

# Quantitative & Qualitative Trauma Data Management for Analytical Optimization

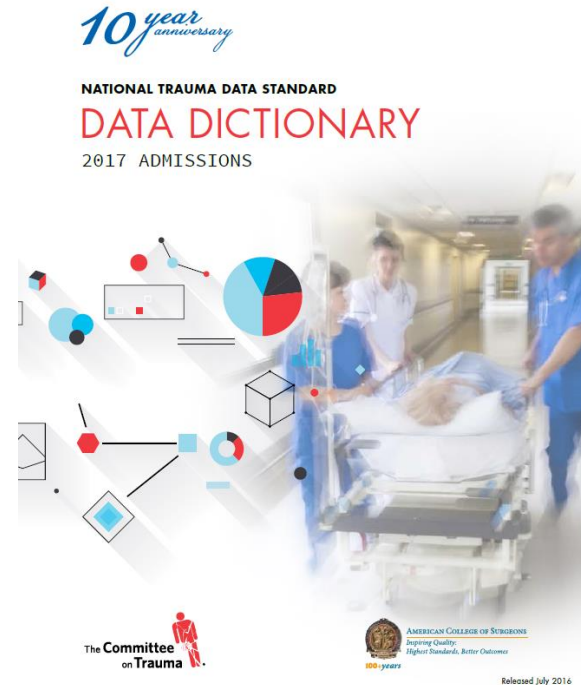
Allen Stout, MS

Trauma Analyst

Munson Healthcare

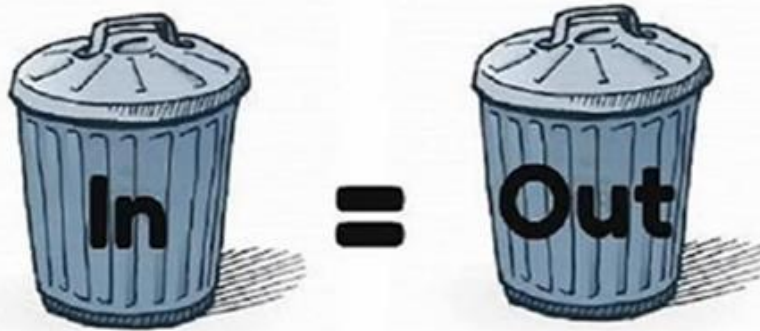
# Objectives

- Quantitative Strategies
- Qualitative Strategies
- Merging Datasets
- Analytical Optimization



# Importance of Data Quality

Let's talk about data!



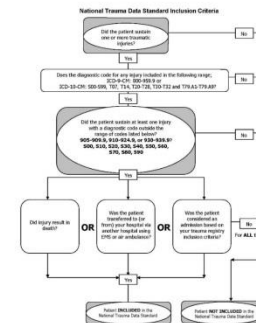
AMERICAN COLLEGE OF SURGEONS  
*Inspiring Quality:  
Highest Standards, Better Outcomes*

ACS  
**tqip**  
TRAUMA  
QUALITY  
IMPROVEMENT  
PROGRAM

© American College of Surgeons 2017. All rights reserved Worldwide.

# Quantitative Strategies

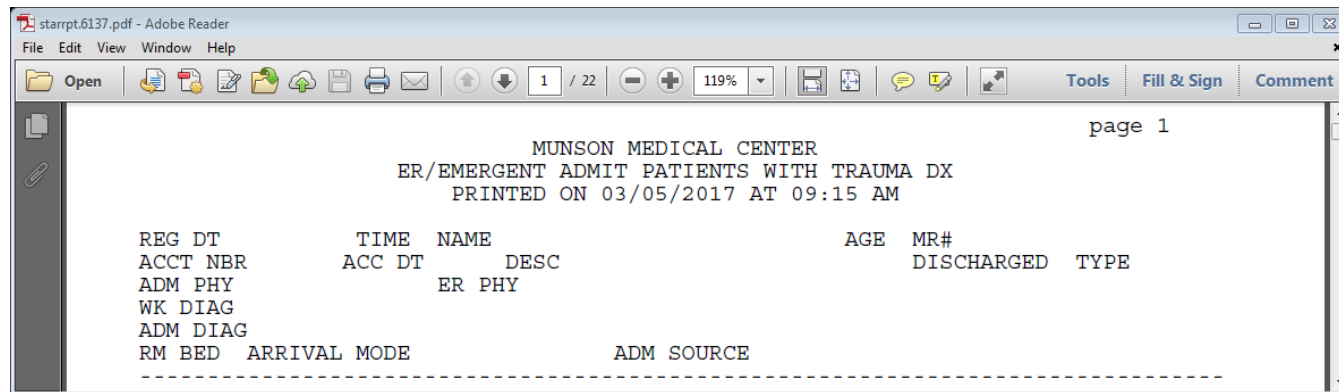
- Remember NTDB Inclusion Criteria
  - Injury diagnosis (other than superficial) – per ICD-10 range
- AND
- Inter-facility transfers via EMS (even if discharged from ED)
- OR
- Hospital admission
- OR
- Death resulting from traumatic injury



- Remember Institution Specific Inclusion Criteria (as applicable)
  - All trauma activations
  - All trauma consults
  - Mechanism specific injuries

# Quantitative Strategies

- Ensuring all Trauma Inclusion eligible patients are identified
  - ED / Trauma Logs
  - Trauma Service Patient Lists
  - Daily ED Patient Lists w/ chief complaint (Injury Related)
  - Daily ED Patient List w/ admission source (Transfer from Hospital)
  - Daily I/P Patient Lists w/ chief complaint (Injury Related)



- Eliminate single points of failure...“Redundancy ensures competency”

# Quantitative Strategies

- Ad hoc audit tools...ensuring no eligible patients are missed
  - Medical billing coding records
  - Clinical intelligence data warehouse queries

**Munson Healthcare Portal**

Encounter Extract

**Qualifications**

Dischrg FY	Dischrg FYM	Entity	IP/OP Grouping	Pat Type
All Values (4)	All Values (9)	All Values (5)	All Values (2)	All Values (11)
2017	2017-09-Mar	KALKASKA MEMORIAL HEALTH CTR (65)	Inpatient	COMB OUT TO IN (COI)
2016	2017-08-Feb	MUNSON HEALTHCARE CADILLAC HOSPITAL (55)	Outpatient	COMBINED INPATIENT (CIP)
2015	2017-07-Jan	MUNSON HEALTHCARE GRAYLING HOSPITAL (58)		COMBINED MENTAL HEALTH (CEN)
2014	2017-06-Dec	MUNSON MEDICAL CENTER (45)		COMBINED NURSERY (CUR)
	2017-05-Nov	PAUL OLIVER MEMORIAL HOSPITAL (50)		COMBINED REHAB (CAB)

**Data Extract**

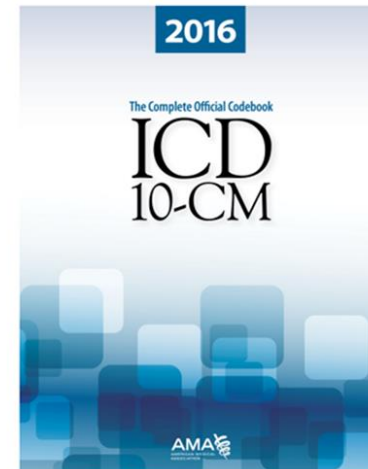
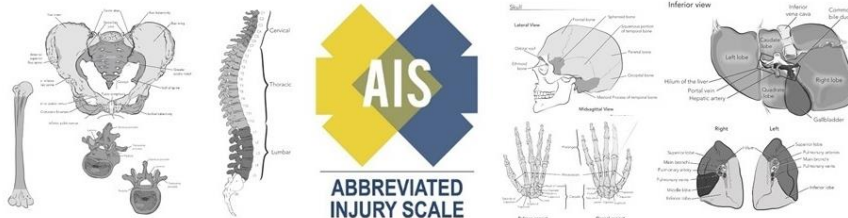
Data Extract: 5 User Defined, 12 Defaulted Columns, 4 Measures

ADMIT ICD-10 DX CODE	ICD DX ALL	ARRIVAL MODE NAME	TRANSFER FROM	TRANSFER TO	PAT ACCT	MRN	ADMIT DATE	DISCHG DATE	PAT TYPE	SVC MED	DRG	PAYER 1
----------------------	------------	-------------------	---------------	-------------	----------	-----	------------	-------------	----------	---------	-----	---------

Five red arrows point to the first five columns of the Data Extract table: ADMIT ICD-10 DX CODE, ICD DX ALL, ARRIVAL MODE NAME, TRANSFER FROM, and TRANSFER TO.

# Qualitative Strategies

- Ensuring all required & essential data elements are completed
  - Consult ACS NTDB National Trauma Data Standard: Data Dictionary for specific elements
  - Consult MTQIP Data Dictionary as appropriate
  - ALWAYS follow established hierarchies when choosing best source of data for entry into the trauma registry
  - ALWAYS follow Abbreviated Injury Scale coding & ICD-10 coding guidelines & rules

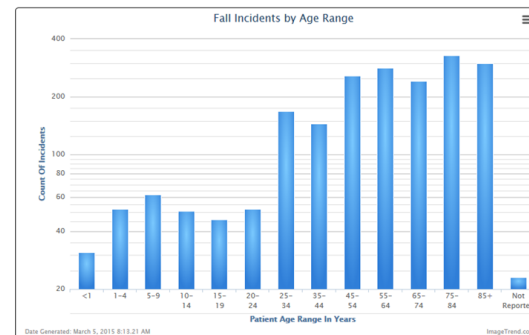
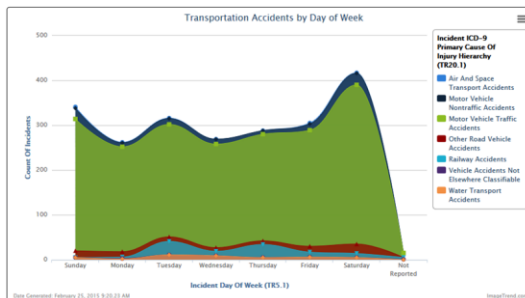


# Qualitative Strategies

- Reduce human error in data collection wherever possible
  - Audit records / re-abstract to ensure quality – multiple levels of review:



- Automate data entry, if possible, to reduce data entry errors
- Use data analysis tools to verify consistent / accurate data entry





# Qualitative Strategies

- Ad hoc audit tools...ensuring no data elements are missed
  - Medical billing coding records
  - Clinical intelligence data warehouse queries

The screenshot shows the Munson Healthcare Portal interface. The top navigation bar includes the Munson Healthcare logo, a menu icon, and links for Back, Home, Encounter Extract, and Charges Extract. The main content area is divided into two sections: Qualifications and Data Extract.

**Qualifications Section:**

Dischg FY	Dischg FYM	Entity	IP/OP Grouping	Pat Type
All Values (4)	All Values (9)	All Values (5)	All Values (2)	All Values (11)
2017	2017-09-Mar	KALKASKA MEMORIAL HEALTH CTR (65)	Inpatient	COMB OUT TO IN (COI)
2016	2017-08-Feb	MUNSON HEALTHCARE CADILLAC HOSPITAL (55)	Outpatient	COMBINED INPATIENT (CIP)
2015	2017-07-Jan	MUNSON HEALTHCARE GRAYLING HOSPITAL (58)		COMBINED MENTAL HEALTH (CEN)
2014	2017-06-Dec	MUNSON MEDICAL CENTER (45)		COMBINED NURSERY (CUR)
	2017-05-Nov	PAUL OLIVER MEMORIAL HOSPITAL (50)		COMBINED REHAB (CAB)

**Data Extract Section:**

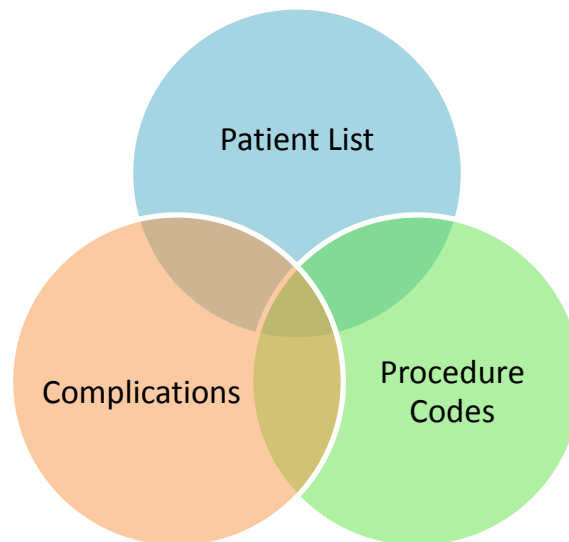
Data Extract: 5 User Defined, 12 Defaulted Columns, 4 Measures

ICD Px ALL	DRG BILLING - ICD10	CAUTI FLAG	CLABSI FLAG	PSI13 POSTOP SEPSIS	PAT ACCT	MRN	ADMIT DATE	DISCHG DATE	PAT TYPE	SVC MED	DRG	PAYER 1
------------	---------------------	------------	-------------	---------------------	----------	-----	------------	-------------	----------	---------	-----	---------

Five red arrows point to the following columns in the Data Extract table: ICD Px ALL, DRG BILLING - ICD10, CAUTI FLAG, CLABSI FLAG, and PSI13 POSTOP SEPSIS.

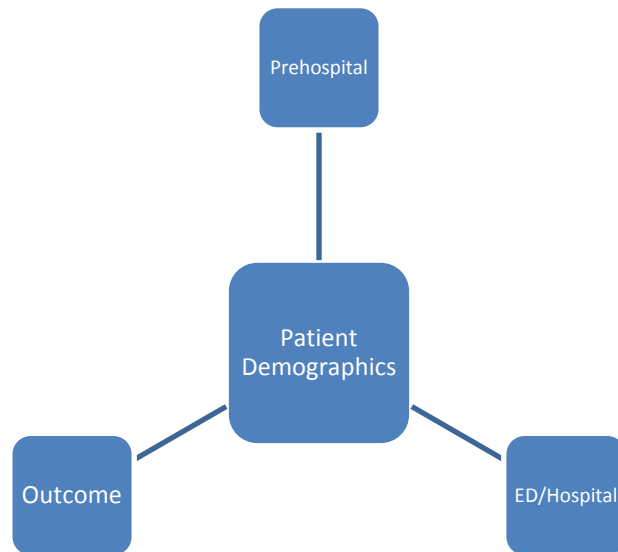
# Merging Datasets

- Identify methods to work “smarter not harder”
- Utilize software solutions to merge datasets for entry into the trauma registry or to expand on the trauma registry
  - Spreadsheet type tools (e.g. Excel, csv, XML)
  - Data linkage & query tools (e.g. Access, SAS)



# Merging Datasets: background

- Relational database = a database structured to recognize relations among stored items of information
- SQL (Structured Query Language) = the language for querying and maintaining the database
- Bottom line: data management relies on relational databases



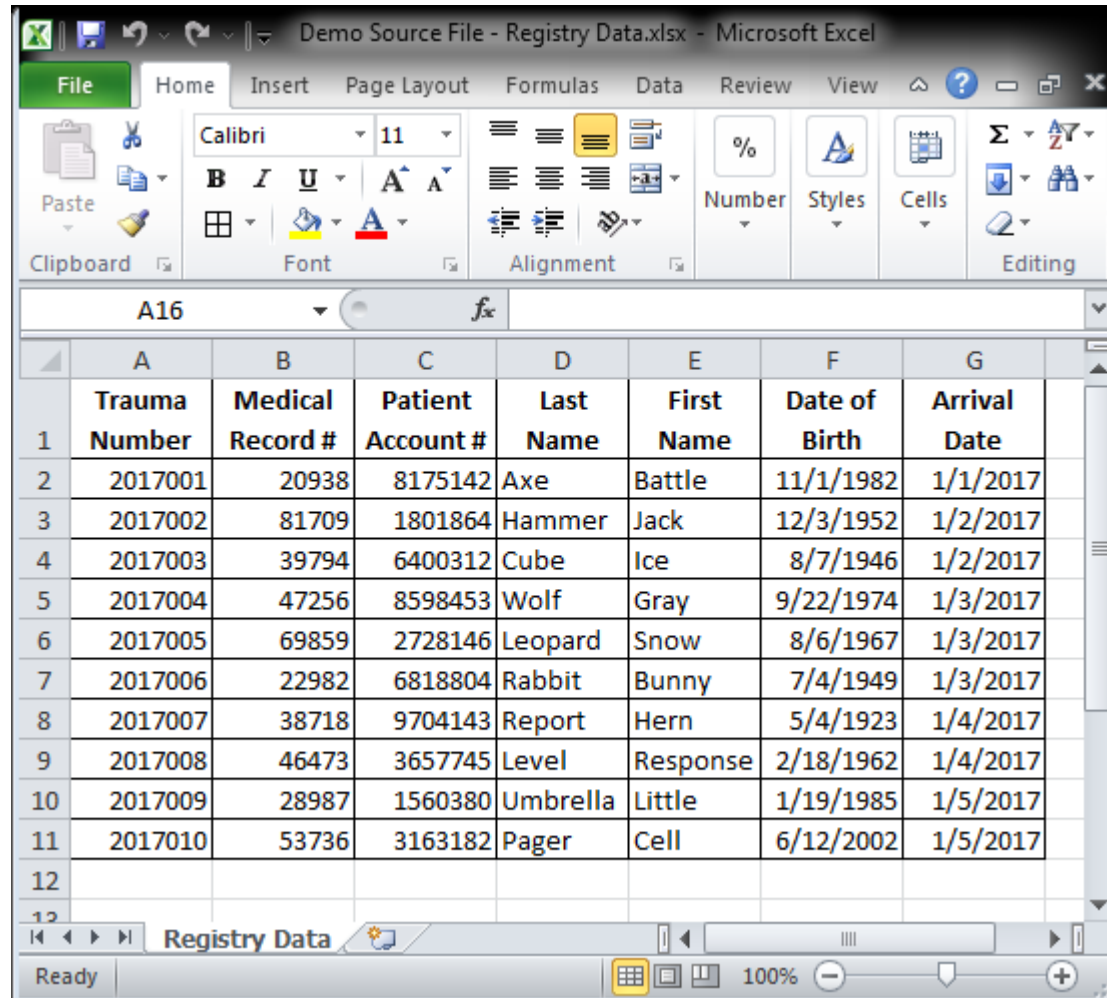
# Merging Datasets: basic steps

- Prepare source files
- Import source files
- Write query to link files
- Generate calculations as needed
- Export desired data elements

# Merging Datasets: prepare files

- Prepare source files
  - Identify linkage variable(s)
    - Patient Account # for unique encounters (e.g. for procedures)
    - Medical Record # to look across encounters (e.g. for readmissions)
    - Name & DOB to look across institutions (e.g. for patient transfers)
  - Ensure column headers are in the first row and properly labeled
    - Use column headers that are readily identifiable
    - Delete extraneous rows & columns (e.g. where no data exists)
  - Verify that source files are inclusive given desired criteria
    - Appropriate date ranges (e.g. CY 2016 vs. FY 2016)
    - Defined population (e.g. all I/P vs. all I/P & O/P)

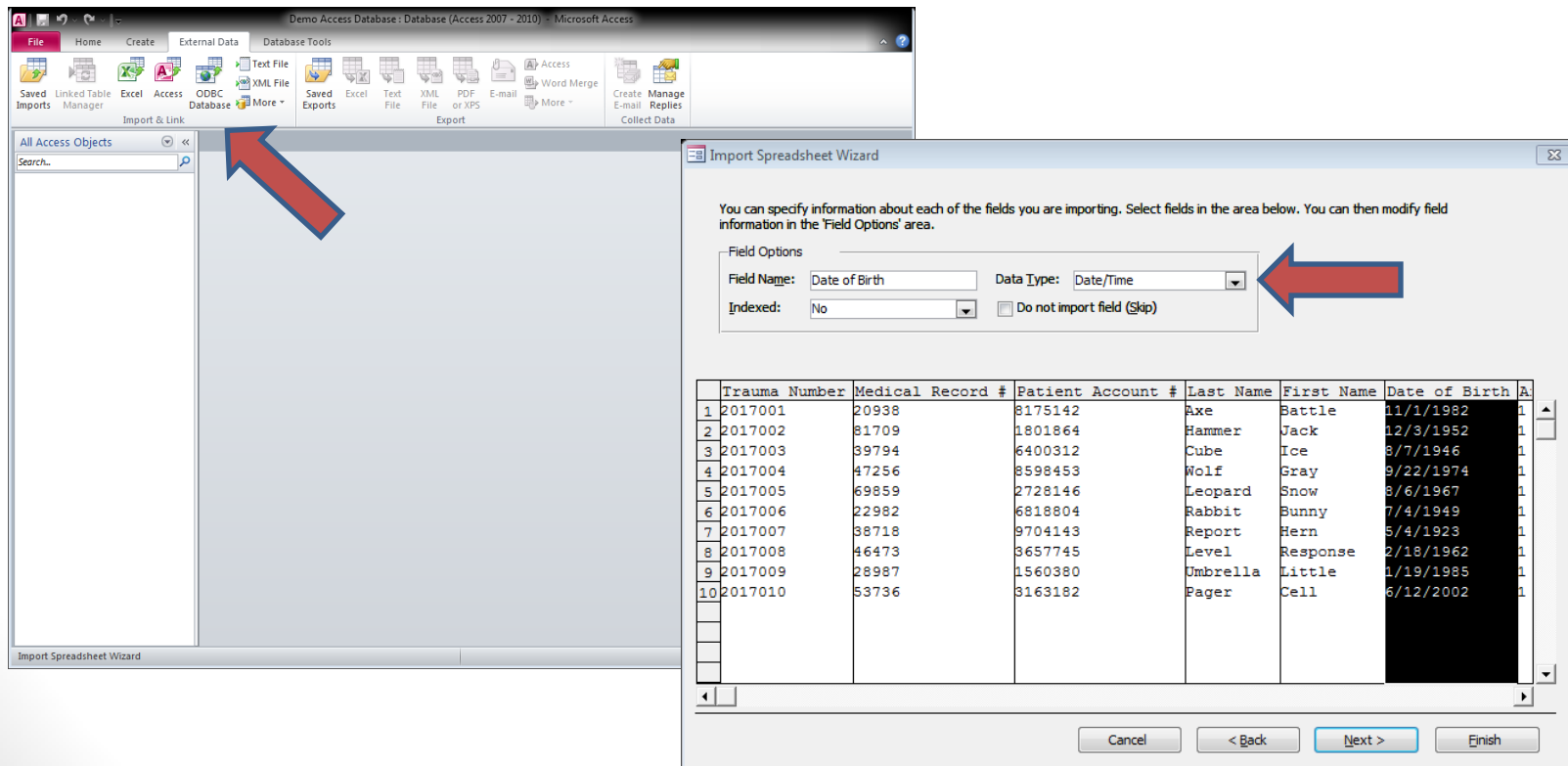
# Merging Datasets: prepare files



	A	B	C	D	E	F	G
	Trauma Number	Medical Record #	Patient Account #	Last Name	First Name	Date of Birth	Arrival Date
1	2017001	20938	8175142	Axe	Battle	11/1/1982	1/1/2017
2	2017002	81709	1801864	Hammer	Jack	12/3/1952	1/2/2017
3	2017003	39794	6400312	Cube	Ice	8/7/1946	1/2/2017
4	2017004	47256	8598453	Wolf	Gray	9/22/1974	1/3/2017
5	2017005	69859	2728146	Leopard	Snow	8/6/1967	1/3/2017
6	2017006	22982	6818804	Rabbit	Bunny	7/4/1949	1/3/2017
7	2017007	38718	9704143	Report	Hern	5/4/1923	1/4/2017
8	2017008	46473	3657745	Level	Response	2/18/1962	1/4/2017
9	2017009	28987	1560380	Umbrella	Little	1/19/1985	1/5/2017
10	2017010	53736	3163182	Pager	Cell	6/12/2002	1/5/2017
11							
12							

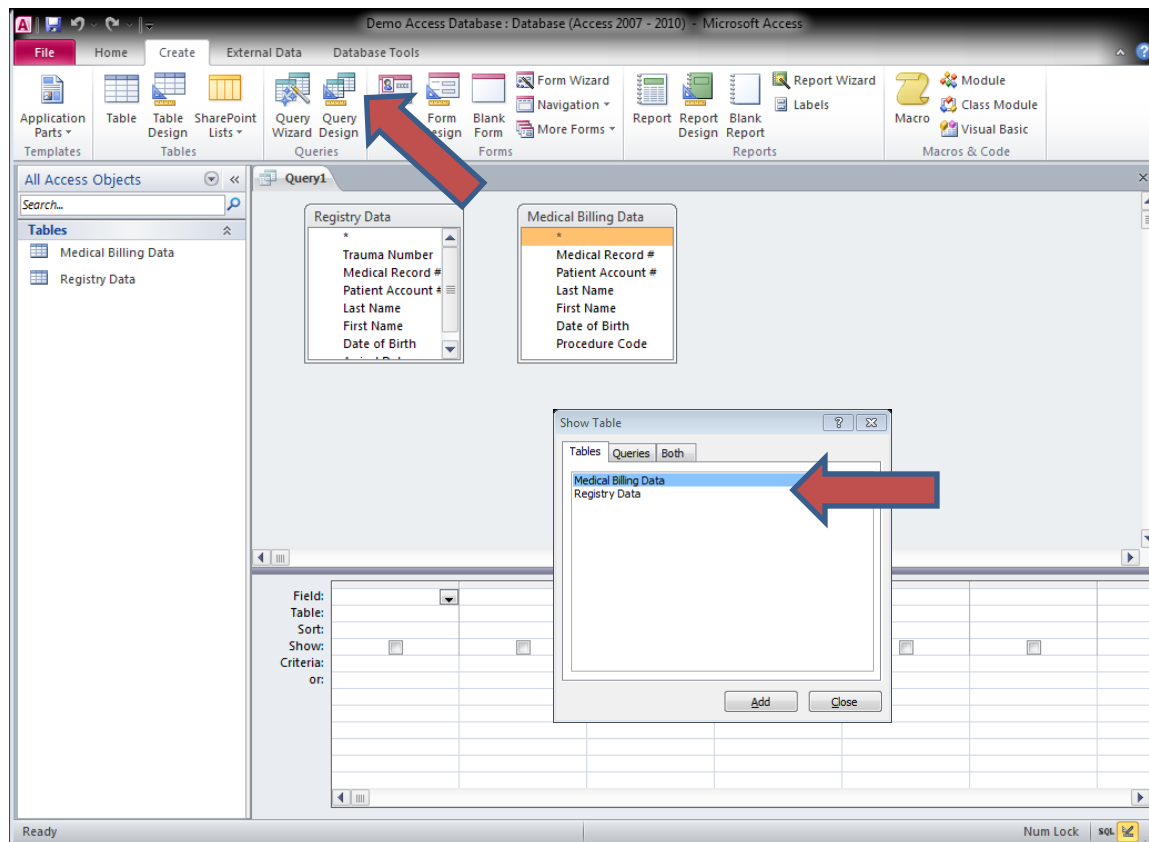
# Merging Datasets: import files

- Import source files {**using Microsoft Access as an example**}
  - Choose appropriate file type to import (e.g. Excel, XML, Text)
  - Ensure data elements are imported in correct format (e.g. dates)



# Merging Datasets: write query

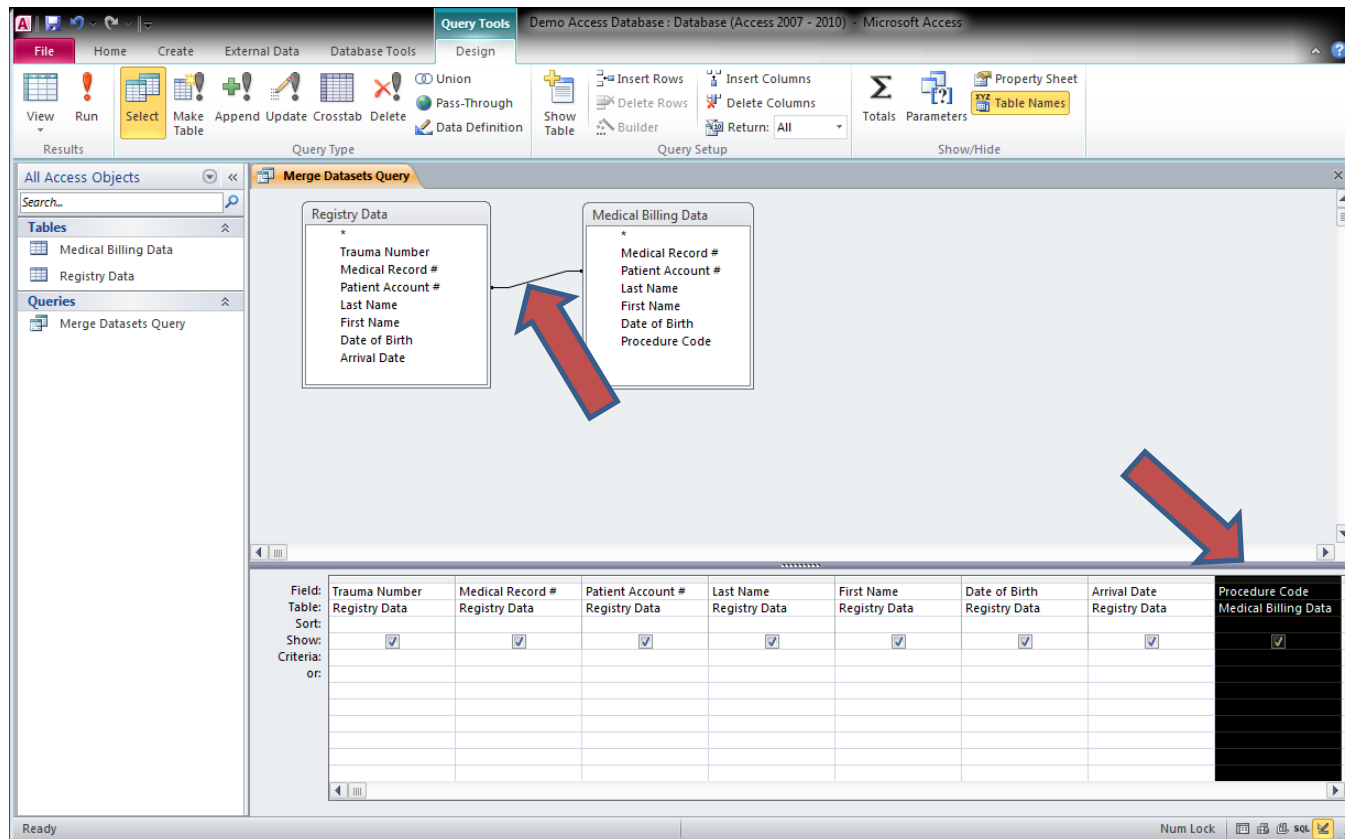
- Write query to link files
  - Select type of query
  - Select files “tables” to merge / query





# Merging Datasets: write query

- Write query to link files
  - “Relate” datasets by connecting key linkage variable(s)
  - Select data elements to display in the query



# Merging Datasets: write query

- Write query to link files
  - “Run” the query to generate desired output / table
  - Verify that output is consistent with intent of the query

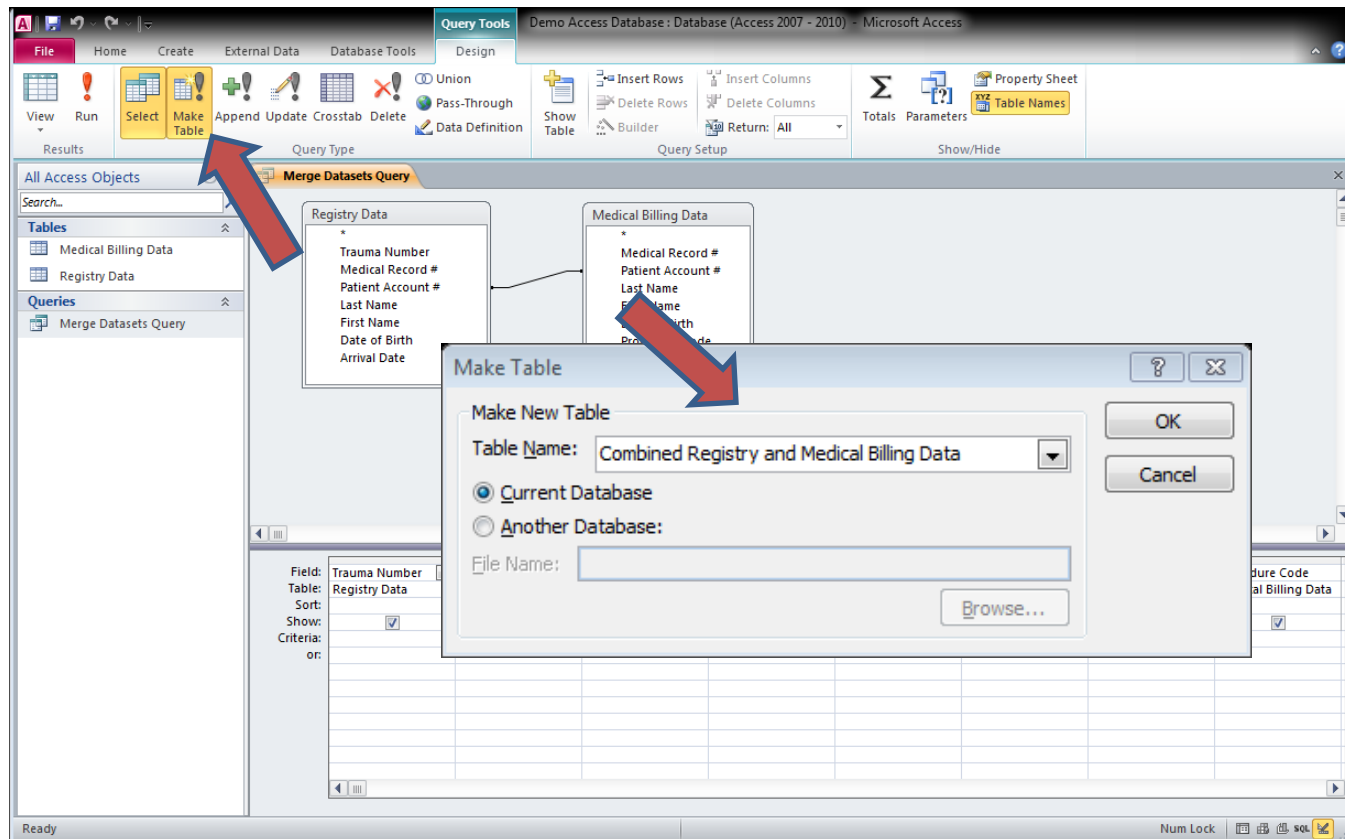
The screenshot shows the Microsoft Access interface with the 'Merge Datasets Query' selected in the 'Queries' list. The query is run, and the results are displayed in a table. The table has columns: Traum, Medicine, Patient, Last Name, First Name, Date of Birth, Arrival Date, and Procedure Code. The results show 10 records of medical data. A red arrow points to the 'Run' button in the ribbon, and another red arrow points to the 'Merge Datasets Query' in the 'Queries' list.

**SQL code:**

```
SELECT [Registry Data].[Trauma Number], [Registry Data].[Medical Record #], [Registry Data].[Patient Account #], [Registry Data].[Last Name], [Registry Data].[First Name], [Registry Data].[Date of Birth], [Registry Data].[Arrival Date], [Medical Billing Data].[Procedure Code]
FROM [Registry Data] INNER JOIN [Medical Billing Data] ON [Registry Data].[Patient Account #] = [Medical Billing Data].[Patient Account #];
```

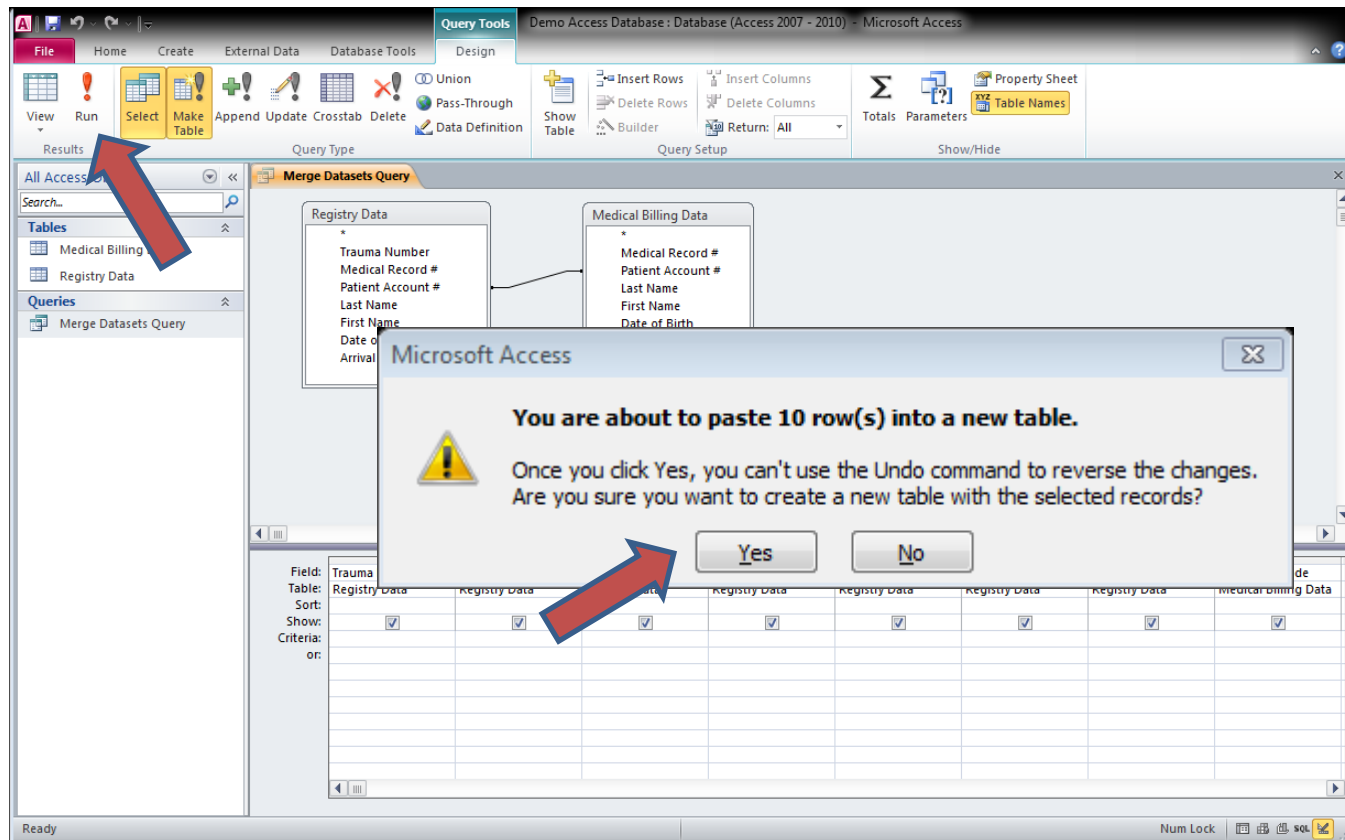
# Merging Datasets: write query

- Write query to link files
  - Make a new combined table to run additional queries against
  - Select table name that can be reused in future (e.g. monthly)



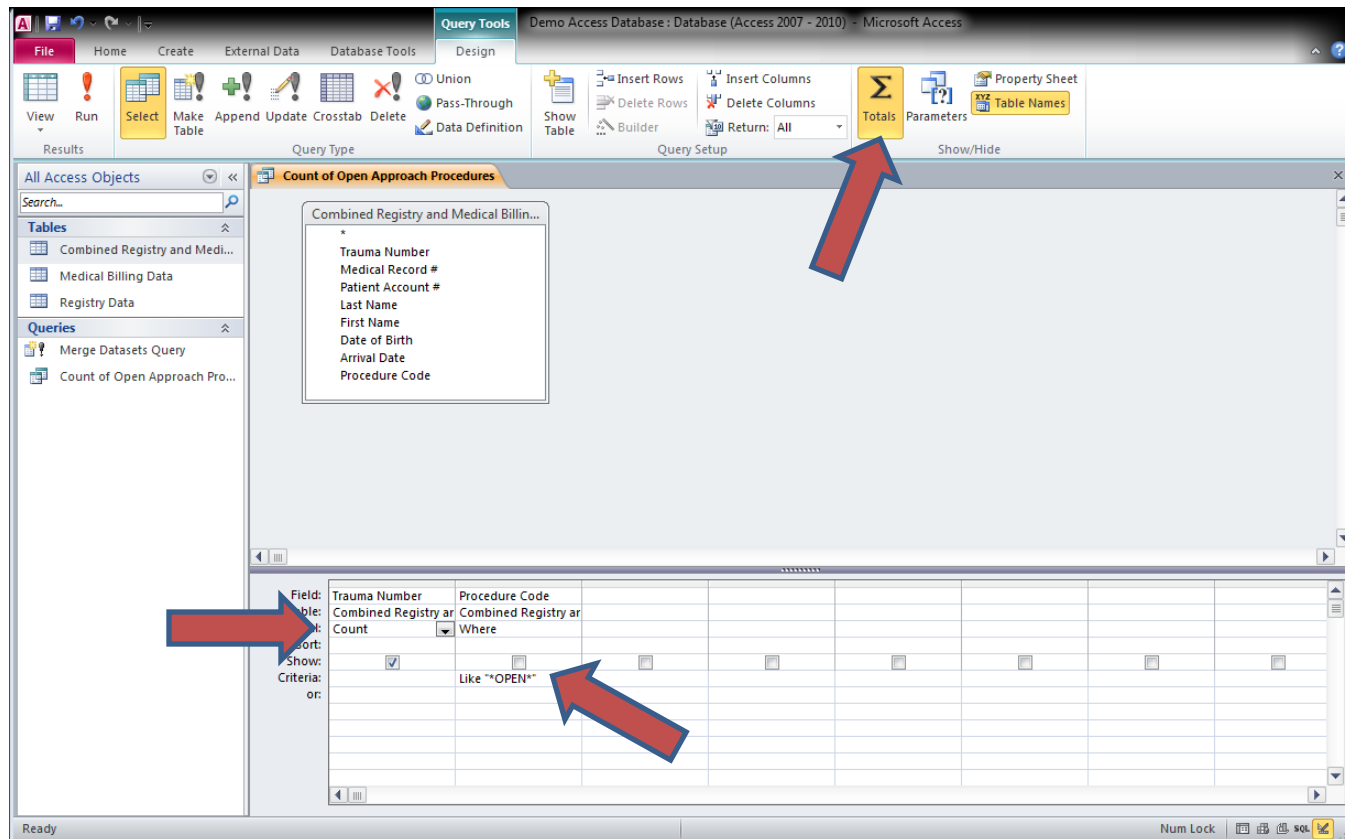
# Merging Datasets: write query

- Write query to link files
  - “Run” the Make Table query to generate desired table
  - Verify record count to ensure table is generated correctly



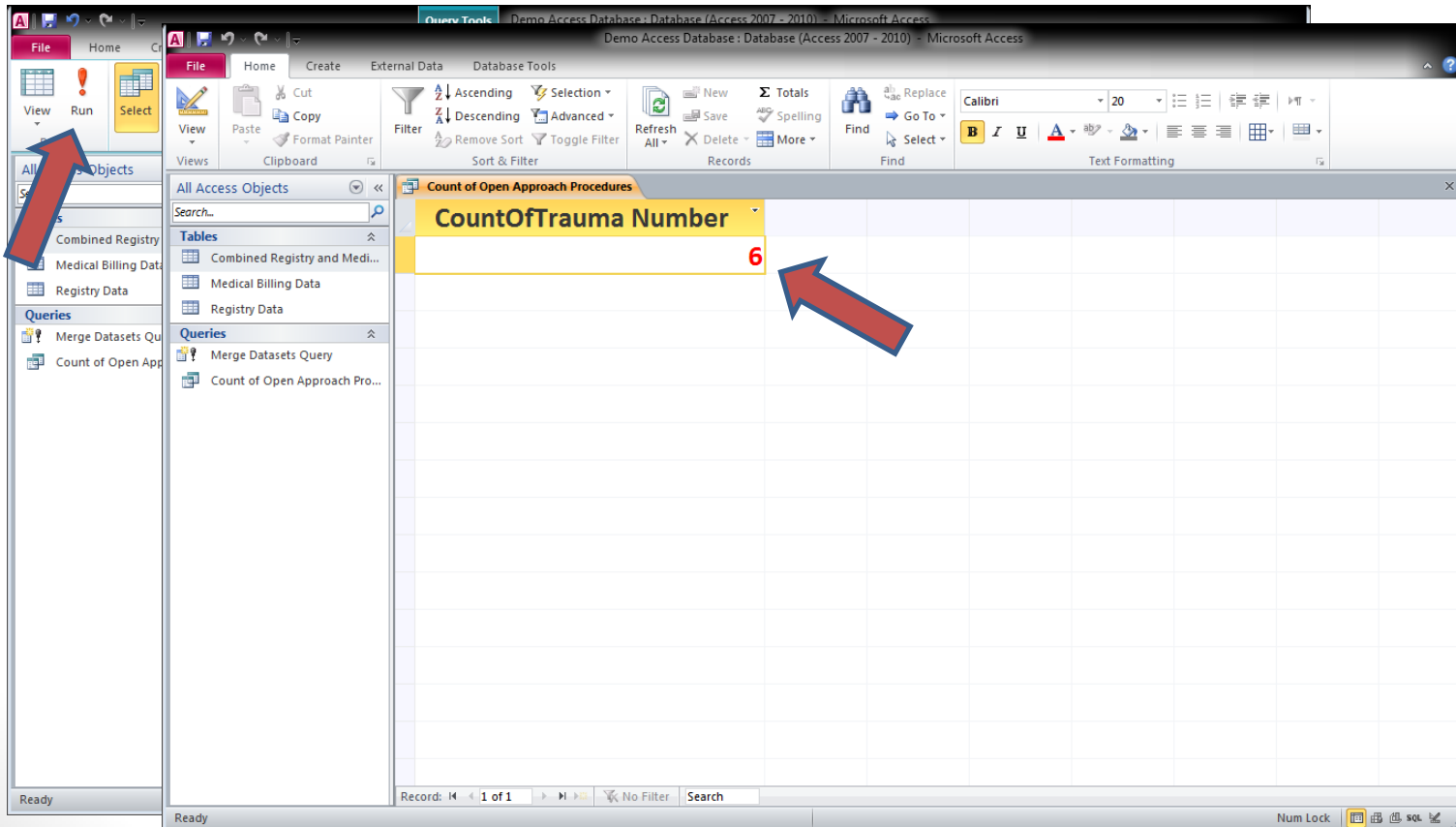
# Merging Datasets: calculations

- Generate calculations as needed (**narrative search example**)
  - Start a query based on new table & select “Totals”
  - Select calculation (e.g. **Count**) & criteria (e.g. **Like “\*OPEN\*”**)



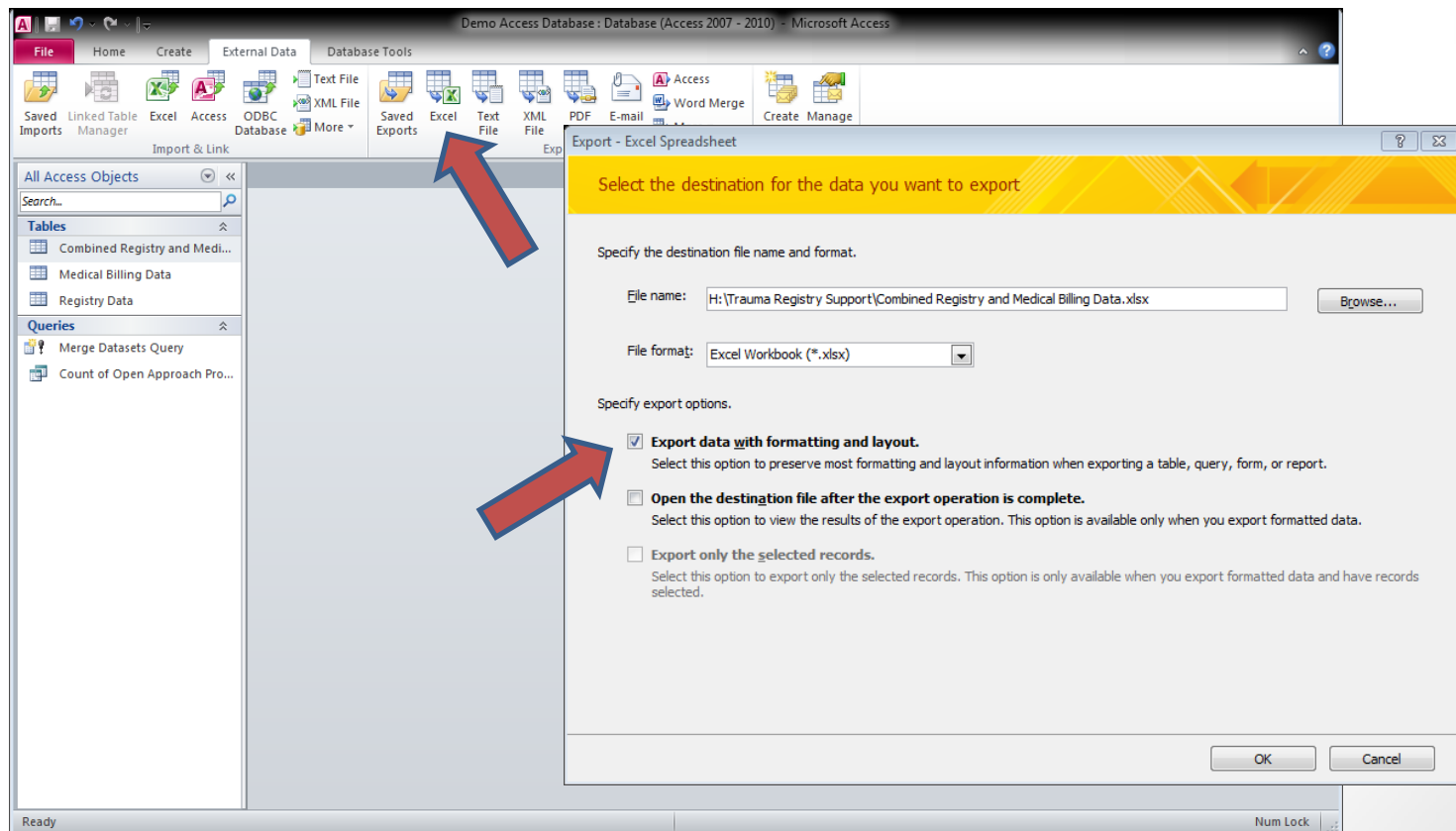
# Merging Datasets: calculations

- Generate calculations as needed (**narrative search example**)
  - “Run” the query
  - Evaluate the results



# Merging Datasets: export

- Export desired data elements
  - Select table or query to export & type of export file (e.g. XML)
  - Select destination and formatting & layout for export file



# Merging Datasets: export

- Export desired data elements
  - Utilize exported file for reporting purposes
  - Utilize exported file as an aid with trauma registry data entry
  - Utilize exported file as an audit tool (e.g. looking for consistency)

Combined Registry and Medical Billing Data.xlsx - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View

Clipboard Font Alignment Number Styles Cells Editing

Calibri 11 A A

B I U

Wrap Text

General

\$ % .00 .00

Conditional Formatting Format as Table Cell Styles

Insert Delete Format

AutoSum Fill Clear Sort & Filter Find & Select

H15 fx

	A	B	C	D	E	F	G	H
	Trauma Number	Medical Record #	Patient Account #	Last Name	First Name	Date of Birth	Arrival Date	Procedure Code
1								
2	2017001	20938	8175142	Axe	Battle	01-Nov-82	01-Jan-17	0QS606Z REPOSITION R UP FEMUR WITH INTRAMED FIX, OPEN APPROACH
3	2017002	81709	1801864	Hammer	Jack	03-Dec-52	02-Jan-17	00C40ZZ EXTIRPATION OF MATTER FROM SUBDURAL SPACE
4	2017003	39794	6400312	Cube	Ice	07-Aug-46	02-Jan-17	0LQL0ZZ REPAIR RIGHT UPPER LEG TENDON, OPEN APPROACH
5	2017004	47256	8598453	Wolf	Gray	22-Sep-74	03-Jan-17	00NW0ZZ RELEASE CERVICAL SPINAL CORD, OPEN APPROACH
6	2017005	69859	2728146	Leopard	Snow	06-Aug-67	03-Jan-17	0HQ1XZZ REPAIR FACE SKIN, EXTERNAL APPROACH
7	2017006	22982	6818804	Rabbit	Bunny	04-Jul-49	03-Jan-17	0PSC04Z REPOSITION RIGHT HUMERAL HEAD WITH INT FIX, OPEN APPROACH
8	2017007	38718	9704143	Report	Hern	04-May-23	04-Jan-17	0SS934Z REPOSITION RIGHT HIP JOINT WITH INT FIX, PERC APPROACH
9	2017008	46473	3657745	Level	Response	18-Feb-62	04-Jan-17	0SR503A REPLACE L HIP JT, FEMORAL W CERAMIC, UNCEMENT, OPEN
10	2017009	28987	1560380	Umbrella	Little	19-Jan-85	05-Jan-17	30233N1 TRANSFUSE NONAUT RED BLOOD CELLS IN PERIPH VEIN, PERC
11	2017010	53736	3163182	Pager	Cell	12-Jun-02	05-Jan-17	0QSG04Z REPOSITION RIGHT TIBIA WITH INT FIX, OPEN APPROACH
12								

Combined Registry and Medical B

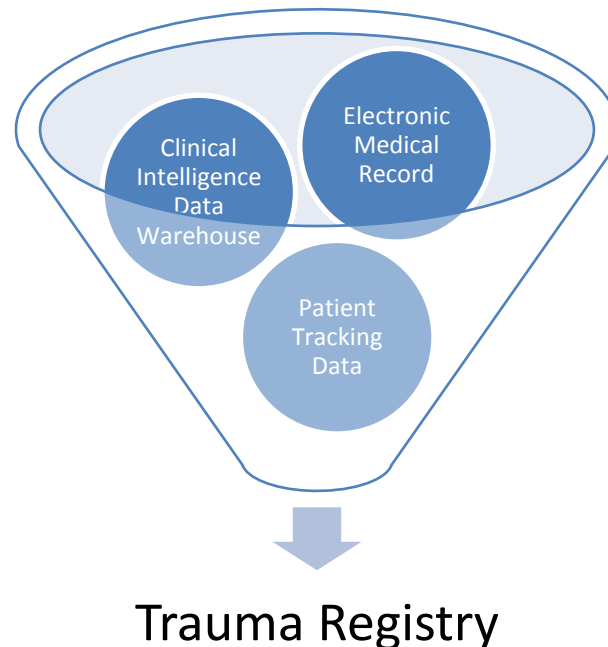
Ready

100%



# Analytical Optimization

- Quantitatively & Qualitatively robust data are essential for optimal data analysis
- Utilizing the full spectrum of data resources (**and human resources**) to support the trauma registry is key...



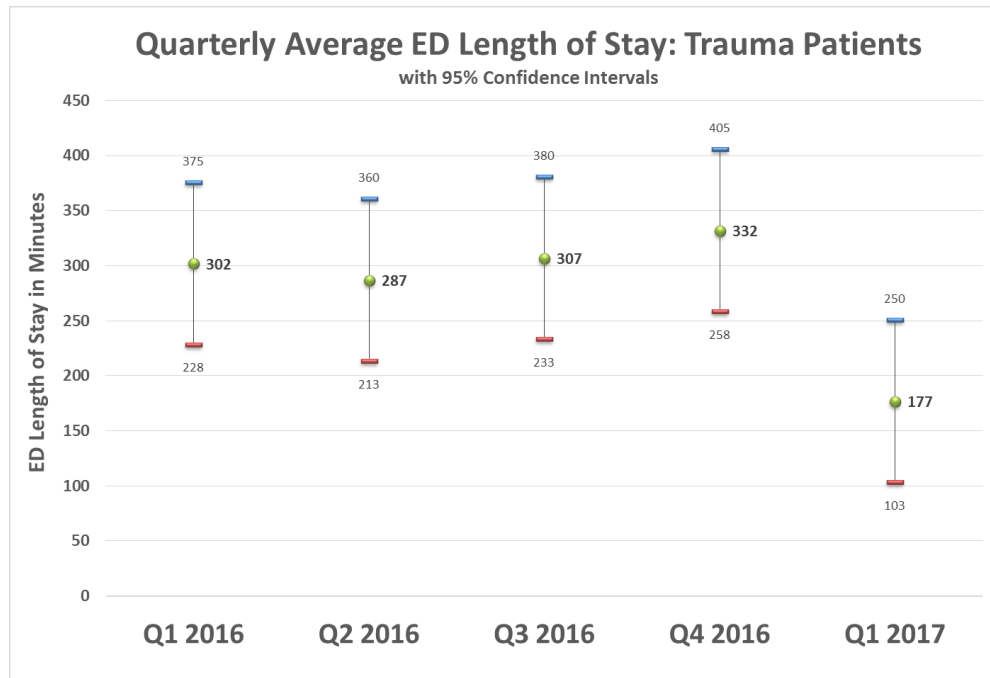
# Analytical Optimization



**Analytic Excellence Leads to Better Decisions**

# Analytical Optimization

- Keep issues in perspective...remember random variation occurs with or without external influence
- Take advantage of statistical testing to support the decision making process (e.g. TQIP / MTQIP type reports)



# Analytical Optimization

- Utilize tools in Excel to analyze data (if no other software is available) – *activate “Analysis ToolPak” in Options: Add-Ins*
- Statistical formulas can also be created in Excel to help determine if rates of change are “significant” or not (e.g.  $=IF((ABS(A2-B2))>(((SQRT(((A2^2)/C2)+((B2^2)/D2))))*1.96)),"YES","NO")$ )

	A	B	C	D	E	F	G	H
1	Undertriage Rate 1	Undertriage Rate 2	Undertriage Incidents 1	Undertriage Incidents 2	Statistically Significant Difference?			
2	5%	16%	7	20	YES			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Enter Rates and corresponding count of Incidents

Stat Sig Test for Rates

# Analytical Optimization

- Though reports are typically presented as descriptive statistics (showing what is happening NOT why it is happening), the audience will often draw their own conclusions
- These inferential conclusions are often based on presentation, explanation and understanding of the data/issue
- Be aware of possible alternative explanations for changes in the data over time...not just the more obvious

# Analytical Optimization

- Present data with meaningful time units (e.g. quarterly vs. monthly)
- Be aware that horizontal axis (time units) and/or vertical axis (quantitative units) can skew perceptions
- Remember that there are often cyclical/seasonal trends that can cause month-to-month variation (avoid tail-chasing)
- Data stability (e.g. rare events unstable)...reporting period/frequency should be appropriate

# Analytical Optimization

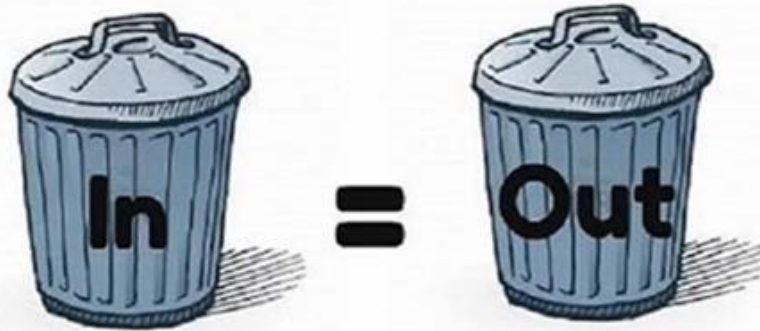
- Do not present data you do not understand (data interpretation requires a well-reasoned argument and, typically, local hospital knowledge)



- Remember: whether or not a particular event results in a failure it is often a matter of chance, so it will not necessarily reflect whether or not a hazard is under control...the absence of “failures” in the trauma registry does not necessarily mean underlying issues do not still remain

# Conclusion

Let's talk about data!



AMERICAN COLLEGE OF SURGEONS  
*Inspiring Quality:  
Highest Standards, Better Outcomes*

ACS  
**tqip**  
TRAUMA  
QUALITY  
IMPROVEMENT  
PROGRAM

© American College of Surgeons 2017. All rights reserved Worldwide.