How Technology Can Help

A medical home's ability to transmit and access information as well as communicate effectively with patients and specialists requires physicians to address the challenges of finding, implementing, and financing an appropriate and fully functioning EMR system.

Chapter in Brief:

- *Vendors are just now working on systems that will meet the needs of medical homes to enhance work flow, team functioning, and the ability to generate reports.*
- *Be careful when making an EMR purchase. Look for the capability to communicate with other providers and with other computers.*
- *Include patients in your communication strategy. Practices large and small should be on the Web using portals that allow online appointment scheduling, e-mail, and patients' access to their medical records. "Wired" patients can be more involved in their own care.*

Any practice changing to the medical home model will benefit from using computers extensively for the two vital components of the medical home: information and communication. The pressure's on since Medicare's medical home demonstration project won't even consider a practice that doesn't have EMRs. In addition, a successful medical home is likely to have tools like e-mail and text messaging to go along with or replace phone calls, and patients will increasingly expect to be able to access their medical information through the Internet.

The medical home requires using the system in a more cost-

For the treatment of hypertension

BYSTOLIC.

Significant blood pressure reductions with a low incidence of side effects.[1-3]

Bystolic®
(nebivolol) tablets

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Important Safety Information

Patients being treated with BYSTOLIC should be advised against abrupt discontinuation of therapy. Severe exacerbation of angina and the occurrence of myocardial infarction and ventricular arrhythmias have been reported following the abrupt cessation of therapy with beta blockers. When discontinuation is planned, the dosage should be reduced gradually over a 1- to 2-week period and the patient carefully monitored.

BYSTOLIC is contraindicated in severe bradycardia, heart block greater than first degree, cardiogenic shock, decompensated cardiac failure, sick sinus syndrome (unless a permanent pacemaker is in place), severe hepatic impairment (Child-Pugh >B), and in patients who are hypersensitive to any component of this product.

BYSTOLIC should be used with caution in patients with peripheral vascular disease, thyrotoxicosis, in patients treated concomitantly with beta blockers and calcium channel blockers of the verapamil and diltiazem type (ECG and blood pressure should be monitored), severe renal impairment, and any degree of hepatic impairment or in patients undergoing major surgery. In patients who have compensated congestive heart failure, BYSTOLIC should be administered cautiously. If heart failure worsens, discontinuation of BYSTOLIC should be considered. Caution should also be used in diabetic patients as beta blockers may mask some of the manifestations of hypoglycemia, particularly tachycardia.

Use caution when BYSTOLIC is co-administered with CYP2D6 inhibitors (quinidine, propafenone, fluoxetine, paroxetine, etc). When BYSTOLIC is administered with fluoxetine, significant increases in d-nebivolol may be observed (ie, an 8-fold increase in AUC).

In general, patients with bronchospastic disease should not receive beta blockers.

BYSTOLIC should not be combined with other beta blockers.

The most common adverse events with BYSTOLIC versus placebo (approximately ≥1% and greater than placebo) were headache, fatigue, dizziness, diarrhea, nausea, insomnia, chest pain, bradycardia, dyspnea, rash, and peripheral edema.

Forest Pharmaceuticals, Inc.
Pharmaceuticals • Therapeutics • Healthcare • Ethicare • Managed Care • Specialty Sales

Please see brief summary of Prescribing Information on adjacent page.

References: 1. BYSTOLIC [package insert]. St. Louis, Mo: Forest Pharmaceuticals, Inc.; 2008. **2.** Data on file. Forest Laboratories, Inc. **3.** Saunders E, Smith WB, DeSalvo KB, Sullivan WA. The efficacy and tolerability of nebivolol in hypertensive African American patients. *J Clin Hypertens.* 2007;9:866-875.

 44-1014950 01/09

Bystolic®
(nebivolol) tablets
2.5 mg, 5 mg, 10 mg and 20 mg

Rx Only

Brief Summary: For complete details please see full Prescribing Information for BYSTOLIC.

INDICATIONS AND USAGE
BYSTOLIC is indicated for the treatment of hypertension. BYSTOLIC may be used alone or in combination with other antihypertensive agents.

CONTRAINDICATIONS
BYSTOLIC is contraindicated in patients with severe bradycardia, heart block greater than first degree, cardiogenic shock, decompensated cardiac failure, sick sinus syndrome (unless a permanent pacemaker is in place), or severe hepatic impairment (Child-Pugh >B), and in patients who are hypersensitive to any component of this product.

WARNINGS
Abrupt Cessation of Therapy
Patients with coronary artery disease treated with BYSTOLIC should be advised against abrupt discontinuation of therapy. Severe exacerbation of angina and the occurrence of myocardial infarction and ventricular arrhythmias have been reported in patients with coronary artery disease following the abrupt discontinuation of therapy with β-blockers. Myocardial infarction and ventricular arrhythmias may occur with or without preceding exacerbation of the angina pectoris. Even patients without overt coronary artery disease should be cautioned against interruption or abrupt discontinuation of therapy. As with other β-blockers, when discontinuation of BYSTOLIC is planned, patients should be carefully observed and advised to minimize physical activity. BYSTOLIC should be tapered over 1 to 2 weeks when possible. If the angina worsens or acute coronary insufficiency develops, it is recommended that BYSTOLIC be promptly reinstituted, at least temporarily.

Cardiac Failure
Sympathetic stimulation is a vital component supporting circulatory function in the setting of congestive heart failure, and β-blockade may result in further depression of myocardial contractility and precipitate more severe failure. In patients who have compensated congestive heart failure, BYSTOLIC should be administered cautiously. If heart failure worsens, discontinuation of BYSTOLIC should be considered.

Angina and Acute Myocardial Infarction
BYSTOLIC was not studied in patients with angina pectoris or who had a recent MI.

Bronchospastic Diseases
In general, patients with bronchospastic diseases should not receive β-blockers.

Anesthesia and Major Surgery
If BYSTOLIC is to be continued perioperatively, patients should be closely monitored when anesthetic agents which depress myocardial function, such as ether, cyclopropane, and trichloroethylene, are used. If β-blocking therapy is withdrawn prior to major surgery, the impaired ability of the heart to respond to reflex adrenergic stimuli may augment the risks of general anesthesia and surgical procedures.

The β-blocking effects of BYSTOLIC can be reversed by β-agonists, e.g., dobutamine or isoproterenol. However, such patients may be subject to protracted severe hypotension. Additionally, difficulty in restarting and maintaining the heartbeat has been reported with β-blockers.

Diabetes and Hypoglycemia
β-blockers may mask some of the manifestations of hypoglycemia, particularly tachycardia. Nonselective β-blockers may potentiate insulin-induced hypoglycemia and delay recovery of serum glucose levels. It is not known whether nebivolol has these effects. Patients subject to spontaneous hypoglycemia, or diabetic patients receiving insulin or oral hypoglycemic agents, should be advised about these possibilities and nebivolol should be used with caution.

Thyrotoxicosis
β-blockers may mask clinical signs of hyperthyroidism, such as tachycardia. Abrupt withdrawal of β-blockers may be followed by an exacerbation of the symptoms of hyperthyroidism or may precipitate a thyroid storm.

Peripheral Vascular Disease
β-blockers can precipitate or aggravate symptoms of arterial insufficiency in patients with peripheral vascular disease. Caution should be exercised in these patients.

Non-dihydropyridine Calcium Channel Blockers
Because of significant negative inotropic and chronotropic effects in patients treated with β-blockers and calcium channel blockers of the verapamil and diltiazem type, caution should be used in patients treated concomitantly with these agents and ECG and blood pressure should be monitored.

PRECAUTIONS
Use with CYP2D6 Inhibitors
Nebivolol exposure increases with inhibition of CYP2D6 (see **Drug Interactions**). The dose of BYSTOLIC may need to be reduced.

Impaired Renal Function
BYSTOLIC should be used with caution in patients with severe renal impairment because of decreased renal clearance. BYSTOLIC has not been studied in patients receiving dialysis.

Impaired Hepatic Function
BYSTOLIC should be used with caution in patients with moderate hepatic impairment because of decreased metabolism. Since BYSTOLIC has not been studied in patients with severe hepatic impairment, BYSTOLIC is contraindicated in this population (see **CLINICAL PHARMACOLOGY, Special Populations** and **DOSAGE AND ADMINISTRATION**).

Risk of Anaphylactic Reactions
While taking β-blockers, patients with a history of severe anaphylactic reactions to a variety of allergens may be more reactive to repeated challenge either accidental, diagnostic, or therapeutic. Such patients may be unresponsive to the usual doses of epinephrine used to treat allergic reactions.

In patients with known or suspected pheochromocytoma, an α-blocker should be initiated prior to the use of any β-blocker.

Information for Patients
Patients should be advised to take BYSTOLIC regularly and continuously, as directed. BYSTOLIC can be taken with or without food. If a dose is missed, the patient should take the next scheduled dose only (without doubling it). Patients should not interrupt or discontinue BYSTOLIC without consulting the physician.

Patients should know how they react to this medicine before they operate automobiles, use machinery, or engage in other tasks requiring alertness.

Patients should be advised to consult a physician if any difficulty in breathing occurs, or if they develop signs or symptoms of worsening congestive heart failure such as weight gain or increasing shortness of breath, or excessive bradycardia.

Patients subject to spontaneous hypoglycemia, or diabetic patients receiving insulin or oral hypoglycemic agents, should be cautioned that β-blockers may mask some of the manifestations of hypoglycemia, particularly tachycardia. Nebivolol should be used with caution in these patients.

Drug Interactions
BYSTOLIC should be used with care when myocardial depressants or inhibitors of AV conduction, such as certain calcium antagonists (particularly of the phenylalkylamine [verapamil] and benzothiazepine [diltiazem] classes), or antiarrhythmic agents, such as disopyramide, are used concurrently. Both digitalis glycosides and β-blockers slow atrioventricular conduction and decrease heart rate. Concomitant use can increase the risk of bradycardia.

BYSTOLIC should not be combined with other β-blockers. Patients receiving catecholamine-depleting drugs, such as reserpine or guanethidine, should be closely monitored, because the added β-blocking action of BYSTOLIC may produce excessive reduction of sympathetic activity. In patients who are receiving BYSTOLIC and clonidine, BYSTOLIC should be discontinued for several days before the gradual tapering of clonidine.

CYP2D6 Inhibitors: Use caution when BYSTOLIC is co-administered with CYP2D6 inhibitors (quinidine, propafenone, fluoxetine, paroxetine, etc.) (see **CLINICAL PHARMACOLOGY, Drug Interactions**).

Carcinogenesis, Mutagenesis, Impairment of Fertility
In a two-year study of nebivolol in mice, a statistically significant increase in the incidence of testicular Leydig cell hyperplasia and adenomas was observed at 40 mg/kg/day (5 times the maximally recommended human dose of 40 mg on a mg/m^2 basis). Similar findings were not reported in mice administered doses equal to approximately 0.3 or 1.2 times the maximum recommended human dose. No evidence of a tumorigenic effect was observed in a 24-month study in Wistar rats receiving doses of nebivolol 2.5, 10 and 40 mg/kg/day (equivalent to 0.6, 2.4, and 10 times the maximally recommended human dose). Co-administration of dihydrotestosterone reduced blood LH levels and prevented the Leydig cell hyperplasia, consistent with an indirect LH-mediated effect of nebivolol in mice and not thought to be clinically relevant in man.

A randomized, double-blind, placebo- and active-controlled, parallel-group study in healthy male volunteers was conducted to determine the effects of nebivolol on adrenal function, luteinizing hormone, and testosterone levels. This study demonstrated that 6 weeks of daily dosing with 10 mg of nebivolol had no significant effect on ACTH-stimulated mean serum cortisol $AUC_{0\text{-}120\ min}$, serum LH, or serum total testosterone.

Effects on spermatogenesis were seen in male rats and mice at ≥40 mg/kg/day (10 and 5 times the MRHD, respectively). For rats the effects on spermatogenesis were not reversed and may have worsened during a four-week recovery period. The effects of nebivolol on sperm in mice, however, were partially reversible.

Mutagenesis: Nebivolol was not genotoxic when tested in a battery of assays (Ames, *in vitro* mouse lymphoma $TK^{+/-}$, *in vitro* human peripheral lymphocyte chromosome aberration, *in vivo* Drosophila melanogaster sex-linked recessive lethal, and *in vivo* mouse bone marrow micronucleus tests).

Pregnancy: Teratogenic Effects. Pregnancy Category C:
Decreased pup body weights occurred at 1.25 and 2.5 mg/kg in rats, when exposed during the perinatal period (late gestation, parturition and lactation). At 5 mg/kg and higher doses (1.2 times the MRHD), prolonged gestation, dystocia and reduced maternal care were produced with corresponding increases in late fetal deaths and stillbirths and decreased birth weight, live litter size and pup survival. Insufficient numbers of pups survived at 5 mg/kg to evaluate the offspring for reproductive performance.

In studies in which pregnant rats were given nebivolol during organogenesis, reduced fetal body weights were observed at maternally toxic doses of 20 and 40 mg/kg/day (5 and 10 times the MRHD), and small reversible delays in sternal and thoracic ossification associated with the reduced fetal body weights and a small increase in resorption occurred at 40 mg/kg/day (10 times the MRHD). No adverse effects on embryo-fetal viability, sex, weight or morphology were observed in studies in which nebivolol was given to pregnant rabbits at doses as high as 20 mg/kg/day (10 times the MRHD).

Labor and Delivery

Nebivolol caused prolonged gestation and dystocia at doses ≥5 mg/kg in rats (1.2 times the MRHD). These effects were associated with increased fetal deaths and stillborn pups, and decreased birth weight, live litter size and pup survival rate, events that occurred only when nebivolol was given during the perinatal period (late gestation, parturition and lactation).

No studies of nebivolol were conducted in pregnant women. BYSTOLIC should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Nursing Mothers

Studies in rats have shown that nebivolol or its metabolites cross the placental barrier and are excreted in breast milk. It is not known whether this drug is excreted in human milk.

Because of the potential for β-blockers to produce serious adverse reactions in nursing infants, especially bradycardia, BYSTOLIC is not recommended during nursing.

Geriatric Use

Of the 2800 patients in the U.S.-sponsored placebo-controlled clinical hypertension studies, 478 patients were 65 years of age or older. No overall differences in efficacy or in the incidence of adverse events were observed between older and younger patients.

Pediatric Use

Safety and effectiveness in pediatric patients have not been established. Pediatric studies in ages newborn to 18 years old have not been conducted because of incomplete characterization of developmental toxicity and possible adverse effects on long-term fertility (see **Carcinogenesis, Mutagenesis, and Impairment of Fertility**).

ADVERSE REACTIONS

The data described below reflect worldwide clinical trial exposure to BYSTOLIC in 6545 patients, including 5038 patients treated for hypertension and the remaining 1507 subjects treated for other cardiovascular diseases. Doses ranged from 0.5 mg to 40 mg. Patients received BYSTOLIC for up to 24 months, with over 1900 patients treated for at least 6 months, and approximately 1300 patients for more than one year. In placebo-controlled clinical trials comparing BYSTOLIC with placebo, discontinuation of therapy due to adverse events was reported in 2.8% of patients treated with nebivolol and 2.2% of patients given placebo. The most common adverse events that led to discontinuation of BYSTOLIC were headache (0.4%), nausea (0.2%) and bradycardia (0.2%).

Adverse Reactions in Controlled Trials

Table 1 lists treatment-emergent signs and symptoms that were reported in three 12-week, placebo-controlled monotherapy trials involving 1597 hypertensive patients treated with either 5 mg, 10 mg or 20-40 mg of BYSTOLIC and 205 patients given placebo and for which the rate of occurrence was at least 1% of patients treated with nebivolol and greater than the rate for those treated with placebo in at least one dose group.

Table 1. Treatment-Emergent Adverse Events with an Incidence (over 6 weeks) ≥1% in BYSTOLIC-Treated Patients and at a Higher Frequency than Placebo-Treated Patients

	Placebo (n = 205) (%)	Nebivolol 5 mg (n = 459) (%)	Nebivolol 10 mg (n = 461) (%)	Nebivolol 20-40 mg (n = 677) (%)
Headache	6	9	6	7
Fatigue	1	2	2	5
Dizziness	2	2	3	4
Diarrhea	2	2	2	3
Nausea	0	1	3	2
Insomnia	0	1	1	1
Chest pain	0	0	1	1
Bradycardia	0	0	0	1
Dyspnea	0	0	1	1
Rash	0	0	1	1
Peripheral edema	0	1	1	1

Other Adverse Events Observed During Worldwide Clinical Trials

Listed below are other reported adverse events with an incidence of at least 1% in the more than 5300 patients treated with BYSTOLIC in controlled or open-label trials, whether or not attributed to treatment, except for those already appearing in **Table 1**, terms too general to be informative, minor symptoms, or events unlikely to be attributable to drug because they are common in the population. These adverse events were in most cases observed at a similar frequency in placebo-treated patients in the controlled studies.

Body as a Whole: asthenia.

Gastrointestinal System Disorders: abdominal pain

Metabolic and Nutritional Disorders: hypercholesterolemia and hyperuricemia

Nervous System Disorders: paraesthesia

Laboratory

In controlled monotherapy trials, BYSTOLIC was associated with an increase in BUN, uric acid, triglycerides and a decrease in HDL cholesterol and platelet count.

Events Identified from Spontaneous Reports of BYSTOLIC Received Worldwide

The following adverse events have been identified from spontaneous reports of BYSTOLIC received worldwide and have not been listed elsewhere. These adverse events have been chosen for inclusion due to a combination of seriousness, frequency of reporting or potential causal connection to BYSTOLIC. Events common in the population have generally been omitted. Because these events were reported voluntarily from a population of uncertain size, it is not possible to estimate their frequency or establish a causal relationship to BYSTOLIC exposure: abnormal hepatic function (including increased AST, ALT and bilirubin), acute pulmonary edema, acute renal failure, atrioventricular block (both second- and third-degree), bronchospasm, erectile dysfunction, hypersensitivity (including urticaria, allergic vasculitis and rare reports of angioedema), myocardial infarction, pruritus, psoriasis, Raynaud's phenomenon, peripheral ischemia/claudication, somnolence, syncope, thrombocytopenia, various rashes and skin disorders, vertigo, and vomiting.

OVERDOSAGE

In clinical trials and worldwide postmarketing experience there were reports of BYSTOLIC overdose. The most common signs and symptoms associated with BYSTOLIC overdosage are bradycardia and hypotension. Other important adverse events reported with BYSTOLIC overdose include cardiac failure, dizziness, hypoglycemia, fatigue and vomiting. Other adverse events associated with β-blocker overdose include bronchospasm and heart block.

The largest known ingestion of BYSTOLIC worldwide involved a patient who ingested up to 500 mg of BYSTOLIC along with several 100 mg tablets of acetylsalicylic acid in a suicide attempt. The patient experienced hyperhidrosis, pallor, depressed level of consciousness, hypokinesia, hypotension, sinus bradycardia, hypoglycemia, hypokalemia, respiratory failure and vomiting. The patient recovered.

Due to extensive drug binding to plasma proteins, hemodialysis is not expected to enhance nebivolol clearance.

If overdose occurs, BYSTOLIC should be stopped and general supportive and specific symptomatic treatment should be provided. Based on expected pharmacologic actions and recommendations for other β-blockers, the following general measures should be considered when clinically warranted:

Bradycardia: Administer IV atropine. If the response is inadequate, isoproterenol or another agent with positive chronotropic properties may be given cautiously. Under some circumstances, transthoracic or transvenous pacemaker placement may be necessary.

Hypotension: Administer IV fluids and vasopressors. Intravenous glucagon may be useful.

Heart Block (second or third degree): Patients should be carefully monitored and treated with isoproterenol infusion. Under some circumstances, transthoracic or transvenous pacemaker placement may be necessary.

Congestive Heart Failure: Initiate therapy with digitalis glycoside and diuretics. In certain cases, consideration should be given to the use of inotropic and vasodilating agents.

Bronchospasm: Administer bronchodilator therapy such as a short-acting inhaled β_2-agonist and/or aminophylline.

Hypoglycemia: Administer IV glucose. Repeated doses of IV glucose or possibly glucagon may be required.

In the event of intoxication where there are symptoms of shock, treatment must be continued for a sufficiently long period consistent with the 12-19 hour effective half-life of BYSTOLIC. Supportive measures should continue until clinical stability is achieved.

Call the National Poison Control Center (800-222-1222) for the most current information on β-blocker overdose treatment.

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efficient, improved way to meet your patients' needs, and accessing the right information at the right time is a key part of the equation, says Barbara Morris, MD, chief medical officer for Community Care Physicians, Latham, N.Y.

"It's impossible to have a medical home without electronic support if you have a large patient population," she says. "An overloaded primary care physician taking care of the urgencies of the day doesn't have a good, reliable way to know what types of patients he or she has, and which ones have specific issues in common that constitute a disease management population."

Two of the 35 sites in Dr. Morris's practice are participating in the medical home pilot program run by Capital District Physicians Health Plan (see Chapter 4). These sites already have an advantage since the group, which has about 200 primary care providers, has had an EMR system since July 2005. It uses

Apples to Apples: How to Get EMRs Working Together

Arguably the most frustrating part of today's physician office electronic medical record (EMR) systems is their lack of uniformity, which makes switching from one system to another infuriating or, at times, impossible. Because the problem is going to be even more profound under the EMR demands of the patient-centered medical home, practices may want to better understand EMR certification.

The conflict stems from how many of these systems were created: Physicians exasperated by the shortcomings of existing products came up with their own, constructed for specific contexts and purposes. Thus, many products don't easily adapt to one another or to new uses. The specter of such a task alone may have scared many physicians off from even trying EMRs. Now imagine the needs of the medical home: Can your system, for example, pull up lists of patients who share certain characteristics? If the information has been entered properly, such tasks are simple; if not, they're out of the question.

The good news is that EMRs have a standard-setting body called the Certification Commission for Health Information Technology (CCHIT). Formed in 2004 as a joint effort by three health information technology professional organizations and funded by all major primary care specialty societies, CCHIT is an independent not-for-profit organization. It developed its certification criteria under a contract from the U.S. Dept. of Health and Human Services starting in 2005, and at this writing it is a leading candi-

Allscripts to collect basic data in patients' records. The practice then "mines" that information to analyze the patient population and track performance.

The system can do both because physicians enter as much data as possible in "granular" form, filling out boxes and clicking buttons rather than typing or dictating notes. As a result, the system can easily find the data it needs to build a database and produce reports. Because many physicians prefer reading narratives, Dr. Morris says the next release of the software will allow for a lot of data to be entered into templates that store it as individual elements, but convert it into narrative notes for the user.

Be Glad You Waited

If you've waited to invest your money, time, and effort to convert to EMRs, that may have been a smart move when it comes

date to be responsible for certifying EMRs under the provisions of the American Recovery and Reinvestment Act.

A CCHIT-certified EMR stores data in certain standard ways so that it can be easily pulled out for reports or passed to another system. In order to earn CCHIT certification, vendors have to demonstrate that their products can comply with 67 pages of criteria that specify what data is stored in the EMR, how it is stored, and how it can be extracted. The process guarantees a basic level of standardization intended to help physicians make apples-to-apples comparisons when they're deciding which system to buy. Individual user interfaces—how the screens look and whether the user can change things around—vary by vendor.

"CCHIT runs tests to make sure 100 percent of the criteria are included and have been demonstrated to work in patient-care scenarios," says CCHIT's spokesman John Morrissey. Then it's up to buyers to test-drive and do due diligence on the specific products.

CCHIT doesn't specifically certify EMRs for use in medical homes—yet. But products that continue to meet the CCHIT's ever-changing standards may be poised to cope with the data demands of the medical home, such as being able to store specific pieces of data as discrete elements and to make sure they're associated with any relevant codes.

For a list of systems that have passed CCHIT certification tests, visit *http://www.cchit.org*.

to medical homes. Most earlier EMRs wouldn't have been able to do the job the medical home needs. In fact, most EMRs aren't yet set up to create disease registries, one of the most basic medical home functions.

You're not alone if you haven't made the leap. Only 4 percent of physicians have a fully functional EMR, and another 13 percent have a basic system, according to a study published last year in *The New England Journal of Medicine*. A $20 billion provision for health information technology in the economic stimulus package adopted in February, mostly in the form of incentive payments from Medicare and Medicaid, should increase those numbers. The Congressional Budget Office estimates that as a result of the stimulus money, 55 percent of physician offices will be fully "wired" by 2014, compared with only 25 percent that could have achieved this landmark without that financial boost.

Most systems were designed originally to help with coding

Turning Dictation Into Usable Data

Much vital medical information is in the form of physicians' dictation and notes, which are difficult to convert into the kind of granular data that lends itself to patient registries and computer analysis—two cornerstones of patient management under the medical home model of care. Computer programmers would rather have physicians abandon their old habits of documentation in favor of checking off boxes, but a branch of computer science called natural language processing (NLP) may help physicians have their dictation and analyze it, too.

NLP takes free text and breaks it down into elements that computers can use. For example, a 2007 competition sponsored by the Computational Medicine Center challenged participants to take clinical free text and program a computer to assign ICD-9-CM codes to it (*http://www.computationalmedicine.org/*). The competition attracted 44 research teams.

A company called CodeRyte offers a Web-based service that does the same thing even though its products currently are targeted to specialties with limited codes: radiology, pathology, emergency medicine, and cardiology (*http://www.coderyte.com/?gclid=CM6qquHb9ZkCFRIeDQodNHavRg*). But Lyle Schofield, vice president of product management and chief compliance officer, has his eye on a much larger potential market: analyzing the free text of primary care physicians to support the patient-centered medical home. The company is working with the Massachusetts Coalition

and billing instead of managing people, explains Dr. McGeeney of TransforMED. While TransforMED, for one, has advised some vendors how to tack medical home-friendly capabilities onto their existing products, health information technology vendors haven't embraced the needs of medical homes anywhere near the way they need to, according to Chris Nohrden, executive director of the Center for e-Health Information and Adoption, an arm of the PCPPC.

The AAFP's Dr. Bagley says some vendors are listening. "They've finally gotten the message that it's not just recording the office visit," he says. "They're starting to see that work flow is important, and how to optimize team functioning." For example, if he needs blood work on a patient, the computer should inform the nurse so that he doesn't have to search for her. The key, he notes, is to integrate decision support so that if the physician is seeing a diabetic who is not on an ACE inhibitor, for

for Primary Care Reform, which advocates a model of payment that's focused on comprehensive primary care rather than charging for individual services. Mr. Schofield can't predict when CodeRyte will offer a service for primary care, but he thinks it's inevitable.

"We will shift over time to care less about billing codes and more about the electronic medical record," he says. "A large part of the struggle for EMR vendors is that they want doctors to do data entry, and that's time consuming and interrupts the flow with the patient. We want to allow doctors to dictate and report as they usually do."

The computer system that supports the medical home will need a "dashboard" that gives the physician at-a-glance information about the state of any individual patient or the panel as a whole. Some systems can already do that, but populating all those data fields is just too much work for most practices, Mr. Schofield says. That's where NLP comes in, pulling out information from physicians' free-text reports—even information that's never been relevant to generating a bill, such as whether a patient is taking herbal supplements or is trying to quit smoking.

"We say, 'Just dictate as you normally do, and we'll extract it,'" Mr. Schofield says. "The medical home is about having the information to understand and manage your patient. Doctors always want to do that, but now there's money on the line."

example, a window reminder will pop up.

A medical home's EMR will also need to generate reports so that outside parties can measure how the practice is doing, especially as pay-for-performance enters the reimbursement mix. "If you want to assess how a practice is performing, you have to make quality reports part of the regular work flow, not just added on top," says ACP's Dr. Barr. Most EMRs don't create those overall reports, which is one reason payers tend to use incomplete and often inaccurate claims data to measure physicians' performance. ACP offers a set of online tools to help member

Medical homes will be expected to go beyond what the Web industry calls "brochureware"—practice address and phone number, physician bios, and pictures of generic happy patients—to include online appointment scheduling, e-mail, and patient access to their medical records.

practices select and implement an EMR, including a list of vendors who adhere to a basic set of standards that ACP deems essential (for more information, see *http://www.acponline.org/running_practice/technology/*). The list isn't based on the vendors' assertions that they comply: ACP staff makes site visits and creates its own evaluation. At this writing there were nine vendors on the approved list, but more are being added as they qualify, Dr. Barr says.

The larger vendors know what they need to do for the medical home, and they're working on it. Glen E. Tullman, CEO of Allscripts, says that the company's products support at least half of the NCQA's medical home requirements and they are adding more capabilities with each new software release.

A Communication Strategy

For a true medical home, getting an EMR is just the first step. The next is figuring out how to communicate with everyone—specialists, hospitals, pharmacies, and especially patients.

Don't rush into an EMR purchase without evaluating what the medical home model will require to communicate with other providers, warns Dr. Fisher of the Center for Health Policy

Research at the Dartmouth Institute for Health Policy and Clinical Practice. "I'd be very cautious, even if a [federal government] stimulus package includes a $5,000 tax credit [for an EMR], because I wouldn't be surprised if five years down the line the requirement would be that they'd be interoperable with the systems of other providers," he says.

Interoperability—the ability for two computers to automatically swap data without a lot of fiddling by their owners—is essential, says Mark Dente, MD, vice president for healthcare solutions, integrated IT solutions, at GE Healthcare, vendor of the popular Centricity EMR system. It's most important to know your vendor's strategy to help you interoperate because even comprehensive EMR systems are never really complete.

When you're putting together information to make an EMR decision, inventory all the systems that you'd like yours to be able to interact with, and make sure your selected vendor can make that happen—ideally because the vendor has made those particular connections before.

Wiring Your Patients

Like every other business in the dawn of the 21st century, primary care practices are expected to have a presence on the Web. And medical homes will be expected to go beyond what the Web industry calls "brochureware"—practice address and phone number, physician bios, and pictures of generic happy patients—to include online appointment scheduling, e-mail, and patient access to their medical records. (See "From Medical Records to Online Consultations," p. 53.)

Some larger systems have already made progress in this regard. For example, the Palo Alto (Calif.) Medical Foundation (PAMF), a 724-physician group practice affiliated with the Sutter Health system, has offered its 600,000 patients access to its EMR system since 2001 (*http://www.pamf.org/*). Half of the patients take advantage of the ability to access their personal health record online—the same information available to physicians, nurses, health coaches, hospitals, and pharmacies through an integrated system. Surveys show that 75 percent of patients who use the system feel that it has saved them at least two phone calls or one office visit at some point. A survey conducted

Rates of Adoption of Electronic Health Records by Physicians, With

Variable	Fully Functional System (N=117) (%)	Standard Error (%)	Basic System (N=330) (%)
All physicians	4	1	13
Sex			
Male	4	1	13
Female	4	1	13
Race or ethinic group†			
Hispanic or Latino	4	1	13
White	4	1	13
Black	5	2	14
Asian	5	2	14
Other	3	2	10
Medical specialty			
Primary care	6	1	15
Not primary care	4	<1	11
No. of years in practice			
1-9	5	1	15
10-19	5	1	14
20-29	5	1	14
≥30	3	1	10
No. of physicians in practice			
1-3	2	<1	7
4-5	3	1	11
6-10	6	1	17
11-50	8	1	22
>50	17	3	33
Clincial setting			
Hospital or medical center	5	1	15
Office not attached to a hospital or medical center	4	<1	12
Other	4	1	13
Location			
Urban	4	<1	13
Rural	4	1	13
Region			
Northeast	4	1	11
Midwest	4	1	13
South	4	1	12
West	6	1	16

**Percentages were calculated with the use of multivariable analysis, applying a cumulative logit model to predict the adoption of an electronic-records system, with adjustment for all vaiables listed in the table. The analysis was adjusted for nonresponse. The total number of respondents does not include 151 who provided incomplete responses. Percentages (which sum across rows) may not total 100 because of rounding.*

Adjustment for the Characteristics of the Physicians and Their Practices*

Standard Error (%)	No Basic or Fully Functional System (N=2160) (%)	Standard Error (%)	*P*-Value
1	83	<1	
			0.76
1	83	1	
1	83	2	
			0.99
2	83	3	
1	82	1	0.84
4	80	6	0.72
3	82	5	0.82
4	87	6	0.45
			<0.001
1	80	1	
1	86	1	
			0.009
2	80	2	
1	81	1	
1	82	1	
1	87	1	
			<0.001
1	91	1	
1	86	2	
2	77	2	
2	71	3	
3	50	5	
			0.008
1	80	1	
1	85	1	
3	83	4	
			0.92
1	83	1	
1	83	2	
			0.02
1	86	2	
1	83	2	
1	84	1	
1	78	2	

†*Respondents could select more than one race or ethnic group.*

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among employees of Cisco, which sponsored text messaging between employees and their physicians, showed that 87 percent felt that the function saved them time away from work, and 70 percent wanted to use the method as their primary communication with their doctor. Cisco estimated that it saved $9.80 in lowered medical costs for every dollar invested in messaging.

Having patients "wired" is invaluable for involving them in their own care, says Paul Tang, MD, the foundation's chief medical information officer and a member of the recently formed federal Health Information Technology Policy Committee, which is charged with developing a national health care information infrastructure plan. For example, PAMF's diabetic patients are asked to record their sugar readings, and they can wirelessly upload data from their glucometers. Once this data is in their record, they can annotate their reading, including information on what they had just eaten, which medications they'd taken, and their most recent kind of exercise. "A reading doesn't mean a lot except in the context of how it's affected by behaviors, and we let them graph everything," Dr. Tang says. "It changes their whole role in managing their health."

NorthShore University HealthSystem in Evanston, Ill., has done something similar with a home page portal called NorthShore Connect (*http://www.northshore.org/*). Of 230,000 active patients, 52,000 have already signed up for access through NorthShore Connect, and the organization is aiming to reach a total of 100,000 by the end of the year.

Physicians resisted the portal at first, fearing that once the public saw their calendars, they would know how many patients they did or didn't have and when they were on vacation; they also were afraid patients would cancel appointments or double-book, says A.J. Melaragno, assistant vice president of interactive marketing. It didn't turn out that way. "Once [doctors] got past the feeling that patients were going to abuse the access, [they] wanted to open it up more and have more features," he says.

The health system is considering offering some form of financial help to affiliated physicians who want to install a compatible EMR. Patients love the access, but they're apt to compare it to their online experience with their bank or eBay. The health system has committed to having test results available online

From Medical Records to Online Consultations

For the medical home to work, patients must have better access to their own information. That's where the Internet comes in.

Typical patient portals not only give access to at least a basic medical record, they also allow patients to schedule appointments, send messages to their physician, and pick up health education information. Some enable patients to upload glucose and blood pressure readings and the like for tracking chronic illnesses. Some support full online consultation, in which patients fill out detailed forms with their symptoms and concerns and then get feedback from their physicians. A few insurers are beginning to reimburse for online encounters.

Most large EMR vendors have some sort of patient portal offering to go with their products, including the following:

- Allscripts: *http://www.allscripts.com/*
- Centricity EMR: *http://www.gehealtcare.com/usen/hit/products/centricity_practice/emr_index.html*
- eClinicalWorks: *http://www.eclinicalworks.com/*
- Epic Systems: *http://www.epicsystems.com/*
- McKesson: *http://www.mckesson.com/en_us/McKesson.com/*

There are also a number of independent vendors, including the following:

- Care Converge: *http://www.careconverge.com/*
- Medem: *http://www.medem.com/*
- Medfusion: *http://www.medfusion.net/*
- Medseek: *http://medseek.com/*

Capabilities and costs vary.

within three days of the test. Patients who get their test results online make 40 percent fewer calls to their physicians' offices.

Even very small practices can offer their patients this type of sophisticated computer access. Joseph Mambu, MD, a family practice physician in Lower Gwynedd, Pa., has been experimenting with a Web portal that allows patients to review their records, make appointments, and communicate with him and his staff. (For more about Dr. Mambu's practice, see Chapter 5.) Because his reimbursement structure doesn't allow time to swap e-mails with 3,000 patients, he's charging $6.50 per patient per month for the portal, at least for now. Between 50 and 75 of his patients are willing to pay the fee, and he says it works great for them.