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| **Project Title:** Electronic Pre-Operative Anesthetic Plan (EPAP) | |
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| **Project Background:** *The Electronic Pre-Operative Anesthetic Plan (EPAP), currently a proof-of-concept in Microsoft Excel, is a proposed smartphone (Android, iPhone) program that is* designed for anesthesia healthcare professionals, technologists and pharmacists that work in an operating room (OR) setting. The program addresses four themes within the perioperative workflow:  - Communication: There is no day-before-surgery communication system between anesthesia providers and other end-users (i.e. technicians, pharmacists)  - Efficiency: No day-before ordering system for materials and medications delays anesthesia ready time on day of surgery and leads to costly waste of unused products, inadequate provision of high-demand equipment and resultant case delays.  - Standardization: Anesthetic plans for complex patients are disconnected from medical history, which can be housed in many different locations within the patient’s electronic health record (EHR). There is no standard electronic tool for the healthcare provider to formulate one’s plan, and the majority of anesthetic plans are written or memorized. As a result, anesthesia plans are lacking anticipatory steps during pre-operative preparation.  - Accuracy: Manual calculation of weight-based dosing, especially in the pediatric population, is time-costly and error-prone, especially in the setting of rushed turnovers. | |
| **Project Objective(s):**   * Extract information items relevant to the patient’s demographics and medical history patient’s anesthetic workup from the EHR and provide a concise display within the proposed application. * Develop an electronic ordering system, characterized by drop-down selectable menus, that address each tenet of a typical anesthetic plan. This is to be used the day BEFORE surgery, but can be modified on the day OF surgery. Further development goals include using voice-activated text input or item selection to decrease the amount of time spent with each individual pre-operative plan. * Develop an interface to receive and display information for each for anesthesia technicians and pharmacy to receive these electronic orders ahead of time. | |
| **Description of the Solution:**   1. Enable [FHIR](https://www.hl7.org/fhir/overview.html)-mediated integration with the electronic medical record in a number of ways, including pre-population of patient specific information such as age, height/weight/BMI, estimated creatinine clearance, serum potassium and other anesthetically relevant information. 2. Create a demo version of the electronic ordering sheet, which includes drop-down menus that fall under major categories pertinent to the anesthetic plan (see attachment)    1. Menu content (e.g. specific supplies or medications) will be supplied to the programming team. It should be noted that many institutions may not have specific supplies or tools, and some practices may have items not supplied on the original content list. Thus, preparations should be made to routinely update or add menu content, which will be downloadable by the end-user as part of routine updates or as a separate “pack.”    2. After all content is selected, the user is presented with buttons   “Save” – the user can save the plan, with menu items already selected, under a file name, and re-open this file at any later time. The file name should not include protected health information (PHI)  “Share” – the user can share the file (saved draft or finalized plan) via their smartphone’s native e-mail program. Future iterations will include “user id/password” access to facilitate sharing within a practice group, as well as for providers to “take over” the anesthesia plan and subsequent anesthetic care for the patient.  “Submit” – executive function which introduces the individual plan to queue for anesthesia technicians and pharmacists (see #3)   * 1. Future iterations will include pre-populated anesthetic plans or “order sets” for specific procedure categories. This will facilitate anesthetic plan preparation and decrease the burden of selecting individual menu items (which can be upwards of 30 clicks of separate menus for each patient)   2. Language: English (initial demo version)   3. Statement about Survalytics - Survalytics is an open-source solution for the collection of survey responses as well as arbitrary analytic metadata from users of Android operating system apps. Surveys may be administered in any combination of one-time questions and ongoing questions. The module may be deployed as a stand-alone app for experience sampling purposes or as an add-on to existing apps. The module takes advantage of free-tier NoSQL cloud database management offered by the Amazon Web Services DynamoDB platform to package a secure, flexible, extensible data collection module. DynamoDB is capable of Health Insurance Portability and Accountability Act compliant storage of personal health information.  1. Develop a display interface for pharmacist and technician end-users that employs a simple display of day-of-surgery (DOS) cases organized by OR. This includes 2. Real-time whiteboard display (i.e. LCD monitor) of all cases in a central area (i.e. anesthesia workroom, central OR pharmacy) 3. Color-coding of cases based on their status (i.e. patient not arrived, in pre-op, ready for OR, in OR, case ending/announced, in PACU) 4. Similar to 2b, anesthesia technicians can establish and use a “user id/password” to receive and track OR assignments on their smartphones, and trade or “take over” the responsibilities of another anesthesia technician. | |
| **Desired Student Skills/Background:**  Java (the app is currently written in Android Java), C#/Xamarin (the codebase needs to be ported to the cross-platform Xamarin framework), User Interface and Experience, Healthcare/Medicine, HIPAA, Amazon Web Services, Basic Database/SQL | |
| **Data Requirements and Potential Sources:**  **EHR** | |
| **Other Comments:**  Consultation with colleagues at different academic medical centers reveals similar deficiencies in pre-operative preparation and and perceptions of inefficiencies with day-of-surgery patient care tasks. Previous studies have evaluated the wastage of intravenous drugs and other materials at single centers, and induction agents and endotracheal tubes (ETT) characterized the most commonly wasted items (CITE). However, no study to date has evaluated the utility of an ordering  While there are a plethora of studies focusing on pre-operative checklists to enhance preparation and communication, no versatile tool to streamlining ordering and item prioritization. | |



