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### A New Application for Improving EP Lab Operations: Experience at the University of California, San Diego Medical Center

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The implementation of electronic medical records (EMR) or electronic health records (EHR) systems in hospitals and medical offices has become a major priority in the last few years. This is due in part to governmental mandates that will require such systems in the next few years, in part as a legitimate means of improving access to medical information by medical care personnel, and in part as a means of improving operational efficiency and quality of patient care.

Appropriately designed EMR or EHR systems will allow medical personnel the capability to more easily research patient medical information, on a broader scale, while still maintaining confidentiality, in order to identify new or existing treatment modalities that may be more medically effective, safer, or more cost effective.

The CardioSure® Application Suite (Perminova, Inc., San Diego, CA) was developed and implemented in conjunction with the University of California, San Diego (UCSD) Medical Center EP Program as its initial test site, to manage ongoing operations in our EP program. This includes patient, staff and procedure scheduling, pre-operative evaluation, intra-operative care including procedural and nursing documentation, charge capture and billing, electrophysiologic data capture and documentation, automated physician reporting to eliminate dictation and transcription, and more.

Unlike conventional enterprise healthcare solutions, the CardioSure® application was implemented in our EP program in just six weeks. This technology offers the UC San Diego EP Program enhanced productivity and performance by moving to an innovative new electronic workflow that improves access to patient information and overall patient care. In addition, CardioSure has met our EP program's requirements to integrate with legacy systems in order for UC San Diego Medical Center to optimize its previous technology investments. This is part of the hospital's effort to achieve government-mandated meaningful use by implementing an effective EHR system.

#### Use of the Application at UCSD

After being referred by outside physicians or by our own faculty to UCSD Medical Center for an EP-related procedure (i.e., device implantation, device testing, EP study, or ablation), our office administrative staff enter the pertinent procedural information into the CardioSure® application scheduling module, which automatically receives patient demographic information from the hospital's EMR system. This information may include (Figure 1):

- the date, time and location of the pre-operative anesthesia evaluation (at which time the staff may also request an ancillary testing such as a pre-operative cardiac CT scan or transesophageal echocardiogram);
- the date, time and location of the admission to the pre-operative evaluation suite where an interim evaluation, peripheral intravenous access, vital sign documentation, ECG and consent may be obtained;
- the date, time and location (EP lab, catheterization lab, or operating room) where the procedure is to be performed;
- the specific procedures to be performed;
- the specific equipment that will be required to perform the procedure; and
- the staff and faculty who will be performing the procedure.

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Since this information is available via the web to all staff and faculty, at any time and any place, the use of the CardioSure® Application Suite for scheduling has greatly improved the consistency and efficiency of our operations as it pertains to patient care and work flow prior to the actual procedure. This is exemplified by the comments of key staff. "To make scheduling and tracking procedures simpler, we need visibility into active cases across both of our UC San Diego Medical Center hospitals, where there are multiple physicians and staff members needing concurrent access to information from various locations," said Lisa Baer, RN, BSN, CCRN, Nurse Manager for Cardiovascular Catheterization and Electrophysiology Labs at UCSD Medical Center.

Patients at UCSD Medical Center report to the pre-operative admissions area several hours prior to their scheduled procedures, where their arrival time, history, and physical examination, including initial vital signs, are documented in the CardioSure® Application Suite. The patient is then brought to the EP or catheterization laboratory for their procedure, where again their arrival time and vital signs are documented immediately. The CardioSure® application is then used to enter all subsequent procedure-related data, such as (Figure 2):

- vascular access sites
- drug administration (e.g., time, route, amount, etc.)
- anticoagulation status (e.g., time and value of ACTs)
- electrophysiologic study data (e.g., intervals, refractory periods, arrhythmia mechanisms, methods of induction, etc.)
- mapping data (e.g., equipment used, arrhythmia mechanism, activation or pace mapping observations, entrainment results, etc.)
- ablation data (e.g., ablation sites, number of ablations, power, temperature, results, etc.)
- device implant data (e.g., device models, serial numbers, lead measurement data, defibrillation threshold testing data, etc.)
- billing data (e.g., hospital and professional fee codes).

Upon completion of the procedure, the time of which is noted, all the aforementioned data can be automatically imported into a physician-selected template related to the procedure type and arrhythmia diagnosis, and an operative report can be generated in PDF format. This report can then be electronically signed and uploaded immediately to the hospital EHR as part of the patient's permanent medical record, obviating the need for the physician to dictate an operative report and subsequently edit the transcription. In addition, a procedure note is generated automatically, including all nursing notes, administered drugs, vital signs, etc. that can be sent to the hospital EHR as part of the permanent medical record. Lastly, a billing report, including all the hospital and professional fee billing codes, are generated automatically and can be forwarded as a PDF to the hospital and medical group billing offices or via a standardized electronic billing message that can be sent directly into the facility's billing application. Electronic generation of these reports has improved our efficiency and accuracy, saved staff and physician time, and eliminated our use of paper copies.

Overall, the implementation of the CardioSure® application at UCSD Medical Center has had a very positive impact on our EP program. Such solutions help us to enhance our focus on patient safety and improve the quality of patient care, allowing UCSD Medical Center to blaze the trail and take another successful step toward a fully integrated EMR.

An additional value of implementing an EMR system such as CardioSure is its potential role in research. The CardioSure® application, by storing extensive data on all patients treated, at either single or multiple institutions using this system, will allow the physician/scientist access to a much greater number of patients' data, potentially across multiple hospital systems, in order to provide the power needed to make conclusions regarding the efficacy, safety and cost effectiveness of different treatments for specific conditions. At present, this is typically done by centrally pooling data from multicenter trials, which is often difficult and costly. However, innovative medical solutions offered by this type of information management system will facilitate collaborative research between and among healthcare professionals.

### Conclusion

In summary, improvements offered to our EP program through the CardioSure® Application Suite have included ease of scheduling and case tracking, enhanced charge capture for supplies and procedure billing, advanced data abstraction and auditing capabilities, standardized documentation, reduced cost and footprint with removal of paper-based procedures, specialty-specific workflow, and compliance with the Health Insurance Portability and Accountability Act (HIPAA) guidelines. Thus, the CardioSure® Application Suite provides the only flexible, comprehensive, web-based system for management of cardiac arrhythmia patients, as most enterprise or legacy EHR/EMR systems do not provide a similar low-cost alternative to hospitals for the electrophysiology lab.

Future enhancements that are currently in development or planned include automatic data feed via an HL7 interface to the CardioSure® application from various types of monitoring equipment in the EP labs, including importation of anesthesia monitoring data, vital sign data, electrophysiologic data from our EP recording systems, mapping data from our EP mapping systems, and ultrasound and fluoroscopy images from our intracardiac ultrasound and x-ray systems. We hope these enhancements will further improve efficiency and efficacy of patient care for the UCSD Medical Center EP Program.

*Disclosures: Robert Cass, RN is the President and CEO of Perminova, Inc. Gregory K. Feld, MD is the Chief Medical Officer of Perminova, Inc.*

Editor's Note: This article underwent peer review by one or more members of EP Lab Digest's editorial board.

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