

Open source software products (OSS) are systems whose programming code is openly available to download, use, review, critique, modify, and redistribute. The definition of “open source software” refers to the licensing terms governing the use and distribution of the software code as intellectual property. The terms of the open source software license allow for the code to be modified, customizing the program to the needs of a practice.

In most instances, because the source code is openly available, the program is free, although there may be costs for service, support, implementation, and hardware. Open source software in the form of EMRs for physician practices is emerging as an option.

While strictly speaking, “open source” is an engineering term referring to source code, it also is used in a broader context to refer to a philosophy where openness, transparency, and collaboration are seen as the best approach to solve problems. An example is the emergence of health information exchanges where collaboration is critical to get stakeholders to exchange patient records, and where openness is necessary to access and exchange the data. This broader approach is becoming known as “open health care.”

This “open” approach is the cornerstone of the efforts of the [National Health Information Network \(NHIN\)](#). It is being developed to provide a secure, nationwide, interoperable health information infrastructure that will connect providers, consumers, and others involved in supporting health and health care. The NHIN will be used to transmit data to appropriate federal agencies, such as Medicare, for quality measures.

The infrastructure, [NHIN Connect](#), is being built using open source development methods and code, which means the code is free and available to all who wish to connect their applications to the NHIN. Even vendors with proprietary data formats can use the software interfaces of NHIN Connect to share data.

A nonprofit organization, [Open Health Tools](#), recently has emerged as a major collaboration point for these efforts. The organization now has more than 40 members including government agencies, academia, commercial companies, and nonprofit organizations. Some of the members already have made major contributions such as Britain’s [National Health Service \(NHS\)](#), which has contributed over \$40 million worth of tools and terminology to the open source community.

## VistA

Open source EMRs have a long and successful history in U.S. federal agencies. The U.S. Department of Veterans Affairs (VA) began EMR development in 1978. This was done using a decentralized development strategy that encouraged hands-on involvement of physicians, nurses, and other clinicians in product development. Today, more than 300,000 people use the software (now called VistA) daily to care for more than 6 million veterans at more than 1,200 VA facilities across the world. While only a minority of private hospitals in the United States have EMRs, 100 percent of VA facilities have used EMRs for almost 15 years.

VistA is available as open source software to the public and to companies that are implementing it and continuing its development in the private sector. There are hundreds of successful deployments. Some, such as the VistA implementation at the Midland Memorial Hospital in Midland, Texas, have been covered extensively in the press. It was implemented in a fraction of the time and for a fraction of the cost that otherwise might have occurred.

Today, almost every major medical school in the United States is located near a VA medical center. A large percentage of teachers at U.S. medical schools are employed by the VA, and more than 50 percent of all medical students complete their residencies at VA hospitals. These doctors already have experience using VistA.

VistA has extended beyond the VA to the Indian Health Service (IHS). The mission of IHS is to provide medical care to more than 3 million American Indians and Native Americans. As Congress allocated no money for developing an EMR, IHS developed an EMR in collaboration with the VA for over 30 years. Today, this EMR, called Resource and Patient Management System (RPMS), is deployed at more than 600 medical facilities.

Although they share 95 percent of the code base, VistA and RPMS are different. This has to do largely with the different missions of the VA and IHS. The VA is primarily a hospital-centric environment whose mission has been to care for veterans. IHS operates a few small hospitals and large number of clinics. In addition, it cares for people from cradle to grave. This RPMS's workflow is optimized for clinics, and it has additional modules such as pediatric and OB-Gyn modules. Thanks to open source collaboration, many of the additional modules in RPMS have been ported to VistA. At the same time, many consider RPMS, although not as well known as VistA, to be a better choice for clinics.

## Advantages

Open source has worked with great success in other industries, sometimes becoming the dominant licensing model. The Internet runs on open source software that uses open standards. More than 70 percent of the world's Web servers run on a combination of open source software.

Open source is vendor-neutral and is created in a culture of collaboration. Multiple vendors support each open source program. These programs also may be supported by communities and physicians who may contribute to the project enhancements written for their practices. While access to the software's program for adaptation is important, open source users may scrutinize and identify avenues for improvements to the software that lead to high-quality, reliable software. This can have the added benefit of fewer software bugs, continuous improvement, and more local customization.

There are costs involved in implementing "free" open source EMR software. One of the great advantages of open source is that it can be downloaded and thoroughly examined and tested before it is implemented. However, implementing EMR software is complex whether the product is open source or proprietary. Many of the physicians who have downloaded and installed open source solutions in their practices recommend that the practice hire a vendor or a consultant to carry out the implementation and provide the support. Also note that open source EMRs require the purchase of hardware.

Many costs, such as implementation, are similar to those of proprietary software. Other costs may be substantially lower. Table 1 outlines the costs that may and may not be incurred during the implementation of an open source solution. The comparison assumes that the practice hires an independent consultant or a vendor to implement the solution.

**Table 1**  
**Open Source: What Costs Money and What Doesn't**

What you pay for	What you don't pay for
Implementation	Licensing fees
Support and maintenance	Interfaces
Training	Templates
Database (if you choose a proprietary one)	Database (if you choose an open source one)
Operating system if you use a proprietary operating system such as Windows	Operating system if you choose an open source solution such as Linux
Hardware and infrastructure (servers, desktops, network, etc.)	Tools

Looking at Table 1 in detail, we do see that it will cost money to implement the EMR, but open source EMRs do not involve the major costs associated with proprietary EMRs, which include licensing fees, interfaces, and templates. Licensing fees, for example, vary greatly for proprietary EMRs, and in some cases, they exceed the cost of implementation. In contrast to open source vendors, proprietary vendors may charge licensing fees per physician, per user, for workstations, for equipment such as faxes and scanners, per site, and so on.

While there are costs to implement open source solutions, in most cases, they will be substantially lower than a proprietary solution.

The software is not the only difference between open source and proprietary models. The way consultants and vendors operate is also different. The primary business model for vendors in the health care industry has been what is known as the “lock-in” model. That is, the software is designed in such a way as to “lock in” the customer; once a practice has purchased an EMR (or a practice management system), it is difficult to change vendors or migrate data to a different system. This is one of the reasons for the difficulty today in exchanging medical records. Once a contract is signed and the proprietary software installed, the vendor is then in the position to start a cycle of upgrades, which require new licenses and additional charges for other components. The initial investment in the software can grow substantially, and the customer is locked into this cycle.

In contrast, the open source model makes it easy to change vendors — there is no lock-in. Most open source software vendors compete for service and support contracts, not for sales, forcing a successful open source vendor to concentrate on customer support. You are not pay-

ing for advertising or sales costs of a business. Because the program is openly available, the physician practice retains a degree of control and protection against the risk of a technology vendor going out of business or merging with another company, or having to accept an expensive system upgrade. As open source programs are supported by multiple vendors, if one vendor goes out of business or provides poor support and services, it can be replaced by another vendor.

Open source EMRs may appeal to physician practices because they are very easy to acquire, by downloading them from the Web; they also have lower acquisition and maintenance costs. The flexibility and innovative potential of open source EMRs are greater than with proprietary software due to their modular structure and the ability to modify the source code.

These attributes allow the practice to more easily customize the open source EMR for unique needs instead of asking and waiting for a proprietary vendor to do so. These code customization abilities, as well as other components such as templates, have proven to be a great benefit to open source implementers. Many of the open source adopters are actively sharing the templates they have developed. Interestingly enough, because these templates are released as open source, not only are the adopters of the open source solutions downloading and installing these templates, but also it turns out that even adopters of proprietary solutions are doing the same.

Furthermore, open source EMRs lend themselves more readily to interoperability; may actually decrease barriers to interoperability; offer increased quality of product, development, or support issues; and protect the practice from other vendor failures including product terminations.

## Disadvantages

As we have seen, open source solutions have some distinct advantages, but they may present risk for the physician practice.

One of the great challenges to open source solutions can be described as “look and feel.” Open source developers, many of whom are physicians, usually focus on technical capabilities and functionality. Most open source solutions are generally not aesthetically pleasing. Fancy icons and buttons, beautiful fonts, and splashes of color are not generally a priority for open source developers.

Comparing solutions side by side, a prospective user may pick a proprietary solution over an open source solution with greater functionality and capabilities simply because of the visual aesthetics of the

proprietary solution. This is an issue that is being resolved, as open source solutions are more widely deployed and commercial open source companies are developing better graphic images with which to differentiate themselves. However, it may be awhile before they can match the aesthetics of some of the proprietary solutions. Conversely, it should be noted that some of the proprietary EMRs are hard to use because they require navigating through multiple screens to enter data, making the process time-consuming.

Changes to open source EMR software require expertise with the product, the programming language, and the steps to incorporate changes. Because it is difficult to self-manage open source software, especially for small practices, you typically will need a technical consultant with expertise in implementation, training, and ongoing support of open source solutions.

Physicians who lack experience and knowledge about open source software may not be able to afford or want to spend time becoming familiar and comfortable with the concept. Such familiarity is helpful for the practice to take full advantage of the flexibility of the software.

Without a vendor acting as a fiduciary agent for their product, there may be liability issues that emerge with the use of open source software.

Despite the flexibility of open source EMRs, there are some technical limitations to open source solutions. While some open source EMRs, such as VistA, have a full set of features, other products lack fully featured e-prescribing or lab ordering capabilities, do not have strong decision support capabilities, and rely heavily on free text entry that is not linked to coded clinical data that can aid in quality reporting.

How quickly these technical gaps close in the future depends on the persistence of knowledgeable developers and how much effort is applied to open source solutions development.

## Barriers

Oddly enough, low cost is one of the great barriers to open source adoption in health care in two ways. First, as the revenues for open source projects are substantially lower, there is considerably less money to invest in advertising and promotion. Users usually find open source solutions through word-of-mouth or Internet searches as opposed to advertisements in magazines or exhibits in trade shows. Second, the unfounded perception is that because open source solutions are so “inexpensive” compared with proprietary solutions, they cannot possibly be as good.

Proprietary software itself is the largest barrier to open source prevalence, as the idea of sharing and changing a product conflicts with the traditional business model. In the health care arena, it may require considerable political support to manage the opposition by several major health care stakeholders before the open source approach will be able to gain a foothold. Open source continues to be a little fish in the large pond of health care EMRs, and proprietary vendors have no incentives to promote an ease of transfer to another vendor’s product.

An additional barrier to open source EMRs is the difficulty in establishing trust in the physician marketplace. Open source solutions are not as well known as proprietary ones, and currently, there are a limited number of vendors who provide installation and support and a limited number of knowledgeable developers.

Sometimes the open source community can be its own worst enemy. Disagreements among community members may lead to what is called a “fork” in the code. The very nature of open source allows developers who disagree with the way a project is going to take the code and start a new version with a different name.

Exploring concerns about privacy and security is important, even though there is no evidence that open source software is any more or less secure than proprietary software.

And finally, to establish a critical mass of open source within health care, the medical community must be enlightened on open source issues such as licensing, needed technical perspective, software limitations, and marketplace hindrances.

**Table 2**  
**Summary of Open Source Advantages and Disadvantages**

Advantages	Disadvantages
Low-cost software	Higher physician involvement and potential risk if self-deployed
Flexibility with customization	Limited decision support features
Data accessibility and portability through interoperability	Increased liability if self-deployed
Avoid vendor lock-in through customer ownership	Lacks quality reporting capabilities

## Certification Issues

Open source software has to comply with the same kind of certification requirements as proprietary software, with some modifications to account for the development model. By its nature, the community-based open source technology is constantly evolving, which makes it difficult to certify using the same methodology as with proprietary standards. By definition, “proprietary software” is developed behind closed doors by the vendor. There is no mandated schedule for upgrades and product releases.

Thus, in contrast to proprietary solutions, the rapid evolution of open source EMR solutions would require that the open source product be frequently recertified — currently a very expensive and daunting proposition. In addition to vendor certification, the fact that the users can modify the software presents its own challenges.

To address these challenges, the [Certification Commission for Health Information Technology](#) (CCHIT) developed several new options for certification in early 2009. One of those options, CCHIT-S, provides a path for CCHIT certification of individual sites instead of a product. This allows sites who use self-developed EMRs, including open source solutions, to be CCHIT certified.

## Evaluating Open Source for Your Practice

One of the challenges to adopting open source in health care is that currently there is no central Web site or location where you can find information about all available solutions; but there are several good starting points.

The most comprehensive and detailed study of open source software in health care was conducted by the [California Healthcare Foundation](#). Its report identified numerous active open source EMR projects in the United States and internationally as defined by (1) providing software that manages patient-specific clinical information, and (2) providing at least some of the software under an open source license.

Currently, the most notable open source EMR project in the United States, the Department of Veterans Affairs’ release of VistA Office EHR, is a version of the Veterans Affairs Hospital records system that has been adapted for use in small- and medium-size medical practices.

As noted earlier, [Open Health Tools](#) is a site worth visiting, though it focuses on projects, not software packages per se.

For those interested in VistA or RPMS, there are three major sites to visit: [www.Medsphere.org](http://www.Medsphere.org), [www.WorldVistA.org](http://www.WorldVistA.org), and [www.vxVistA.org](http://www.vxVistA.org). While the first two sites are fully active and operational, [www.vxVistA.org](http://www.vxVistA.org) is under construction and should be up September 2009.

As previously stated, open source software is freely available for anyone interested in downloading the product. However, just like installing commercial software, users must abide by the same operational considerations, such as the costs associated with installation, maintenance, upgrades, and training. In the long run, open source savings may be substantial, as the user is not paying for costs such as marketing and technical support. This approach might be right for your practice if you are willing to work with software that is not backed by a large company offering consistent technical support. An increasing number of commercial entities, however, are offering commercial support for open source software. Look for these items when evaluating open source software:

- A good application
- A robust, active community
  - Multiple developers actively advancing the product
  - Thousands or tens of thousands of users
  - Active support discussions
  - Good online documentation
- Commercial support\*
- Companies providing professional implementation, support, maintenance, documentation, and training services

*\* Even if the practice will perform its own implementation, the very existence of commercial entities supporting the product is a good indication that it is a mature and full-featured open source product.*

The software is typically downloaded through a Web site, and the license that comes with the product must be accepted prior to completing the download. The software often will only be available to be installed on a single computer. If you are considering open source for your practice's EMR solution, consider what support and services accompany the license when completing your due diligence and research. Also consider how you will adapt the software to fit the needs of your practice. Perhaps you will need to hire a professional programmer to make the needed changes.

With the recent ARRA legislation, there will be continued study of the availability, cost, and capacity for interoperability of open source systems. Open source solutions show great potential for successful use in the health care industry to improve patient care. Spurred by a sense of urgency to adopt HIT, health leaders are showing a renewed interest in open source solutions. At the same time, the community of open source supporters is becoming more energized, prepared to take advantage of a critical mass to tip the scales toward widespread utilization.

### Chapter References

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