Database Plan

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Introduction

Team G of Walden University course 'Information and Knowledge Management' (NURS 6411) recently submitted Team Database Project Part I of III that was assigned by Professor and Dr. Anne Lara. This paper will serve as Part II of the Team Database Project and will include the steps for planning a relational database. Several clinical nursing questions relating to sepsis will be introduced, and one will be chosen to move forward with constructing a database that will answer the clinical question.

Sepsis

The Surviving Sepsis Campaign (SSC) was introduced in 2002 through collaboration between the Society of Critical Care Medicine, the European Society of Intensive Care Medicine, and the International Sepsis Forum (Osborn, Nguyen, & Rivers, 2005). Currently, new recommendations are being developed by the SSC (Donovan & Shimabukuro, 2015) in response to new evidence (Society of Critical Care Medicine, 2015). Sepsis (Neviere, Pathophysiology of Sepsis, 2015) is the leading cause of death of patients in the United States, and it is projected that over one million patients will die from sepsis annually by 2020 (Osborn, Nguyen, & Rivers, 2005). Several studies in the literature have identified that early recognition and treatment of sepsis influences morbidity, mortality, and lengths of stay in hospitals (Henry, Hager, Pronovost, & Saria, 2015). Electronic medical records (EMRs) have allowed healthcare organizations to include early

warning systems as a “Sepsis Alert” using real-time automated queries (LaRosa, Ahmad, Feinberg, Shah, DiBrienza, & Studer, 2012). A sepsis alert identifies systemic inflammatory response syndrome (SIRS) criteria, the precursor to sepsis when vital signs and laboratory values are entered in the patient’s EMR. It is used as a triage screening tool that helps determine a patient’s acuity and those requiring immediate interventions. Most patients with sepsis are identified when seeking treatment in an emergency department (ED); however, 50% of intensive care unit (ICU) patients are at high risk for sepsis (Neviere, 2015). SIRS criteria include:

1. Temperature > 100.4 F or <96.8 F
2. Heart Rate > 90 beats per minute
3. Respiratory Rate > 20 breaths per minute or PaCO2 < 32 mm Hg
4. WBC > 12,000 cells/mcL or < 4000 cells/mcL, or 10% bands

A patient meeting sepsis criteria includes having SIRS criteria and a source of infection. If the patient has an organ dysfunction, hypotension, or hypoperfusion, it is considered severe sepsis. Septic shock is diagnosed once the patient has lactic acidosis, or a systolic blood pressure < 90 mm Hg, or a drop of > 40 mm Hg. Once severe sepsis with hypotension is identified despite adequate fluid resuscitation, it is considered septic shock. Multiple organ dysfunction syndrome (MODS) is diagnosed once there is evidence of two or more organs failing (Medlej, 2016). MODS indicate the end point of sepsis; the majority of these patients die. One study concluded that one in five sepsis patients will be readmitted within 30 days (Donnelly, Hohmann, & Wang, 2015) and it is crucial for clinicians to recognize that sepsis and septic shock needs to be managed aggressively (Schmidt & Mandel, 2015) to prevent the progression to MODS.

Clinical Nursing Questions

Several clinical nursing questions relating to sepsis have been identified by these authors and were based on sepsis bundles (Kramer, Cooke, Liu, Miller III, & Iwashyna, 2015) and protocols

(Donovan & Shimabukuro, 2015) using quality metrics. Bundle effectiveness relies on supporting evidence and compliance with its execution (Khan & Divatia, 2010).

1. "What is the rate of intravenous antibiotics administration within one hour of a sepsis alert?
2. "What is the rate of blood culture draw prior to intravenous antibiotic administration in patients diagnosed with sepsis?"
3. "Which patients diagnosed with sepsis had a repeat serum lactate level of > 4.0 mmol/L?"
4. "What is the mortality rate of patients diagnosed with sepsis?"

Team G has chosen the fourth question as the output of the database project, "*What is the mortality rate of patients diagnosed with sepsis*." The early recognition of sepsis and the utilization of sepsis bundles significantly impacts survival rates and has been well documented in the literature. Team G chose this question to determine the effectiveness of sepsis alerts and the compliance with sepsis bundles among patients in the database. Additionally, this knowledge will help identify if any elements of the sepsis alert and sepsis bundle were excluded or delayed.

Data Elements

The identification of what data are needed and finding meaningful uses is crucial to the discovery process (Berger & Berger, 2004). Many of the data inputs will help determine the relation between early sepsis identification, compliance with the sepsis bundle, and patient outcome. The data elements used for this database are intended for EDs and fast track applications; intensive care, medical floors, and observation units were not considered in the design (American College of Emergency Physicians). These elements are not all inclusive or exhaustive, and the entity relational diagram is located in the Appendix.

Team G has chosen three entities PATIENT, PATIENT RECORD, and ED ENCOUNTER. Tables were created for each entity, and that describes each attribute assigned to that table. The PATIENT table has the attributes of medical record number (primary key), last name, first name, middle name, date of birth, social security number, address, city, state, and zip code. The phone

number was defined as a look-up data type with the options of a cell, home, work, fax, and other number. The Do Not Resuscitate (DNR), advance directive, and medical power of attorney attributes were defined as a yes/no data type.

The PATIENT RECORD table was given the attributes of account number, medical record number (primary key), chief complaint, admission date, admission diagnosis, and discharge date. Admission from is a look-up data type with the options of ED, other unit, other facility, and other. The disposition also has a look-up data type and the options are home, admit, transfer, death, against medical advice, and left without being seen. The ICD-10 CM look up contains several diagnoses joined with the ICD-10 codes and included: abdominal pain, acute coronary syndrome: STEMI, congestive heart failure, contusion, convulsion, chronic obstructive pulmonary disease, fracture: tibia, pneumonia, sepsis, syncope, and urinary tract infection.

The ED ENCOUNTER table consists of the account number (primary key), time at triage, chief complaint. Patient mode of arrival includes a look up with the options of walk in, EMS, other facility, and other. Sepsis alert has a data type of yes/no to indicate if the alert was called or not based on the triage vital signs. The emergency severity index (ESI) level also has a data type of look up and contains the numbers one through five. Vital signs, labs, diagnostics, meds, IV access, IV fluids all have foreign keys to separate tables.

Database Security

Nursing informaticists are governed by standards set forth by the American Nurses Association to establish and maintain patient confidentiality within legal and regulatory guidelines (American Nurses Association, 2015). MS Access provides security measures to enforce security rules and data privacy. These security rules determine who has access, which data items are accessible, and which data operations can be performed by each user (Coronel & Morris, 2015). Team G has employed data policies, standards, and procedures. Password strength decreases security breaches and cyber-attacks. Each user must have a strong password that is changed every

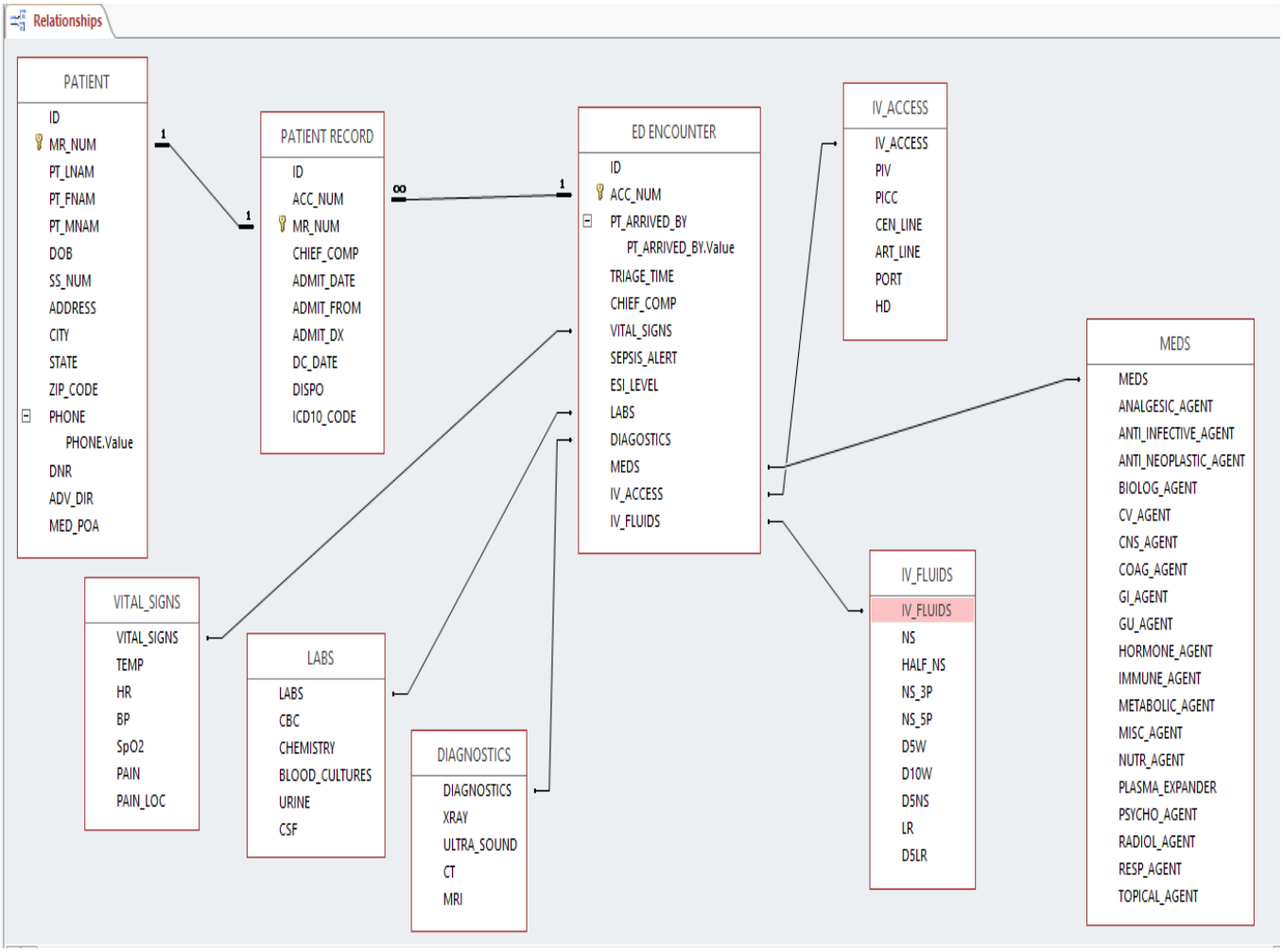
six months. The password is case sensitive and must have at least eight characters, with at least one uppercase, one number, and one symbol. When the password is assigned to the database, it is automatically encrypted each time it closes and makes it unreadable. When the correct password is used to open the database, it is then decrypted to allow the data to be readable (Cox & Lambert, 2013).

Summary

There are several principle functions of an EMR that include: medical management and care, quality improvement, and management, risk management, reimbursement and billing, utilization management, regulatory and legal, and research (Saba & McCormick, 2015). Strategic planning is crucial when designing a database. The team must consider the overview, inputs, activities, outputs, and outcomes for effective and efficient database design. As novice users of MS Access, the team encountered several issues on which entities and their relationships should be included in the project to answer the clinical question. A dilemma was recognized when too many tables were incorporated in the database. Although a typical ED EMR has many entities and attributes that we wanted to capture and accurately illustrate, many were irrelevant when answering the clinical question. The extra entities will serve as placeholders once additional knowledge about MS Access is gained. Another issue became apparent when determining if an attribute would be more efficient when designating it as a “look up” or to create another table. Both of these methods were utilized; additional modifications warrant evaluation when using the prototype in Part III of the Team Database Project. Furthermore, we are investigating how to export the entire database to a shared site so each member may collaborate with real-time editing.

Appendix

Entity Relational Diagram



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