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BRIEF REPORT

Building personalized spreadsheet database for surgical training: brief report

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Data collection and documentation of clinical experiences are challenging tasks faced by training institutions, since they directly impact patient care and patient outcomes. Data collection allows a trainee (i.e., resident- or fellow-in-training) to store and analyze important information that may be used in the future for performance assessment or research. Documentation of training experience—especially documenting clinical and surgical cases—is an essential task of every trainee, and the output may be useful in tracking or evaluating training progress and future reporting.

Databases are created in order to organize data to make them readily-available and easy-to-use.[1] Training institutions should have a reliable database that is reproducible, sustainable, accessible and customizable. Surgeons, in particular, should have a well structured surgical database that is capable of answering a wide array of questions in research and from which they can draw epidemiological, technical, and life quality conclusions.[2]

The existing practice of recordkeeping in the Section of Pediatric Surgery in Southern Philippines Medical Center (SPMC) involves initial logging of patient demographic profile, date of admission, date of surgery, date of discharge, preoperative and postoperative diagnoses, intraoperative findings, disposition at discharge, and histopathology report. All these data are manually recorded in the logbooks, and are subsequently encoded into a spreadsheet (Excel file) in our pediatric surgery office computer. For the more detailed patient data, i.e., patient history, surgical technique reports, patient charts are filled during the entire admission, and are submitted to the medical records section for filing a day after patient discharge. These tasks are done by the residents/fellows-in-training, and the data is used during daily morning endorsements. The hospital's medical records section encodes the patient's personal information, as well as the initial and final diagnoses, and translates these diagnoses into ICD-10 codes that are stored in the hospital registry for periodic census reports. The paper-based medical charts of surgical patients are also stored in the medical records section and are archived in sections that make them supposedly readily available and easily retrievable. However, residents do not have an organized way for filing patients' intraoperative and diagnostic imaging photos. These photos, which are usually used for presentations or case reports, are often stored within residents' personal cellular phones.

This system of recordkeeping is laborious and time-consuming, and therefore inefficient. For example, when a trainee presents a patient's case during a conference, it is necessary to review the patient's chart, which would entail a visit to the hospital's medical records section. Charts of recent surgeries done by the department would be retrieved easily. However, old charts, i.e., dating several years to a decade, would be difficult to find and recover. Also, when postoperative patients consult their surgeon in the outpatient department, it would be difficult to recall the consulting patient among many similar procedures. Going to the medical records for chart retrieval at that point, in order to review the consulting case, would be impractical. Another example would be when the need to produce a census or data on the number of cases of a particular surgical condition arises. Manual retrieval and screening of the charts in the medical records section would be necessary in order to produce an updated and organized data count for this type of information. With the current practice, retrieval of patient data is slow, photos stored on personal devices are lost in time, department census presentation becomes taxing for the residents, and research interests are often not materialized and disregarded.

We developed a customized electronic, pocketable database for specific use by the Pediatric Surgery Fellowship Training in SPMC. We designed the database to serve as a research tool, which will be able to answer research- and training-related questions using the pediatric surgery fellows' experiences in the surgical management of pediatric patients with congenital and acquired conditions.

We conducted this study under the Pediatric Surgery Section of Southern Philippines Medical Center from January 2020 to July 2020.

We used an Apple Ipad Pro 2018 as the main hardware and Apple Numbers Version 10.0 as the main software.[3]

We created a spreadsheet data template in Apple Numbers. We included data variables patterned from those of the Philippine Society of Pediatric Surgery (PSPS) Annual Report for Training, namely: patient's name, hospital number, birthdate, date of surgery, age, sex, admitting diagnosis, intraoperative findings, full procedure, procedure type, surgeon/s, clinical outcome, case category, admission classification (charity or pay), main surgeon (resident or consultant), consultant-on-deck, date admitted, operative technique form photo, intraoperative photos, diagnostic imaging photos, histopathologic findings, and discharge date.[4]

We then populated the spreadsheet with previous data of the Section of Pediatric Surgery, including those from the daily endorsement files in the last five years. Using Apple Numbers Form Maker, we designed an interactive data entry form that outputs directly into the spreadsheet. This allows new entries for succeeding case data. Entry of new data was performed solely by the fellow-in-training of pediatric surgery. New case data were added into the database either via the Apple Ipad or Apple cellular device, both having the same Apple Numbers interface. The spreadsheet database also allows entry of photos and diagnostic imaging into the input forms for future use.

Access to the database was restricted to the designated fellow-in-training of pediatric surgery. To improve the data retrieval process, basic spreadsheet formulas were entered into the database. This allowed automated computations and counting of census for reporting. Fellows-in-training no longer need to manually count each case data in mind as the database will automatically update itself each time a new case data is added.

The same spreadsheet formulas were used to allow quick retrieval and review of any specific patient surgical data in mind. This feature allows a resident, during online consultations, to review patients' surgical data even without access to their charts.

In terms of data security, the database is protected with a password. Since database access is restricted to the designated fellow-in-training, he/she is responsible for updating and extracting data, needed by consultants or other fellows-in-training, from the database.

However, patient case data, i.e., those information that were included in the usual practice of record keeping, still need to be recorded in the logbooks in order to comply with the requirement of the Philippne Board of Pediatric Surgery for our training program.

The outcomes for this study are data filtration, data retrieval, data computation, and statistical analysis of the patient data. The most valuable feature of the database is its ability to filter and retrieve data accordingly. Using the Apple Numbers "Category" and "Filter" features, the database can filter and display any information specified for a particular topic of interest by the user. For example, if one plans to investigate the ratio of male and female patients for a particular procedure or disease, the category feature can automatically display information on these variables. The filter feature may be set to display cases for a particular disease or procedure. The "Search" feature allows a user to input any fraction of a data variable of interest and automatically locates and display this variable.

The Apple Numbers spreadsheet also contains multiple "Formula" features. Using combinations of multiple formulas, we were able to create and integrate statistical tools such as Chi-square test and t-test into our database. At present, however, it is still limited to the comparison of up to 3 population means.

Since its implementation, the database has demonstrated several practical applications in our training program. It has been able to generate periodic census reports with case frequencies, and patient demography. We have been using the database to retrieve data for patient case reviews, to perform data analysis, to identify trends, and to recognize disease distribution patterns. With its ease of use and access, transferability, and shareability, this database is able to create an excellent platform to address research and training related issues accessed simultaneously across multiple electronic devices. This database becomes pocketable as it can function among Apple Cellular devices.

The database is used solely by the Section of Pediatric Surgery for training purposes. Since its creation, the database has been used for: 1) section audit and census; 2) patient

data retrieval and review for outpatient consultations, case presentations and morbidity and mortality conferences; 3) disease and procedure profiling; and 4) census pattern checking for possible research topics.

The database helped us manage our data, especially during this COVID-19 pandemic, where access to raw patient records is difficult. In the past, before the database was created, we had to check our department records and retrieve data from the medical records section in order to generate detailed census data. Recording of new data entries in the logbooks and in the section's computer was avoided in order to curb the spread of infection. With the use of the database, periodic updating, and monitoring of the number of surgical cases at a given time (i.e., weekly, monthly quarterly, and yearly) has ensured adequacy of cases that is used to monitor the department and trainee's progress to achieve the required target for training accreditation.

The database also allowed us to quickly review patient data with a fast browse on our mobile phones especially during teleconsultations and routine ward rounds. Pre-database, we had to retrieve the patient's chart from the medical records section in order to obtain the full surgical information of the patient. The database has provided easy retrieval of valuable patient-specific data that are used for case review or presentation. Patient records are retrieved by using matching identifiers such as name or hospital number. We simply input the patient's name and the database immediately displays the patient's complete surgical information and management.

The database is also able to demonstrate census patterns as well as demographic and clinical data of patients with a few clicks on the filter option of the database. Previously, this process requires a labor-intensive review of the logbooks and also entails retrieval of data from the medical records section.

The database also analyzes and presents data as they become readily available. Since the database is in a spreadsheet format, creating tables and charts became much easier and faster. It is able to analyze surgical cases and draw helpful information from our accumulated case experiences. It uses a combination of data calculation formulas to identify patterns and distributions. The database feature "Trend Finder" allows a user to select any disease entity or procedure of interest which automatically translates into yearly frequency plotted in a bar or line graph. This offers a convenient and quick way of determining frequency for a specific variable of interest (e.g. case incidence, ratio and proportions, percentages, means, and periodic differences).

The framework of this database was patterned with the same variables as the retrospectively collated data. But since this database is easily customizable, it allows users to incorporate new variables of interest into the data framework. This would then allow users to retrieve data that will be needed for future research. In order to determine the reliability of the database, comparison with raw data collected manually from the medical records may be done to support the validity of its usage. In time as technology progresses each year with faster mobile devices and updated softwares, so will the ability of the electronic spreadsheet database to improve.

This study focused on presenting our database construction process that may be replicated and customized depending on the need of the user. Despite its ease-of-use and access and its ability to organize, categorize, filter, and analyze data, techniques in the construction process still requires further improvement. The database presented was created to best fit the requirements of the training program of SPMC, Section of Pediatric Surgery. In the future, expansion of its implementation and practical usage will likely be effective if disease and procedure variables were assigned with ICD codes. This approach establishes uniformity across many users as well as improves further the data filter feature of the database.

The team plans to incorporate standard disease diagnostic and management algorithms into the database. By applying similar data recording schemes under a data framework focusing on patient history, physical findings, and work-up, we plan to provide future users with a tool that guides them in patient management. Following similar data category, data filter, and data computation formulas, we hope to add this feature and further improve the content reliability of our database.

Contributors

KPR, SCA, NMA, NFB and JMJ both had substantial contributions to the study design, and to the acquisition, analysis and interpretation of data. KPR wrote the original draft and subsequent revisions, and both authors reviewed, edited, and approved the final version of the manuscript. All authors agreed to be accountable for all aspects of the work.

Ethics approval

This study was reviewed and approved by the Department of Health XI Cluster Ethics Review Committee (DOH XI CERC reference P20052901).

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None declared

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