

Open Source Medical Software

by Vinod Kurup, MD
<http://www.kurup.com>

Improving the communication of patient information is the key to improving healthcare quality and efficiency. In most health care organizations, written records are the main conduit of this information, yet they are notoriously illegible and difficult to browse. Reviewing past problems and past interventions is time-consuming, if not impossible. The record is used mostly as a one-way device for the clinician to record data. It is used much less efficiently to provide important data or reminders back to the clinician. This leads to redundant testing and treatment, as well as to critical data being overlooked. Multiple providers and administrative departments need access to patient information, yet the paper record can only be in one place at a time. As a comprehensive storehouse of patient information, the paper record is obsolete.

The electronic medical record (EMR) is an important weapon in the fight against healthcare inefficiency. EMRs are software programs that allow the clinician to record patient information. They are usually tied in with other ancillary services such as pathology, laboratory, pharmacy and radiology to provide a comprehensive view of a patient's condition. EMRs have several advantages over written records. Records can easily be searched for pertinent information leading to less duplication of testing and treatment. The record can be programmed to notify the clinician of drug interactions, abnormal lab results as well as routine preventive health recommendations for which the patient is eligible. This decreases medical errors and improves quality. Decreasing errors will, in turn, decrease malpractice costs. EMRs can recognize missed appointments and automatically send letters to the patient reminding them to reschedule. Computers can handle the routine, repetitive aspects of patient care that they do best, allowing the clinician to concentrate on the care of the patient. EMRs can be programmed to translate clinician diagnostic information and documentation into insurer-required diagnosis and billing codes, which makes billing and reporting more accurate and efficient. EMRs can include access to medical references, thus allowing the clinician to apply new knowledge immediately. EMRs have the potential to improve communication between patients, providers and consultants. All three groups can have access to the record at the same time. Properly done, clinicians in different geographic areas and using different computer systems can access and update a patient's record. Finally, EMRs also promise to improve the security and confidentiality of patient information. Paper records can be inspected by any number of people while in transit. EMRs will only let individuals with proper credentials view patient information and different parts of the record can be guarded with different levels of security.

Most EMR software packages are proprietary. The source code is controlled by the vendor and there are restrictions on the use and distribution of the software. As an example, Microsoft Word is a proprietary program. The source code is not available. Users must purchase a copy of the program and use it on only one computer. They are not allowed to copy or redistribute the program and there is no way for them to make changes to the way the program runs.

Proprietary software is not a good solution for the healthcare industry. The software is expensive, often prohibitively so for small clinician groups or for those in developing countries. The software is complex and doesn't meet the clinician's needs. This is due to the fact that clinicians are often not involved in the EMR development process. While the software may be developed in conjunction with advice from a few clinicians, users in the field have little ability to provide feedback or direction to developers. Proprietary software packages often address only one problem in the healthcare arena, such as recordkeeping, billing, transcription, scheduling or medical reference. Unfortunately, since each application is built by a different vendor, there is no communication between applications, thus reducing their overall benefit. There is no incentive for an EMR vendor to allow their application to communicate with another vendor's billing application, for example, because it would reduce their profit potential if they were ever to develop a competing billing application. This leads to the problem of vendor lock-in. Once a healthcare organization implements an EMR, it becomes very difficult to make a change. The vendor can essentially hold the organization hostage to their pricing decision because the organization's patient data is tied up in the current system. This especially becomes a problem when the organization requests that problems be fixed or features be added. They are at the mercy of the vendor who may be slow to fix problems which don't affect their larger customers, or to introduce features which won't be widely demanded. Unfortunately, in the healthcare space, one size does not fit all. If the vendor ever goes out of business or changes their focus, then the organization faces an expensive migration. In addition, many current EMRs run on Windows which has poor reliability and security records in comparison to Linux and UNIX. For all these reasons, using proprietary software is a poor solution for healthcare.

The alternative is Open Source Software (OSS). OSS is free. Free, in this definition, means liberty, not necessarily price. While OSS may have a price tag, the user always has complete liberty to do with the code as they wish, including redistributing it for a charge or no charge. Users have complete access to the source code which defines the behavior of the software. They have the liberty to change the code to

suit their purposes. There are various open source licenses (GPL, BSD) which each have their own various stipulations.

The most visible example of OSS is Linux, an operating system which competes with Microsoft Windows. Apache, the most common web server in use, and Openoffice, a suite of applications similar to Microsoft Office, are 2 other successful examples. Anyone is free to download these software programs, change them and redistribute them, if desired. The strength of these programs come when users make changes to fix problems or add features and then return those changes back to the original developers.

David Wheeler has done an amazingly comprehensive analysis of OSS and concludes:

OSS/FS (Open Source Software / Free Software) has significant market share in many markets, is often the most reliable software, and in many cases has the best performance. OSS/FS scales, both in problem size and project size. OSS/FS software often has far better security, particularly when compared to Windows. Total cost of ownership for OSS/FS is often far less than proprietary software, particularly as the number of platforms increases. These statements are not merely opinions; these effects can be shown *quantitatively*, using a wide variety of measures. This doesn't even consider other issues that are hard to measure, such as freedom from control by a single source, freedom from licensing management (with its accompanying risk of audit and litigation), and increased flexibility.

OSS also lowers the cost for vendors who support it. When proprietary vendors create a product, they start with an empty slate, often rebuilding many pieces that have been built by other vendors. OSS vendors start with an established code base, saving time and money. Their final work then gets returned to the community, thus improving the base at which other vendors start. There is much less reinvention and correspondingly more room for innovation. Users are empowered with OSS. Since they have full access to the source code, they are able to fix problems that are important to them. Alternatively, they can hire outside developers to fix problems. There's no need to rely on the original developers, so if the original developers ever leave the project or "go out of business", the consumer can simply hire another team. The code is theirs. In 1999, Medicallogic introduced an internet-based medical record called LogicianInternet. Physicians took advantage of this system to keep an EMR which was

housed on Medicallogic's computers. When Medicallogic was sold to GE Medical Systems, GE decided to discontinue the program. All the physicians now have to print out their patient records and switch back to paper records, or re-enter all the patient information into a new EMR which they must purchase and install. If the application had been open source, the users could continue to use it, hiring new developers as needed to keep it updated. Arsdigita was a company which specialized in building community-centered websites and they released their code as open source. As the dot-com economy recessed, they were forced to change focus and were eventually bought out by another company. If they had not released their code, all the users of their system would have been forced to live with the program as it was, without updates or enhancements. Alternatively, they would have had to migrate to another system, which would be expensive. Instead, a community grew around the software, called OpenACS (<http://www.openacs.org>). This community has taken the software and improved it. Arsdigita's customers benefit because, unlike Medicallogic's customers, they can continue to use and customize their software. In addition, since the OpenACS community has flourished, former Arsdigita customers can find developers through OpenACS to fix problems and customize their software.

OSS is especially relevant in the medical arena. The medical community is known to value academic freedom. Researchers regularly publish their findings and if an intervention improves patient care, it makes sense that it should be spread as widely as possible. The same should be true of software which improves patient care. Proprietary software is also more risky in the healthcare arena since medical software companies are, as a rule, small outfits and are more prone to failure as a business. The reasons small companies abound in the current arena is because medical practices vary widely in their sizes, characteristics and needs and their problems can not be solved with one homogenous solution. Yet they still need to be able to communicate with other heterogenous systems and legacy systems need to be interfaced, not thrown away. OSS is an ideal method to develop conduits which translate between proprietary software programs, if not to replace them completely. In addition, OSS is a natural fit for international collaboration due to the lack of intellectual property issues and the need for customization of software for local needs. Healthcare organizations in other countries will feel more secure having control over the source code, rather than relinquishing such control to vendors who may be in other countries and subject to different regulations. Overall, OSS will lead to software that improves the clinician's ability to function and improves patient care.

There are numerous vibrant OSS healthcare projects in existence and I encourage readers to follow the URLs to their websites for more information: (See attached list)

How can you get involved? It's easy to make a difference in the Open Source world. All it takes is personal interest, diligence and a willingness to learn. Competence is rewarded. Try out the software. See how it works and how it breaks. Report difficulties that you have or features that you'd like to see. Be aware that developers are sometimes working on their own free time, so be courteous and patient. Take the time to read documentation and follow the discussions before jumping in. Offer to help out where you can. Keep notes about your experiences. These notes can help other new users and help developers improve the program. Non-programmers can help by submitting problem reports, writing documentation, and assisting developers with domain advice. Most importantly, promote open standards and open discussions among those around you. OSS software is the best approach to building software that will solve real healthcare problems.

References

Bray B. *Keynote speech at the Inauguration of the Openkaart Initiative*. 9/26/2001

Bruegger BP, Dal Molin J. *Open Source – Open Content – A Perfect Match for Sustainable Development*. PowerPoint Slideshow

Carnall D. *Open Source Software in Healthcare* <http://www.carnall.demon.co.uk/OpSrcHth.htm>

Carnall D. *Vital Signs*. LinuxUser. October 2001 http://www.linuxuser.co.uk/articles/issue15/lu15-Real_Life_Linux-Vital_signs.pdf

Carnall D. *Healthy Outlook*. LinuxUser. July/August 2000 http://www.linuxuser.co.uk/articles/issue2/lu2-Real_Life_Linux-Healthy_Outlook.pdf

Carnall D. *Medical software's free future*. BMJ 2000; 321:976.

Cook B. *Wipeout: Lessons on protecting Web-based EMR data*. AMNews. 8/19/2002. http://www.ama-assn.org/sci-pubs/amnews/pick_02/bisa0819.htm

Johnson DL. *Open Source Medical Information Management*. <http://lorenzo.uwstout.edu/QQMIM/qg4.html>

Johnson DL. *Medical Enterprises and Open Source*. <http://amygdala.danlj.org/~danlj/OpenSource/MedicalEnterprise.html>

O'Reilly T. *Ten Myths about Open Source Software*. http://opensource.oreilly.com/news/myths_1199.html

Wheeler DA. *Why Open Source Software / Free Software (OSS/FS)? Look at the numbers!* http://www.dwheeler.com/oss_fs_why.html

Links

General Medical Informatics:

- Handbook of Medical Informatics. <http://www.mihandbook.stanford.edu/handbook/home.htm>
- International Medical Informatics Association <http://www.imia.org>
- American Medical Informatics Association <http://www.amia.org>

General Open Source:

- Open Source Initiative: <http://www.opensource.org>
- Free Software Foundation: <http://www.fsf.org>
- The Cathedral and the Bazaar <http://www.tuxedo.org/~esr/writings/cathedral-bazaar>
- Why Open Source Software? http://www.dwheeler.com/oss_fs_why.html

Open Source Medical Projects:

- An up-to-date list of projects is maintained here: http://www.linuxmednews.com/linuxmednews/LMNProjects/Projects/folder_contents
- VISTA – Veteran Administrations comprehensive healthcare software <http://www.hardhats.org>
- GEHR (Good Electronic Health Record) <http://www.gehr.org>
- OIO (Open Infrastructure for Outcomes) <http://www.txoutcome.org>
- OpenEMed- <http://www.openemed.org>

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