

## **Surface Scraping of Intraoperative Hemodynamic Data for the Acquisition and Storage From Epic Electronic Medical Records (EMR)**

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**Introduction:** Since the enactment of The American Recovery and Reinvestment Act of 2009, Electronic Medical Records (EMR) have been broadly implemented in hospitals. It is often difficult to acquire and download hemodynamic data into database, spreadsheet and statistical software packages without the allocation of IT resources and financial expenditures. With these constraints in mind, our group has endeavored to access and digitize hemodynamic information from native clinical reports and save it in a spreadsheet format that can then be easily imported into statistical software packages. Such data could then be used to support research and Quality Improvement (QI) endeavors.

**Methods:** After IRB approval, the charts of 1,066 patients, who underwent spine surgery at our Hospital, from January 1, 2016 to June 30, 2018, were reviewed. A version of APACHE, MySQL server, and phpMyAdmin (PHP) were installed on a personal computer running Microsoft Windows 10. A set of hemodynamic criteria were enumerated by our team to be extracted from these anesthesia records. In total, 6 parameters were identified for extraction (heart rate, systolic blood pressure, mean arterial pressure, diastolic blood pressure, end-tidal carbon dioxide and temperature). When applicable, arterial-line blood pressure readings (systolic arterial-line blood pressure, mean arterial-line blood pressure, diastolic arterial-line blood pressure) were also extracted. Each clinical report was copied using two sets of two keystroke commands and pasted into Microsoft Word 2010. A small sample of 100 charts were chosen and examined for characters that demarcate the boundaries (loci) of hemodynamic data to be extracted. A program was developed in PHP to identify these loci and to extract the hemodynamic data between them. When the loci failed to identify the demarcation of data, the clinical report was re-examined and conditional statements were added to the original PHP function. Conditional statements were added to identify hand-entered hemodynamic parameters, and these were marked with an asterisk. For each group of clinical datasets, SQL statements were written in PHP to import these data points into five related tables in MySQL server using SQL procedural language.

**Results:** Once a stable version of the PHP scraping program was finalized, the native clinical anesthesia reports of 1,066 patients were analyzed. The program proved to be very accurate in extracting data and placing it into the MySQL tables. 1,066 patient records were analyzed with accuracy of 100%.

**Conclusion:** Our data scraping program has proven to be extremely successful in extracting hemodynamic data from a preexisting report form and placing it in a retrievable database system. The advantages of this frontend approach to data acquisition are, it: 1) is extremely inexpensive; 2) uses minimal resources; 3) data acquisition and storage is rapid; 4) it does not require hospital or departmental-based IT support; 5) the data output can be readily accessed with simple SQL commands or through a project driven dashboard; 6) can be completely isolated from the Internet or hospital networks to prevent breach of Health Care Information; and 7) it can be easily imported into spreadsheet and statistical packages. We feel that this technique of surface scraping of preexisting reports for hemodynamic data is a model which will facilitate research and QI endeavors in small to medium-sized anesthesia departments.