

Walden Medical Center Database

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Database Project

Introduction

Microsoft Access is a database management system (DBMS) software program that serves as a gatekeeper between a database and the applications that rely on that database. The purpose of the DBMS is to control and manage the database and allow one to create a relational database (RDB) (Cox & Lambert, 2013). A RDB stores data in tables that consist of attributes and records in a two-dimensional form. Many hierarchical relationships exist within data; the RDB allows one to model and represent these relationships in electronic format with tables. These tables are joined through matched pairs of data values.

Some of the key advantages that a RDB provides are: serving as a data repository, providing an organizational structure and a mechanism for interacting with data, and minimizing data redundancy. The four basic operations used when interacting with data include creating, querying, modifying, and deleting. (Coronel & Morris, 2015). The purpose of this project is to understand and apply database design concepts and to create a RDB that answers a clinical question. The clinical question chosen by Team G asks “What is the mortality rate of patients diagnosed with sepsis?” Due to the limitations of the assignment, this question will be answered using ten patient records from January 2016 located within the Walden Medical Center (WMC) database.

Methods

Three primary entities were created and identified as “PATIENT” table (Appendix A) with a primary key (PK) of “MR_NUM,” “PATIENT RECORD” (Appendix B) having a PK of “AC_NUM,” and “ED ENCOUNTER” (Appendix C) with a PK of “AC_NUM.” Additionally, sample patient demographic and clinical data were generated for each primary entity. In Phase II of the Team Database Project, Team G expanded upon the ED ENCOUNTER table and created object linking and embedding (OLE) tables identified as “LABS,” “DIAGNOSTICS,” “MEDS,” “IV ACCESS,” and “IV FLUIDS.” These five OLE tables each have a PK of “AC_NUM” so that each value is associated with that particular patient ED ENCOUNTER. Sample data were not included in these entities due to the complexities beyond the realm of Team G’s current knowledge; thus, several attributes were excluded from the original design.

The PATIENT and PATIENT RECORD tables have a one-to-many (1: M) relationship respectfully; the PATIENT RECORD and ED ENCOUNTER have a one-to-one (1:1) relationship. Relationships were created and defined by the database tool and the “WMC: Relationships” report was generated to illustrate them (Appendix D). PATIENT (Appendix E), PATIENT RECORD (Appendix F), and ED ENCOUNTER (Appendix G) forms were created using the “Form Wizard;” the ED ENCOUNTER form was aesthetically customized through the design view.

Results

A “SEPSIS ALERT Q” query (Appendix H) was generated using “Query Design” to discover the relationship between a sepsis alert reported in the ED_ENCOUNTER and a “SEPSIS” look up from the ADMIT_DX in the PATIENT RECORD table. The “SEPSIS_ALERT” attribute was filtered to include only those checked as being called. These alerts (LaRosa, Ahmad, Feinberg, Shah, DiBrienza, & Studer, 2012) were 100% efficient in that all seven sepsis alerts corresponded with a sepsis diagnosis. The “SEPSIS DIAGNOSIS Q” query (Appendix I) was also generated using the Query Design feature with ADMIT_DX and DISPO from the PATIENT RECORD table. The query revealed that seven patients were admitted with a diagnosis of sepsis, after using the word “SEPSIS” as criteria; four of the seven patients were discharged home (57.2%) after being treated for sepsis. The third and final query identified which patient using the MR_NUM, were admitted for sepsis and discharged to the morgue. Three of seven patients (42.8%) died in the hospital. Our clinical question was answered using the “ADMIT-MORGUE Q” query (Appendix J). The mortality rate of patients at Walden Medical Center who were diagnosed with sepsis in January 2016 was 42.8% (Appendix K). The mortality rate findings correlate with the current literature (Henry, Hager, Pronovost, & Saria, 2015). Another area to explore in the future is a root cause analysis of each patient who died with sepsis (Appendix L). We have already documented that a sepsis diagnoses followed a sepsis alert 100% of the time in January 2016; in-depth investigations may reveal the contributing factors that led to the patient’s demise.

Security Measures

The WMC database consists of sensitive and protected health information; security measures have been implemented to protect the data. During the design phase, Team G identified the authorized users and their roles concerning the WMC database. Crucial to database security, three constructs must supervene (Murray, 2010): confidentiality, integrity, and availability. Usernames and strong passwords were created for authentication that restricts access to the WMC database with rights and privileges assigned with authorization according to the user’s classification. Additionally, data may be regulated, and only pre-designated areas of the database are available through Grant/Revoke access control. Team G anticipates the data will be protected from unauthorized disclosures, data access, and malicious threats. However, there are no databases systems that are 100% secure and free from threats. Team G will consider collaborating with privacy and security officers about current best practices regarding healthcare database security.

Summary

The database design of this Team Project began with first identifying the output (clinical question) and then determining the inputs (entities) needed to generate queries or data mining in an enterprise system (Berger & Berger, 2004). Understanding the concepts and rules of database design and why they are needed, allow developers and nursing informaticists (Saba & McCormick, 2015) to systematically progress through more complex applications. During this Team Project, many mistakes and adjustments were made through a trial and error process; this was not the most efficient method for a novice developer. However, mistakes provide insight on what not to do in the future.

Appendix A

PATIENT Table

Field Name	Data Type	Description (Optional)
ID	AutoNumber	
MR_NUM	Short Text	Patient Medical Record Number
PT_LNAM	Short Text	Patient Last Name
PT_FNAM	Short Text	Patient First Name
PT_MNAM	Short Text	Patient Middle Name
DOB	Date/Time	Date of Birth
SS_NUM	Short Text	Social Security Number
ADDRESS	Short Text	
CITY	Short Text	
STATE	Short Text	
ZIP_CODE	Short Text	
DNR	Yes/No	Does the patient have a DO NOT RESUCITATE order on file?
ADV DIR	Yes/No	Does the patient have an Advance Directive?

Field Properties

Field Size	Long Integer
New Values	Increment
Format	
Caption	
Indexed	No
Text Align	General

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Appendix B

PATIENT RECORD Table

Walden Medical Center : Database- C:\Users\Julie\Documents\Walden Medical Center.accdb (Access 2007 - 2016 file format) - Acc...

Julie Bangs

File Home Create External Data Database Tools Design Tell me what you want to do

Views Primary Key Builder Test Validation Rules Insert Rows Delete Rows Modify Lookups Property Sheet Indexes Show/Hide Create Data Macros Rename/Delete Macro Relationships Object Dependencies Field, Record & Table Events Relationships

All Access Obj... PATIENT RECORD

Search...

Tables

- DIAGNOSTICS
- ED ENCOUNTER
- IV ACCESS
- IV FLUIDS
- LABS
- MEDS
- PATIENT
- PATIENT RECORD**

Queries

- ADMIT-MORGUE Q
- SEPSIS ALERT Q
- SEPSIS DIAGNOSIS Q

Forms

- ED ENCOUNTER
- PATIENT
- PATIENT RECORD

Reports

- ADMIT-MORGUE R
- SEPSIS DIAGNOSIS R
- WMC: Relationships

Field Name	Data Type	Description (Optional)
ID	AutoNumber	
MR_NUM	Short Text	Medical Record Number
AC_NUM	Short Text	Account Number
ADMIT_DATE	Date/Time	Date of Admission
ADMIT_DX	Short Text	Admission Diagnosis
DC_DATE	Date/Time	Discharge Date
DISPO	Short Text	Disposition of Patient

Field Properties

General Lookup

Field Size	Long Integer
New Values	Increment
Format	
Caption	
Indexed	Yes (Duplicates OK)
Text Align	General

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Design view. F6 = Switch panes. F1 = Help.

Num Lock

Appendix C

ED ENCOUNTER Table

The screenshot shows the Microsoft Access Design view for the 'ED ENCOUNTER' table. The interface includes a ribbon with tabs for File, Home, Create, External Data, Database Tools, and Design. The Design tab is active, showing various tools for creating and modifying the table structure. On the left, the 'All Access Objects' pane lists various database objects, with 'ED ENCOUNTER' selected under the 'Tables' category. The main area displays the table's fields in a grid with columns for Field Name, Data Type, and Description (Optional). Below this grid, the 'Field Properties' section is visible, showing settings for the selected field (AC_NUM), such as Field Size (Long Integer), New Values (Increment), Format, Caption, Indexed (No), and Text Align (General). A status bar at the bottom indicates 'Design view. F6 = Switch panes. F1 = Help.' and 'Num Lock'.

Field Name	Data Type	Description (Optional)
AC_NUM	Short Text	
MR_NUM	Short Text	
TRIAGE	Date/Time	
CHIEF_COMP	Short Text	
VITALS	OLE Object	
SEPSIS_ALERT	Yes/No	
ESI_LEVEL	Short Text	
LABS	OLE Object	
DIAGNOSTICS	OLE Object	
MEDS	OLE Object	
IV_ACCESS	OLE Object	
IV_FLUIDS	OLE Object	
ADMIT_TO	Short Text	

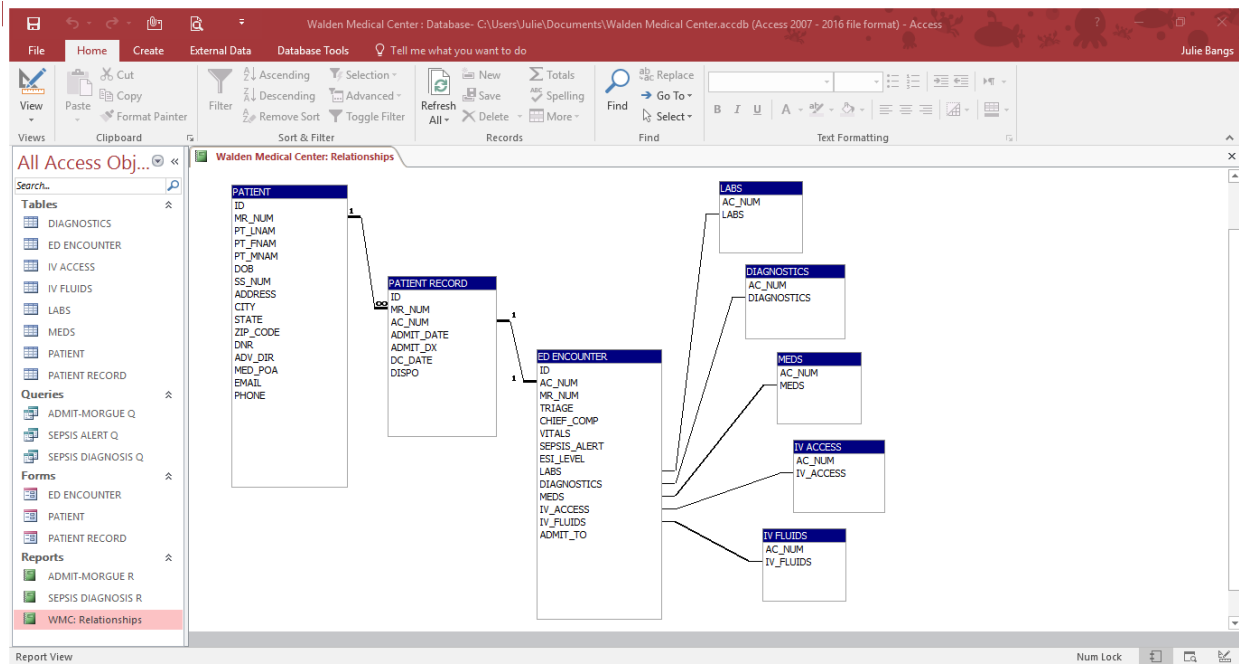
Field Properties

General	Lookup
Field Size	Long Integer
New Values	Increment
Format	
Caption	
Indexed	No
Text Align	General

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Appendix D

WMC: Relationships Report



Appendix E

PATIENT Form

Walden Medical Center : Database- C:\Users\Julie\Documents\Walden Medical Center.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Tell me what you want to do Julie Bangs

PATIENT

Navigation Pane

MR_NUM	MR90000001	MED_POA	☒
PT_LNAM	RUSSELL	EMAIL	lisa.russell@ptsample.com
PT_FNAM	LISA	PHONE	340-410-9898
PT_MNAM	MARIE		
DOB	1/25/1947		
SS_NUM	357-55-9510		
ADDRESS	711 WAYWARD STREET		
CITY	CHARLOTTE AMALIE		
STATE	ST. THOMAS		
ZIP_CODE	00804		
DNR	☒		

Record: 1 of 10 No Filter Search

Form View Num Lock

Appendix F

PATIENT RECORD Form

The screenshot shows a Microsoft Access application window titled "Walden Medical Center : Database- C:\Users\Julie\Documents\Walden Medical Center.accdb (Access 2007 - 2016 file format) - Access". The user is logged in as "Julie Bangs". The form is titled "PATIENT RECORD" and contains the following fields:

Field Name	Value
ID	11
MR_NUM	MR9000004
AC_NUM	AC1000001
ADMIT_DATE	1/4/2016
ADMIT_DX	ACS
DC_DATE	1/7/2016
DISPO	MORGUE

The form is displayed in "Form View". The status bar at the bottom indicates "Record: 1 of 10", "No Filter", and "Search".

Appendix G

ED ENCOUNTER Form

The screenshot shows a Microsoft Access application window titled "Walden Medical Center : Database- C:\Users\Julie\Documents\Walden Medical Center.accdb (Access 2007 - 2016 file format) - Access". The user is "Julie Bangs". The application is displaying the "ED ENCOUNTER" form in "Form View".

The form is organized into a grid with the following fields and sections:

- ID**: Text box containing "1".
- AC_NUM**: Text box containing "AC10000001".
- MR_NUM**: Text box containing "MR90000004".
- TRIAGE**: Text box containing "1/3/2016".
- CHIEF_COMP**: Dropdown menu with "SYNCOPE" selected.
- SEPSIS_ALERT**: Check box, currently unchecked.
- ESI_LEVEL**: Dropdown menu with "3" selected.
- ADMIT_TO**: Dropdown menu with "ICU" selected.
- LABS**: Large empty rectangular box.
- MEDS**: Large empty rectangular box.
- IV_FLUIDS**: Large empty rectangular box.
- VITALS**: Large empty rectangular box.
- DIAGNOSTICS**: Large empty rectangular box.
- IV_ACCESS**: Large empty rectangular box.

The bottom status bar shows "Record: 1 of 10", "No Filter", and a "Search" button. The "Form View" tab is active in the bottom right corner.

SEPSIS ALERT Query



SEPSIS DIAGNOSIS Query

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ADMIT-MORGUE Query

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Appendix K

SEPSIS DIAGNOSIS Report

Walden Medical Center : Database- C:\Users\Julie\Documents\Walden Medical Center.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Tell me what you want to do Julie Bangs

SEPSIS DIAGNOSIS R

SEPSIS DIAGNOSIS R

MR_NUM	ADMIT_DX	DISPO
MR90000002	SEPSIS	HOME
MR90000003	SEPSIS	MORGUE
MR90000005	SEPSIS	HOME
MR90000006	SEPSIS	MORGUE
MR90000007	SEPSIS	HOME
MR90000008	SEPSIS	HOME
MR90000010	SEPSIS	MORGUE

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Appendix L

ADMIT-MORGUE Report

Walden Medical Center : Database- C:\Users\Julie\Documents\Walden Medical Center.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Tell me what you want to do Julie Bangs

ADMIT-MORGUE R

MR_NUM	ADMIT_DX	DISPO
MR90000003	SEPSIS	MORGUE
MR90000006	SEPSIS	MORGUE
MR90000010	SEPSIS	MORGUE

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Navigation Pane

Report View Num Lock

References

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