



Data-Informed Decision Making

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Summary

Discuss how to use data in a number of ways to **guide** action for improvement and help **aid** the decision-making process



Objectives

Understand Data-driven vs. Data-informed:

- Understand the differences between making decisions solely based on data, and making decisions that integrate data insights with subject matter expertise, intuition, and context

Learn to Select Appropriate Tools and Data Visualization Techniques for Informed Decision-Making:

- Explore a range of tools and methods for **collecting**, **analyzing**, and **visualizing** data

Review and reaffirm learnings with a fun "Kahoot" trivia game

- Winner will have bragging rights that last a lifetime



Data-informed vs Data-Driven:

Fundamental differences between Data-Driven and Data-Informed:

Data-driven: You let the data guide your decision-making process

Data-informed: You let data act as a check on your intuition

Data alone never tells the full story

We end up over optimizing

Being data informed means using both intuition and data to produce testable hypotheses



Data Informed Decision Making

- Few decisions are made wholly on quantitative data
- Most successful approaches blend human intuition with data
- Humans have access to a lifetime of experiences and observations on human behavior, which is more nuanced than an analytical data set
- For this reason, humans are more adept at synthesizing information, anticipating anomalies and creating solutions that data models miss



Washington

28°

Sunny

H:32° L:15°



Partly cloudy conditions expected around 6PM.

Now	1PM	2PM	3PM	4PM	5PM
					
28°	30°	32°	32°	31°	30°



Implementing Data-Informed Decision Making

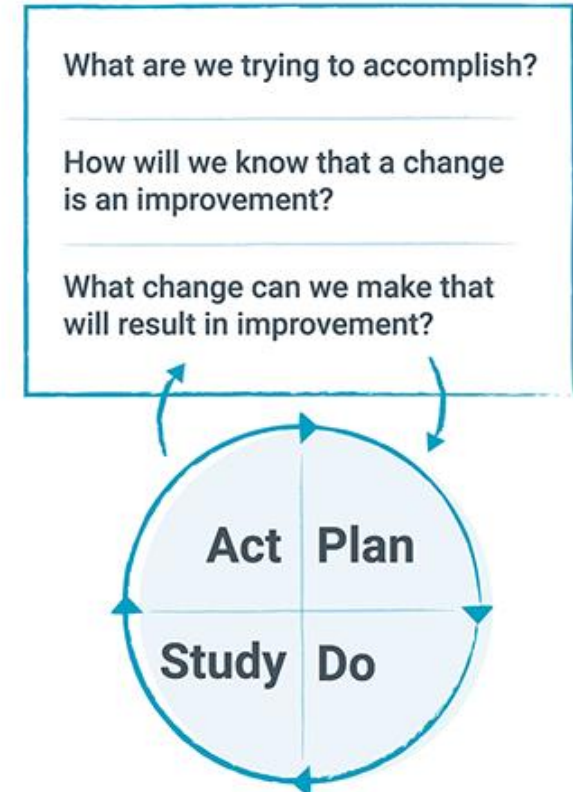


Requires access to useful data, in addition to

- Well-designed supports such as a leadership to model data use and supported time for reflection on data
- Collaboration with colleagues
- Adopting a continuous improvement [Quality Improvement] perspective with goal setting, measurement, and feedback loops (PDSA cycles)

Barriers:

- Lack of expertise in data analysis
- Can locate data needed but lack data literacy skills



Source: Adapted from The Improvement Guide (2009)

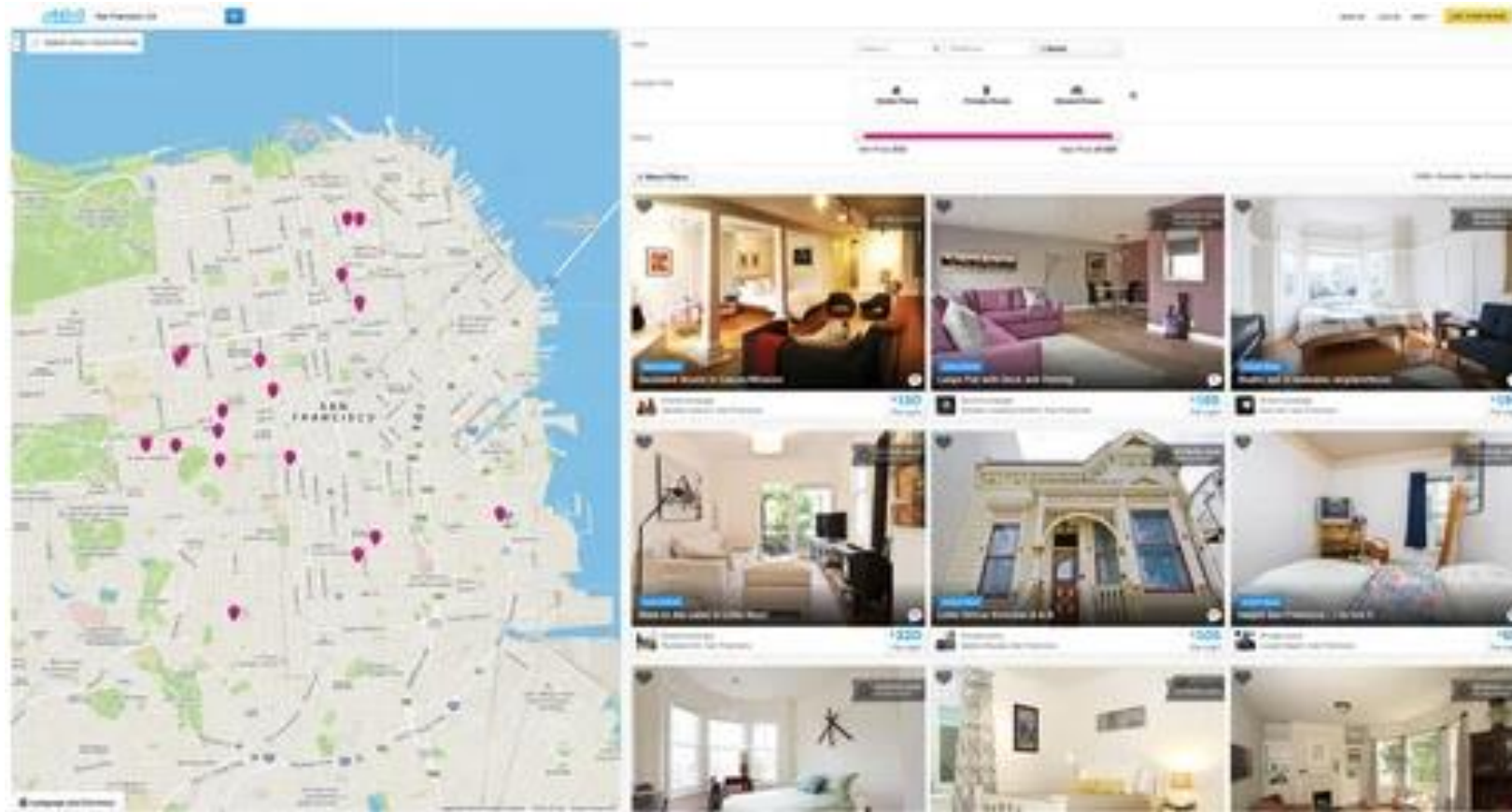
AirBnB Case Study



The screenshot shows the Airbnb search interface for London. At the top, the search bar includes the location 'London', check-in and check-out dates, and the number of guests '1 Guest'. A green 'SEARCH' button is visible. Below the search bar, a blue banner reads 'Going to London? Visit the Airbnb Neighbourhood Guide to London!'. The main content area displays a list of rental options with a sidebar for filters. The sidebar includes a map, 'Room type' (Entire home/apt, Private room, Shared room), 'Price' (a range slider from \$10 to \$1000), and 'Connections'. The rental list shows five items, each with a thumbnail, title, location, price per night, and a 'SHARE' button.

Room type	Price	Connections
Private room	\$82	99+
Private room	\$80	31
Private room	\$82	99+
Private room	\$82	66
Entire home/apt	\$99	85

AirBnB Case Study



AirBnB Case Study



The screenshot shows the Airbnb search results for San Francisco. The search parameters are: San Francisco, Weekend in Apr, May, 2 guests. The page displays two listings and a map.

Listing 1: Remodeled Studio for a Staycation; Easy Par...

- Location: Entire guest suite in Twin Peaks
- Capacity: 2 guests · Studio · 1 bed · 1 bath
- Amenities: Wifi · Kitchen · Self check-in
- Dates: Apr 22 - 24
- Rating: 4.83 (208 reviews)
- Price: ~~\$399~~ \$135 / night (Total: \$422)

Listing 2: Live like you own Church street in SF

- Location: Entire rental unit in Mission District
- Capacity: 2 guests · 1 bedroom · 2 beds · 1 bath
- Amenities: Wifi · Kitchen · Washer · Self check-in
- Dates: Apr 1 - 3
- Price: \$180 / night

Map: A map of San Francisco showing various price points for stays in different neighborhoods. Price points include \$165, \$100, \$149, \$111, \$155, \$215, \$180, \$135, \$160, \$95, \$106, \$143, \$90, \$100, \$100, \$86, and \$90.



Voice of Customer

We must listen to the Voice of the Customer before we can set our Quality Improvement goal:

- Who is our Customer?
- What's important to the customer?
- What's the customer's experience and expectation

What are the key requirements to addressing the problem or Global Aim?





Fundamental Tools in Quality Improvement

Run Chart – Study variation in data over time; understand the impact of changes

Pareto Chart – Focus on areas of improvement with greatest impact

Control Charts - Distinguish between special cause and common cause variation

Frequency Charts – Understand location, spread, shape, and patterns of data



Drill Down Pathway Analysis

- Identify aggregate measure of interest and clarify the measure
- Obtain the data to create the aggregate measure and create a run or control chart for the measure
- Drill down into the measure:
 - By organization unit (placing all units on the same control chart)
 - By placing each unit on its own chart
- Use rational subgrouping with control charts to learn more about the causal system for the measure
- Use SPC tools to learn from the data (PDSA cycles)



Stratification

- Involves separation and classification of data according to selected variables or factors
- Object is to find patterns that help in understanding causal mechanisms
- In drill down, stratification will refer specifically to disaggregation, separating data from different organizational units (time periods, departments, regions, etc.)

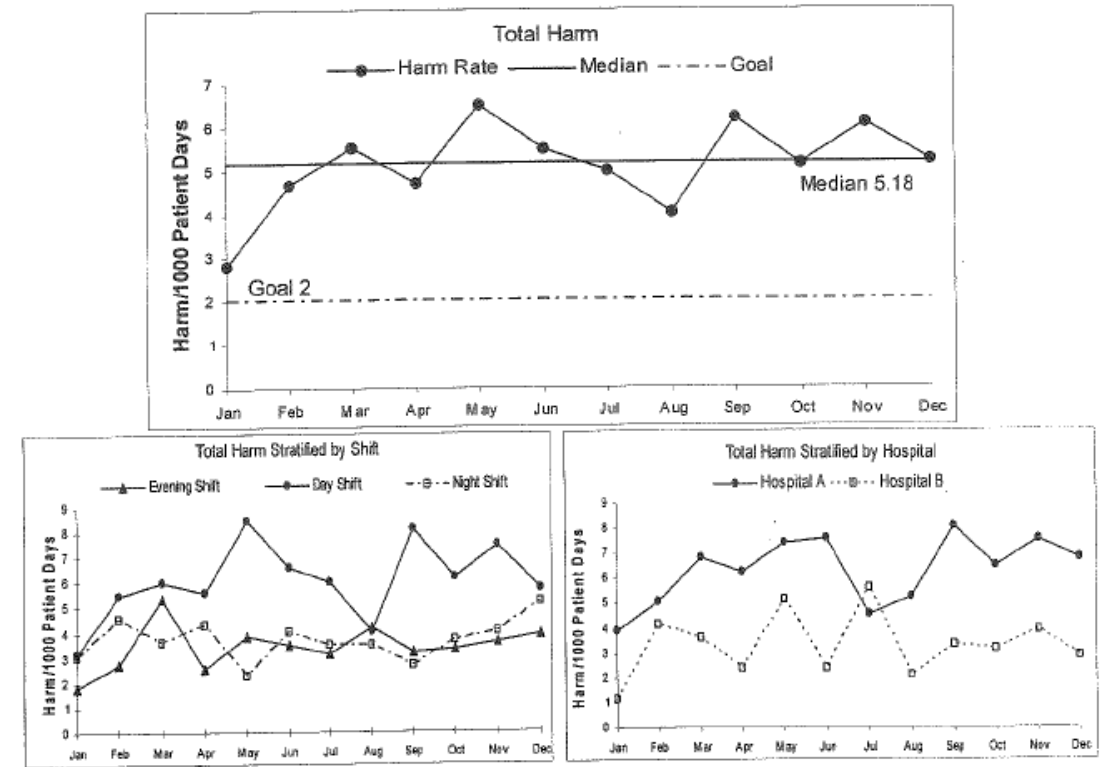


Figure 3.38: Stratification Using a Run Chart



Could YOU Use Stratification?

Think of a QI project or process or outcome measure in your work

- What factors could you use to stratify your data?
- What are your hypotheses for what your charts may show?





Sequencing

- Temporal ordering of data – most often in run charts
- Simple, easy first step before creating a control chart
- Good for small multiples
- Simple to understand variation



Rational Subgrouping

Organizing a group of measurements into meaningful groups in order to find patterns to help in understanding causal relationships to a process

When to Use:

- Special Cause Drilldown
- Help teams identify opportunities for improvement or WHERE to test changes
- See if interventions are working if it's not obvious on the “system” chart

Source: Amy Anneken, Data Scientist, James M Anderson Center for Health Excellence - Intermediate SPC Methods & Analytic Best Practices using Improvement Science to Change the Outcome



Guiding Principles

The conceptual foundation of Shewhart's control charts is the notion of rational sampling and rational subgrouping.

“How the data are collected, how they are arranged into subgroups, and how these subgroups are placed on the charts must be based upon the context for the data, the sources of variation present in the data, the questions to be addressed by the charts, and the use to be made of the knowledge gained.”



Rational Subgrouping

Idea: Organize process data where the greatest chance for the data in each subgroup to be alike (WITHIN SUBGROUP VARIABILITY) and greatest chance for data in other subgroups be different (BETWEEN SUBGROUP VARIABILITY).

Common Cause is WITHIN the subgroup, and special causes are BETWEEN the subgroup

Most Common: Time, but quite often not enough to help teams figure out where to improve their processes.

Knowledge or Theories about the process help determine subgrouping strategies to try....

Rational Subgrouping Ideas for Healthcare



Measure (situation)

Adverse Drug Events
 Length of Stay
 Nosocomial Infections
 Diabetes Control
 Falls (long term care)
 Compliance with Meds

Possible Rational Subgrouping Strategies

units, shifts, drug category, method of administration
 diagnostic group (DRG), provider, unit, categories of patient age
 location, type of organism, method of transmission
 care options, provider, patient characteristics
 unit, risk level, age, sex or other patient characteristics
 housing situation, diagnosis, provider, geographic location

Variation within subgroup is your best estimate of common cause variation.

Area	Application	Measure	Possible Subgroup Strategy
Overall	chronic care satisfaction satisfaction financial	# in registry employee sat. score patient sat. score revenue accounts receivable	specific disease/provider employee categories location/categories of patients /service service line/DRG payer
ED	efficiency productivity	waiting time average cycle time patients seen/hour	day of week/time of day provider/shift/type patient provider
ICU	productivity	# bed turns LOS	DRG/Provider/age DRG/payer
Surgery	workload timeliness	# surgeries min. vary from schd. start	provider/procedure/location day/location/provider
Outpatient	workload diabetic care	# patient visits average HbA1C	day/provider care-option/provider/ pt. characteristics
Long Term Care	workload quality care	resident days # medication doses hours of social activity	unit/payer day/shift/staff category resident/sex/age categories/day of week
Behavioral Health	workload satisfaction care	# client visits client rating of provider ave. days sobriety	day/provider/type visit/location client category/diagnosis/ program/provider/pt. characteristics

Table 5.1: Applications of Shewhart Charts for Continuous Data in Health Care

Rational Subgrouping - System Wide Adverse Drug Event

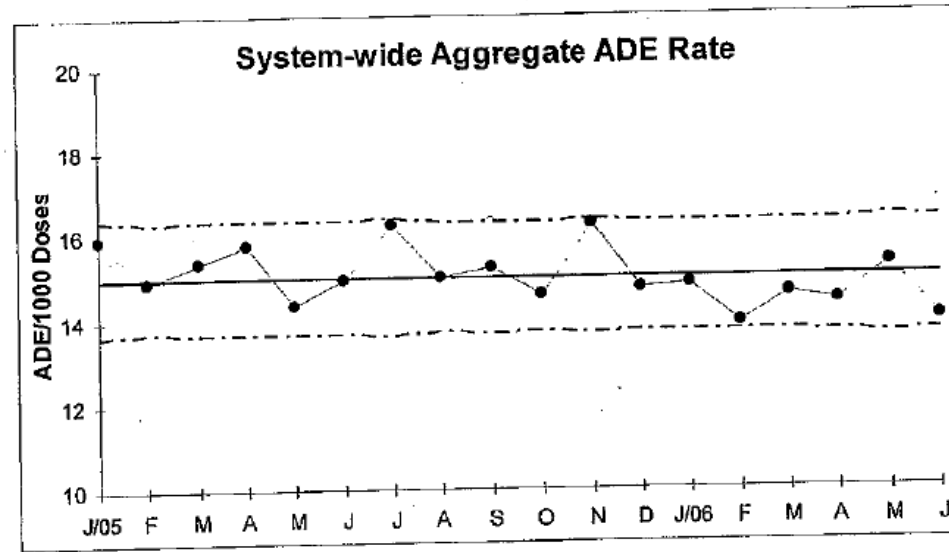


Figure 5.10: System-wide ADE Rate

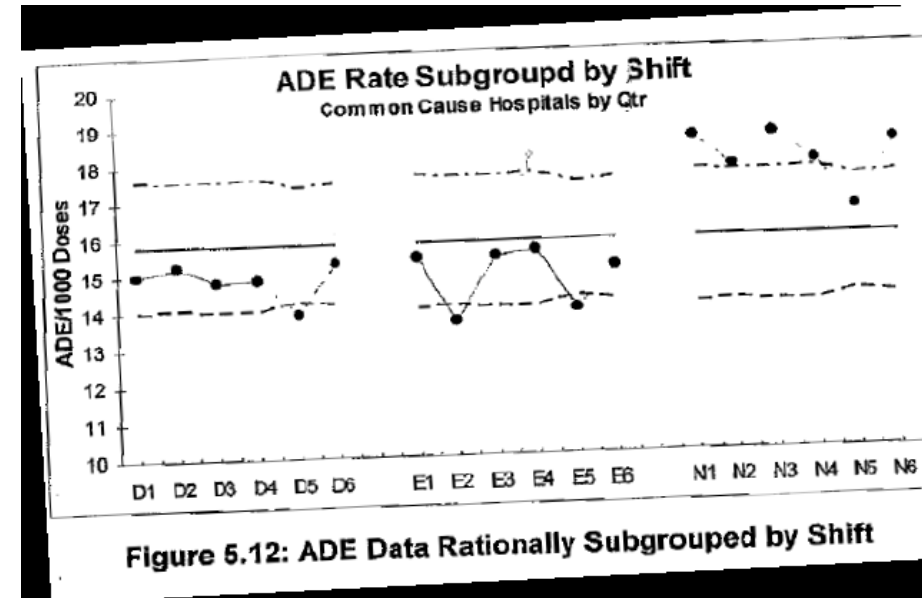


Figure 5.12: ADE Data Rationally Subgrouped by Shift

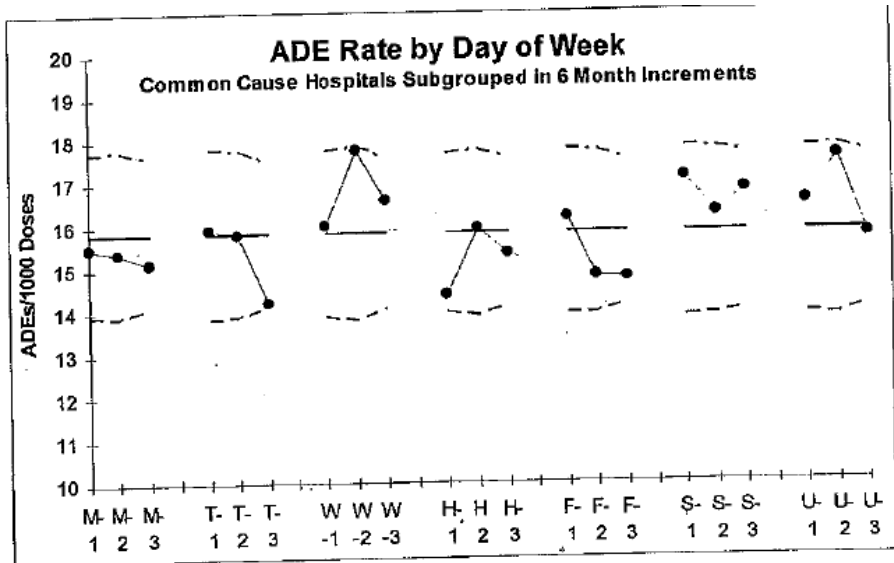


Figure 5.11: ADE Data Rationally Subgrouped by Day of the Week



Funnel Charts

- Special type of rational subgrouping used for attribute data
- Charts are for a single time frame
- Great for understanding baseline data and special cause

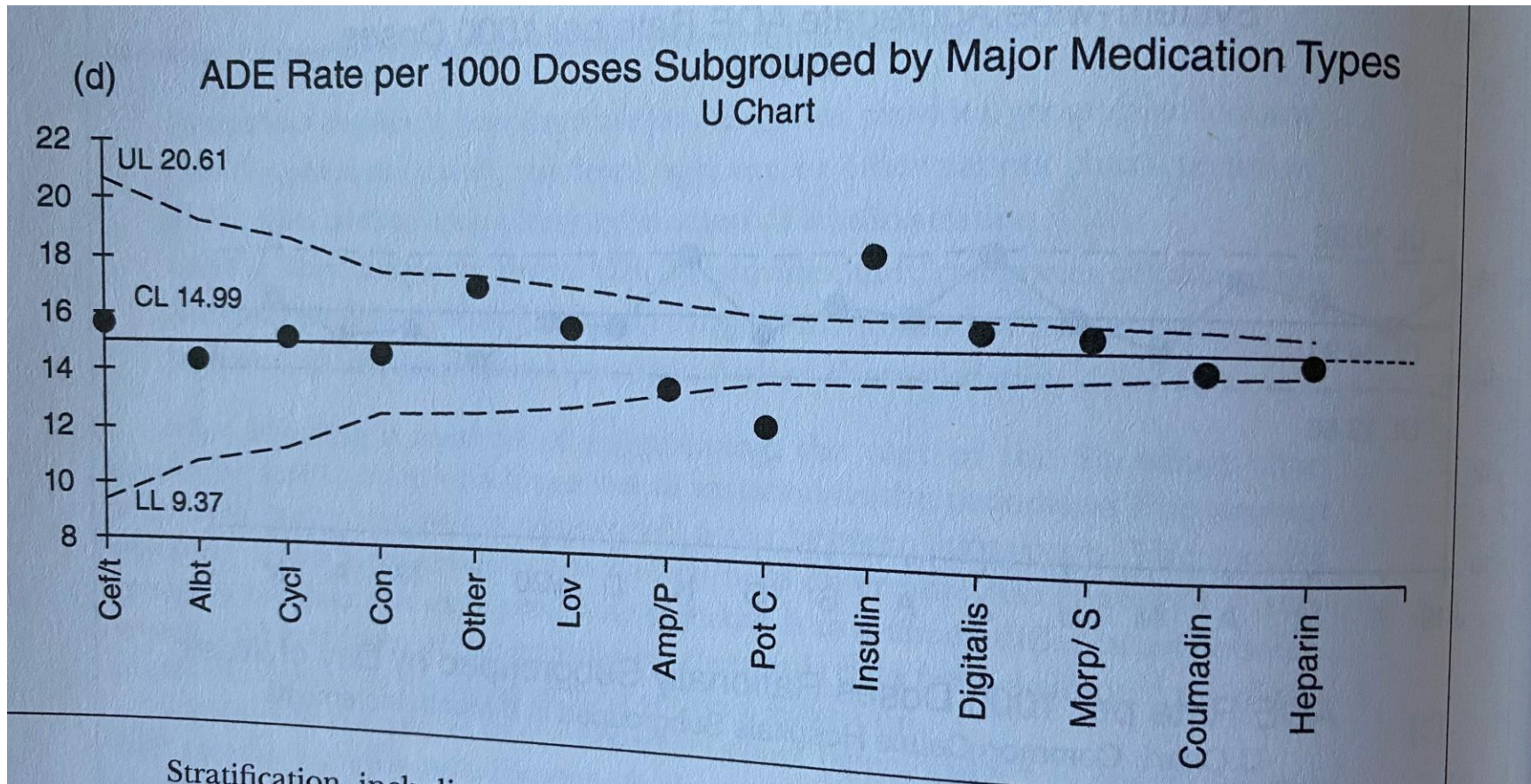
What kinds of questions can you answer with a funnel chart?

- Are units/providers performing at the same level?
- Where do I begin to think about PDSA's?
- How can I show how units are doing when sample sizes are different from each other?

Funnel Charts



Limits are created by sequencing the data in order of subgroup size, rather than sequencing by size.

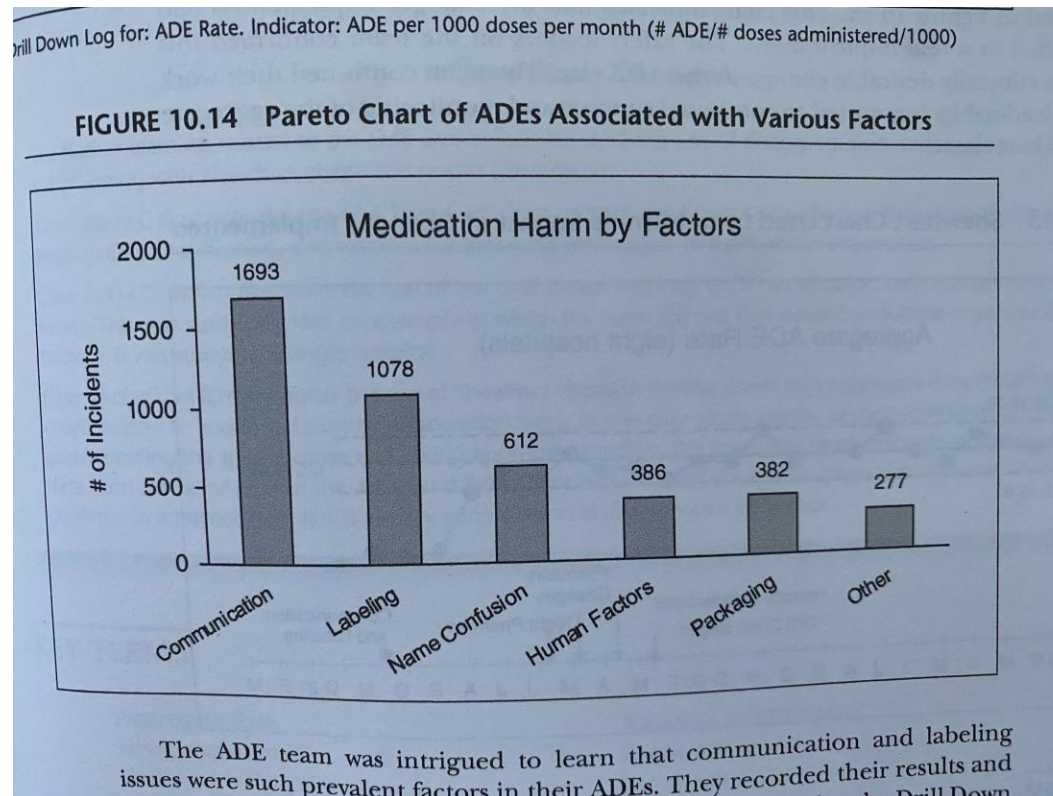


Source: Provost & Murray, "The Health Care Data Learning from Data for Improvement", Chapter 4

Pareto Charts



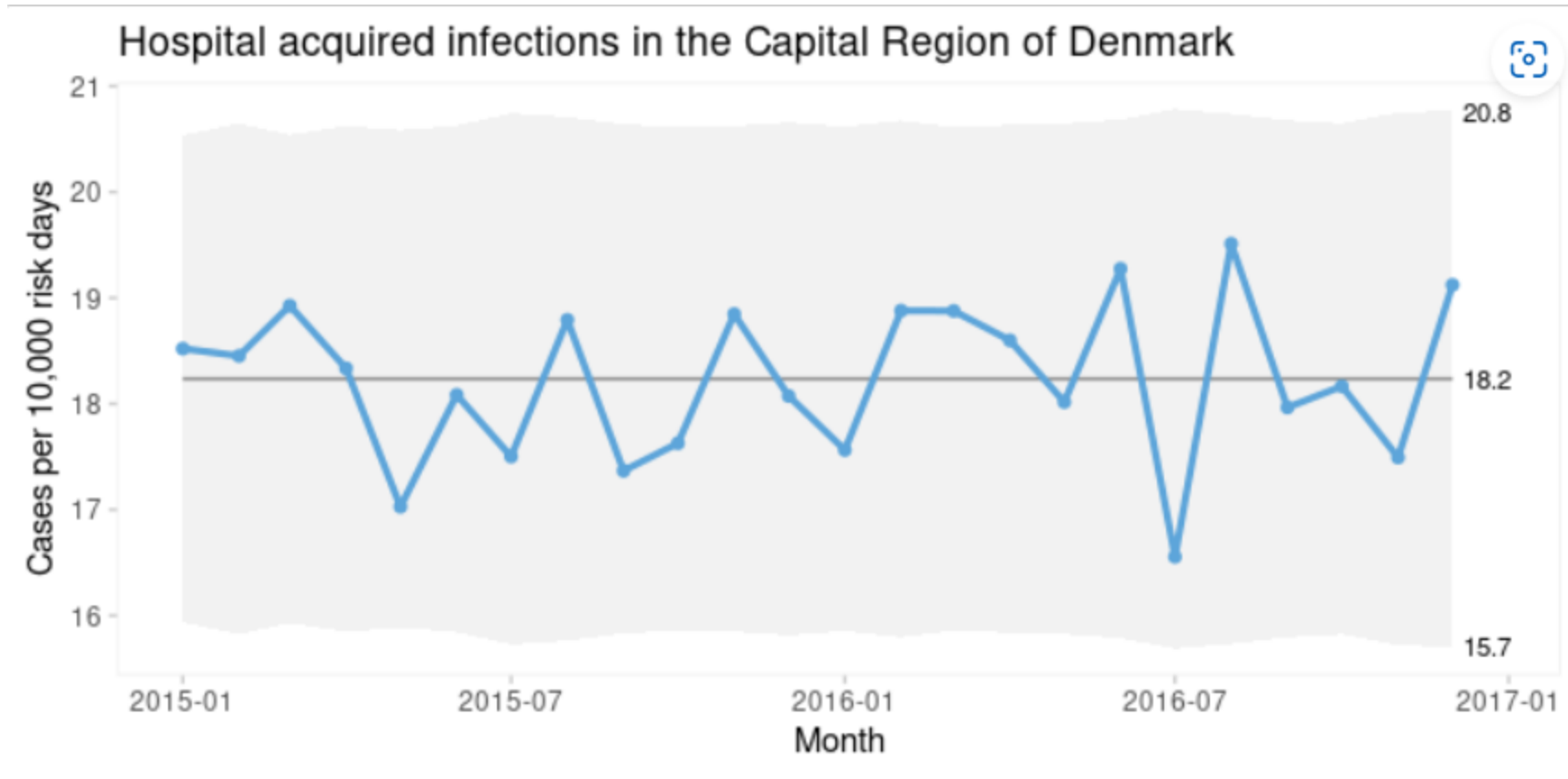
- Used in conjunction with a run or control chart to understand variability
- Select and define logical categories for the topic in question and obtain the data
- Bar chart with categories displayed in descending order of prevalence



Source: Provost & Murray, "The Health Care Data Learning from Data for Improvement", Chapters 6, 10

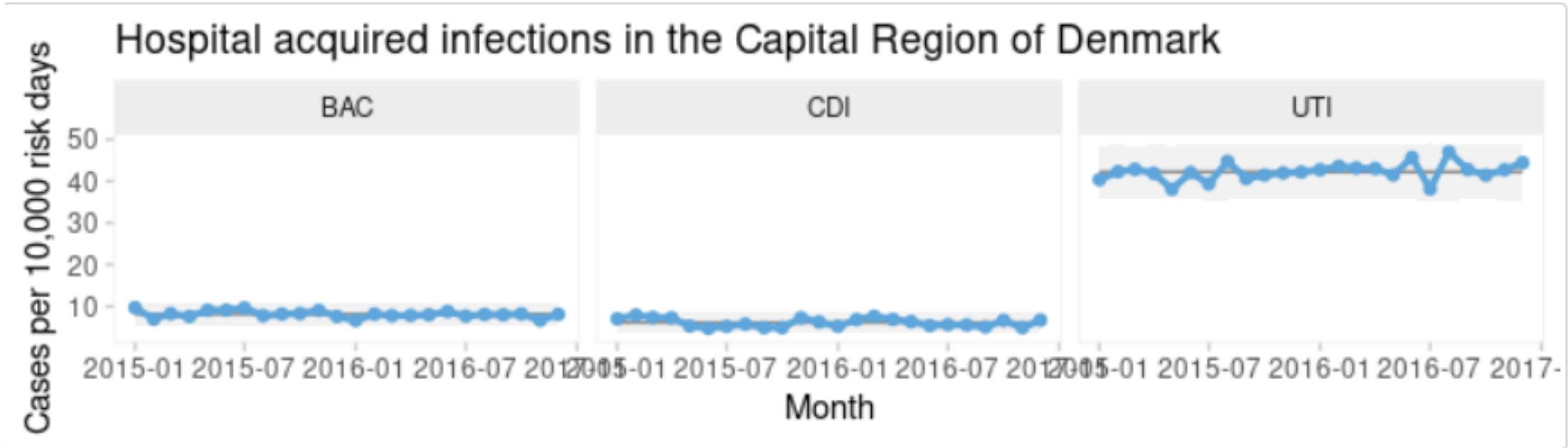
CASE STUDY

Rational Subgrouping – Hospital Acquired Infections in Denmark

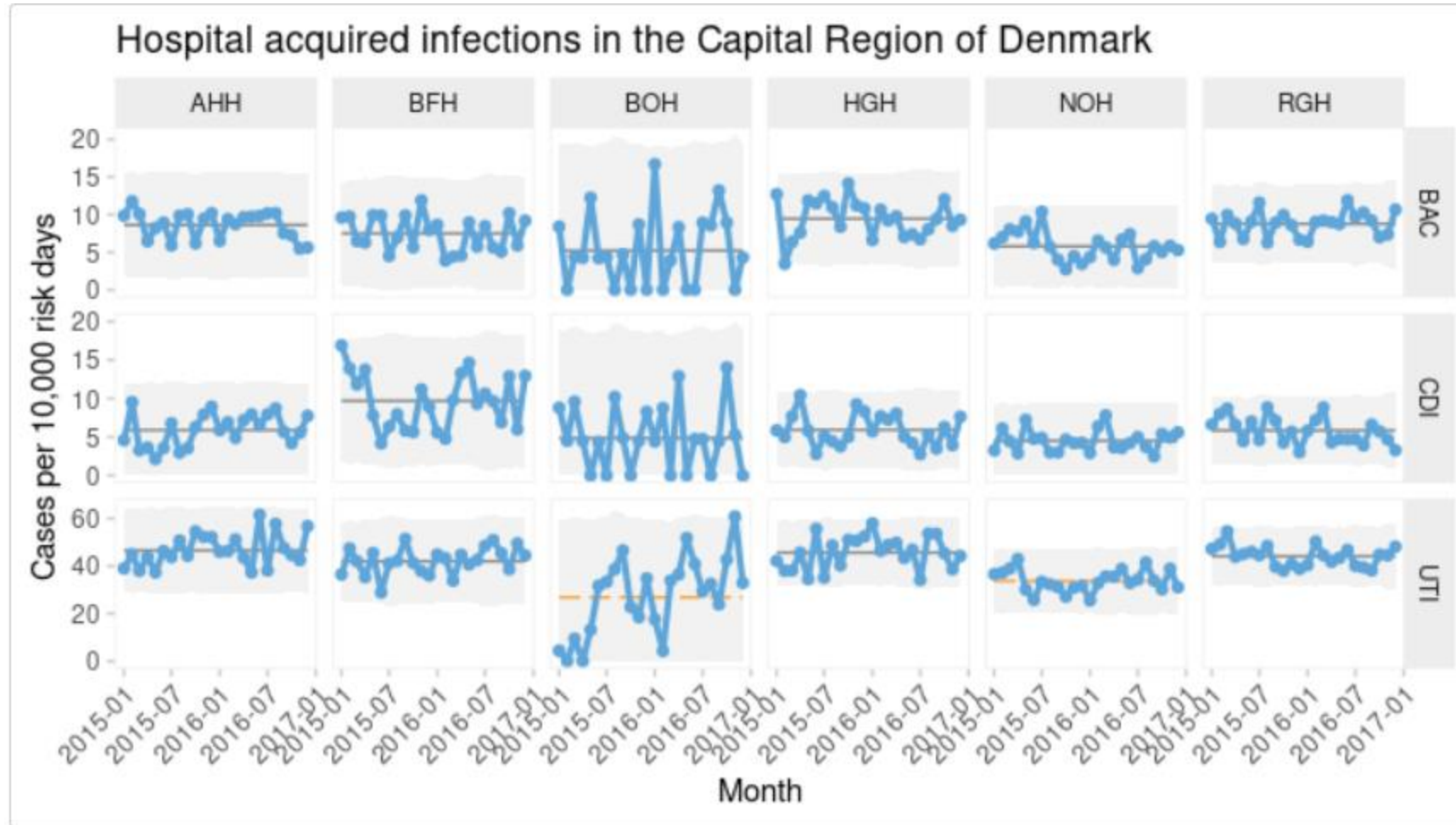


Source: [Quality Improvement Charts \(r-project.org\)](http://QualityImprovementCharts(r-project.org))

U Chart by Infection

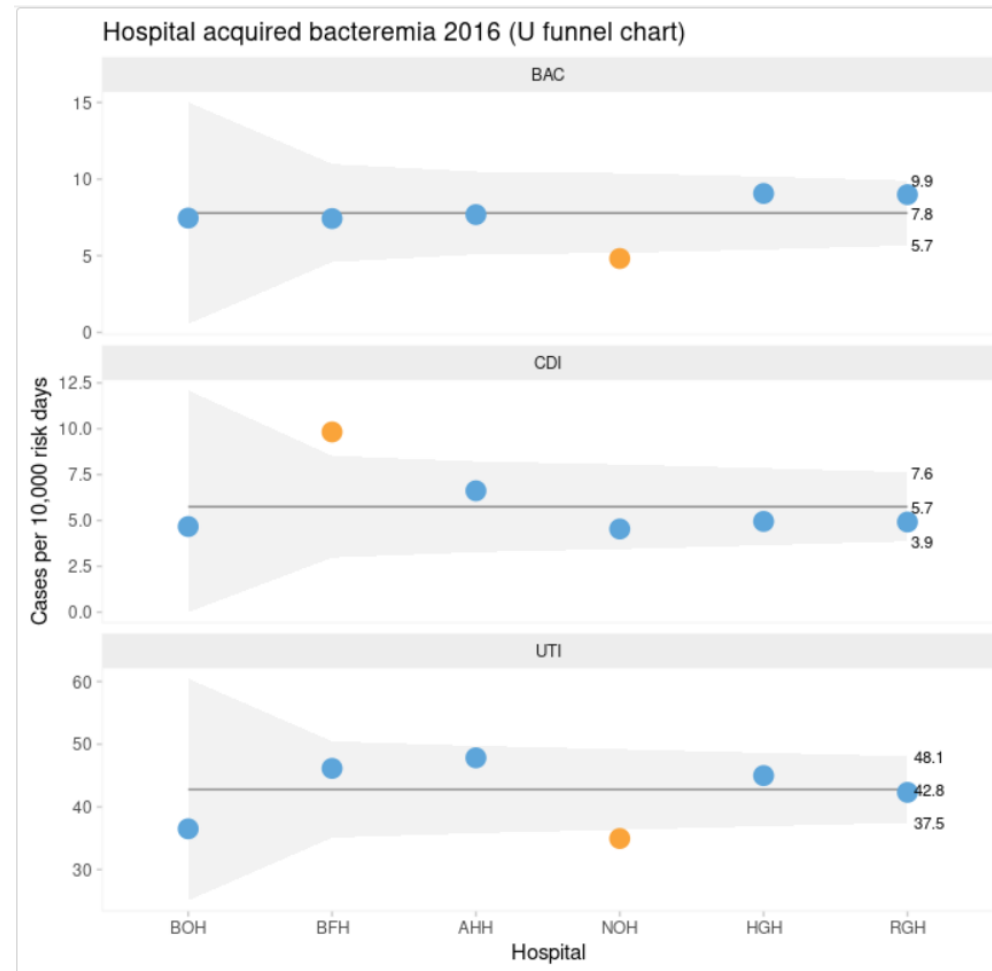


Infections By Hospital





Funnel Charts



Source: [Quality Improvement Charts \(r-project.org\)](http://QualityImprovementCharts(r-project.org))

QUIZ TIME



Kahoot!





Reach out with questions or comments

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