biochemistry that could affect the intake and processing of that drug,” says CEO Miquel Angel Bonachera.

The company launched its first product, Neurofarmagen, in 2010; it is used for depression, schizophrenia, bipolar disorder, and epilepsy. Further products include Neurofarmagen Epilepsy and Neurofarmagen ADHD. Because of their success in Spain, AB-Biotics is preparing a plan to sell these products abroad, first targeting the U.S. market.
REFINING BLOOD TYPES
Current tests define blood type as A/B/O and Rh positive or negative, but some racial groups share a variety of more obscure variants, explains Antonio Martinez, CEO of Bilbao-based Progenika. African and Asians, for instance, might be negative for more rare antigens. These do not cause a problem when someone needs a single blood transfusion and receives antigen-mismatched blood; chronic patients, however, will eventually develop antibodies and suffer allergic reactions if the blood donor is not an exact match. Most blood banks currently accept the fact that some patients will live with these antigen-induced complications. Says Martinez, “We want to avoid this problem by supplying patients with the perfectly matched blood from the very beginning.”

So Progenika developed a DNA chip to identify whether a patient or blood donor is positive or negative for these blood types (their names include RHCE, Kell, Kidd, and Duffy). The test identifies 23 single-nucleotide polymorphisms, or SNPs, and labels them with fluorescent molecules. The DNA blood-typing chip, available since 2008, has already been adopted in blood banks across Europe.

For the U.S. market, Progenika identified SNPs related to sickle-cell anemia. The company has already begun selling in the U.S., and recently signed an agreement with Novartis to sell Progenika products in the U.S. The company is now utilizing the same technology to identify markers for cancers, beginning with prostate cancer.

UNCOVERING TRACES OF DISEASE
Another hope of advanced personalized biotechnology is that new techniques will employ genomic sequencing to detect early markers of a disease, or a patient’s genetic predisposition to a disease.

Madrid-based BlackBio developed a DNA biosequencing technology that improved the speed and accuracy of sequencing, then moved into the realm of diagnostics. Instead of focusing on a patient’s entire genome, BlackBio targeted a handful of SNPs that indicate a patient’s likelihood of, for example, developing Type 2 diabetes. Says Gemma Garcia, deputy general manager, “This is quite an important approach for personalized medicine. If you have a high genetic risk of diabetes, you can take preventive steps: change your diet, exercise, try not to gain weight, get your blood pressure under control.” The test is done using a simple oral swab. BlackBio began validating the kit with a hospital in Madrid in September 2011.

In addition, BlackBio is teasing out the identification of a variety of diseases. Sepsis, a whole-body infection, can be both fast acting and deadly. Traditional microbiology to determine the source of an infection can take from 48 hours to a week, but the diagnostic kit developed by BlackBio can identify the bacterial source of an infection in only eight hours.

Two Catalonia-based companies, Oryzon and Reig Jofré Laboratories, the former a specialist in biomarkers and early diagnosis and the latter a larger, more traditional pharmaceutical company, have teamed up to offer a minimally invasive test to predict the occurrence of endometrial cancer. This cancer, after breast cancer the second most common among Spanish women, can appear at the same time as menopause, and a woman’s irregular bleeding could result from either state. “Ninety-five percent of the time, the bleeding is purely natural,” explains Ignasi Biosca, CEO of the Reig Jofré Group. “But in five percent of the cases, the bleeding is related to endometrial cancer. It’s important to catch that five percent.”

Current tests demand a multistep process and are both expensive and invasive, involving sampling the uterine wall. And Carlos Buesa, CEO of Oryzon, says that “clinicians wanted something simple that could be done on the patient’s first visit,” without anesthesia. In response, the companies developed a test to evaluate genes found in the mucus on the uterine lining. Following a swab test, the technology can pick up the markers of five genes that are over-expressed in the presence of endometrial cancer.

Oryzon and Reig-Jofré have conducted a clinical trial with 16 Spanish hospitals, comparing the swab test to actual results of the current multistep diagnostics for tissue samples from 500 women. The results, presented in September 2011, demonstrate 97% accuracy and compare favorably to current techniques, but these are available in a dramatically shorter time frame and at a significantly reduced cost.

Buesa says that Oryzon’s first product showcases the company’s promise in diagnostic and personalized medicine, as the biomarker discovery platform demonstrates. Buesa continues, “We want to become a leader in molecular diagnostics, with specialization in genomics, proteomics, and bioinformatics.”