

Information Management

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قريباً



دورة متقدمة للكوادر الصحية

إدارة البيانات والسبع أدوات لجودتها

Information management and seven tools of quality

- Goal of IM
- Data/information management process steps
- Basic concepts related to IM
- Quality data sources
- Data collection tools epidemiological measures.
- Apply sampling methodology for data collection
- Use statistics to describe data.
- Be able to interpret data to support decision making
- Discuss 7 tools of quality and their function and uses

**In God we
trust, all
others bring
data.**

—William E. Deming



- *“In God we trust, all others must use data.”*

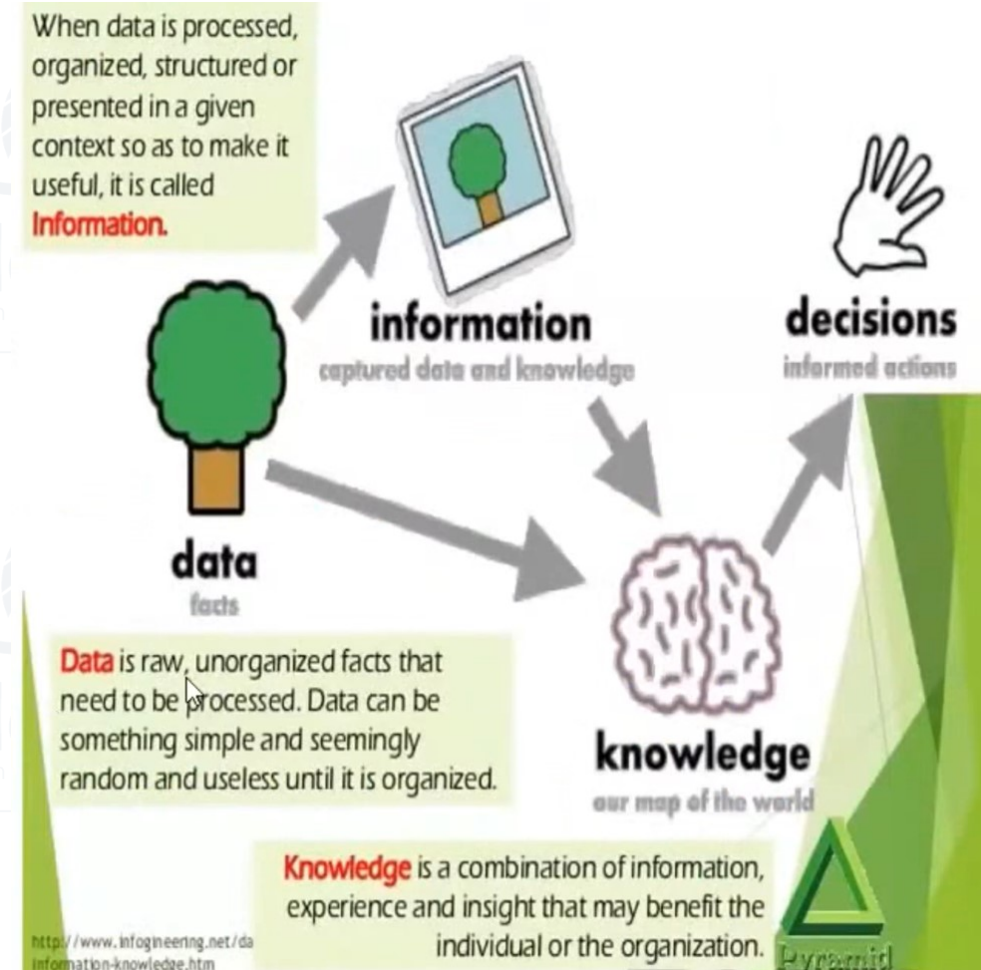


Information management lecture outline

- Goal of IM
- Data/information management process steps
- Basic concepts related to IM
- Quality data sources
- Data collection tools
- epidemiological measures.
- Apply sampling methodology for data collection
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Information Management

- **Data:** un-interpreted observation of facts.
- Data: raw, unanalyzed, unorganized, unrelated, uninterpreted observations or facts.
- Data left alone is not very informative and it is relatively meaningless.
- **Information :** data transformation through analysis and interpretation into a form useful for decision making.
- Information is the set of data that has already been processed, analyzed, and structured in a meaningful way to become useful
- **Goal:** to support decision making to improve:
 - Patient outcomes
 - Safety
 - Documentation
 - performance



- Combination of information , experience leads to knowledge which can assist in decision making and taking actions.





Month	NO of SSI	Total No of surgery
1	10	264
2	3	90
3	4	99
4	6	122
5	4	131
6	6	176
7	10	165
8	12	220
9	16	211
10	8	153
11	9	123
12	16	185

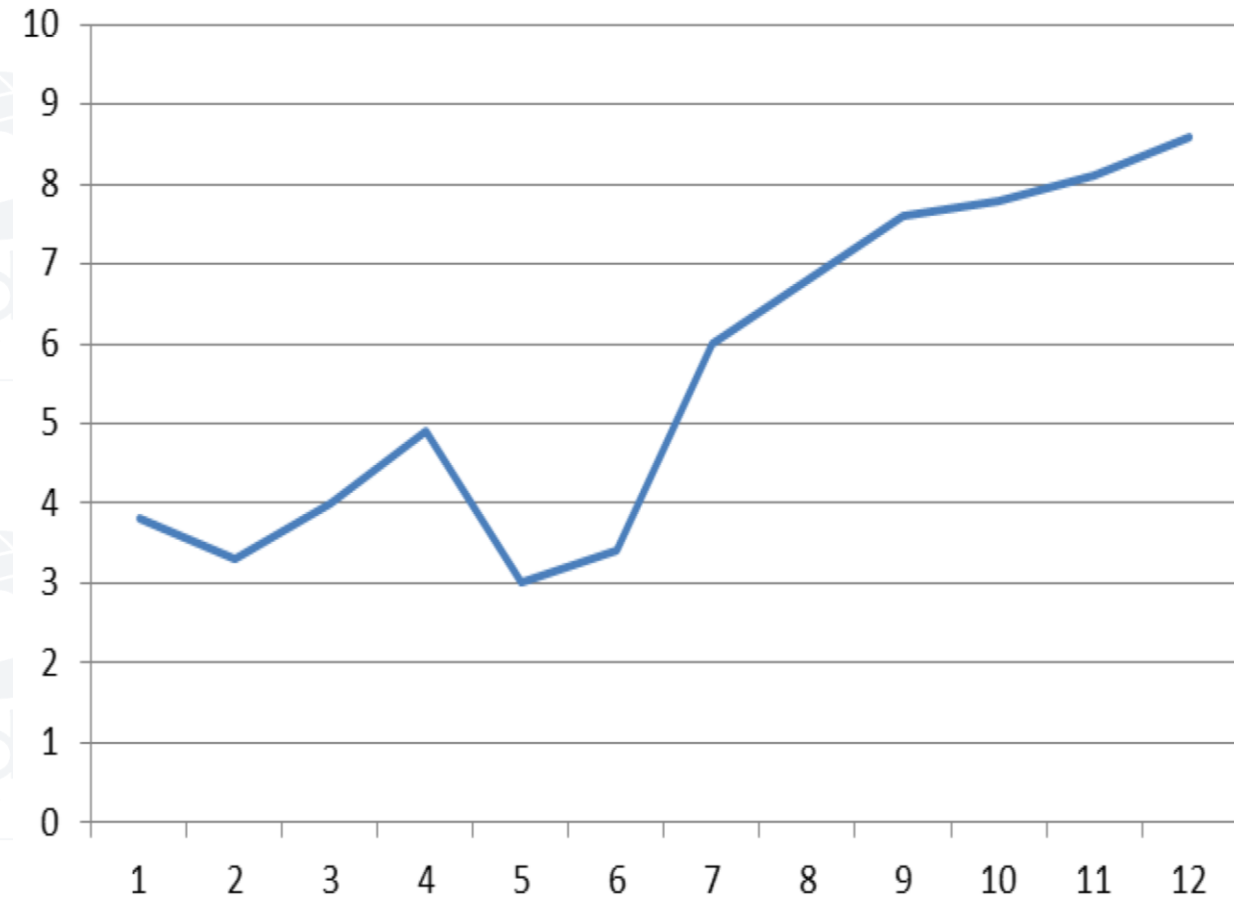
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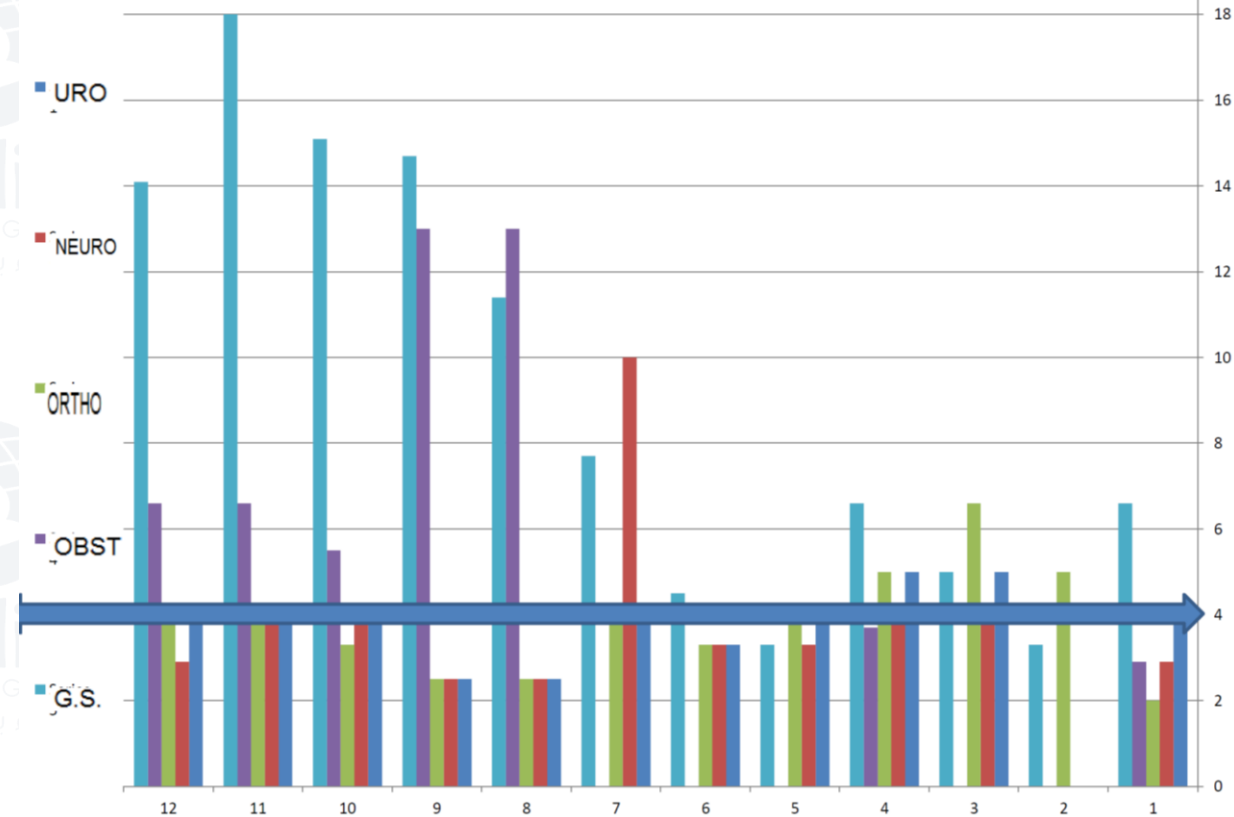
Month	NO of SSI	Total No of surgery	SSI rate
1	10	264	3.8 %
2	3	90	3.3 %
3	4	99	4 %
4	6	122	4.9 %
5	4	131	3 %
6	6	176	3.4 %
7	10	165	6 %
8	15	220	6.8 %
9	16	211	7.6 %
10	12	153	7.8 %
11	10	123	8.1 %
12	16	185	8.6 %

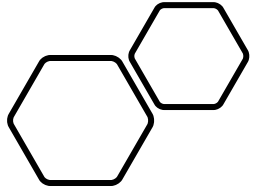




Month	G.S.	Obstetric	orthopedic S.	Neurosurgery	Urosurgery
1	6.6	2.9	2	2.9	4
2	3.3	0	5	0	0
3	5	0	6.6	4	5
4	6.6	3.7	5	4	5
5	3.3	0	4	3.3	4
6	4.5	0	3.3	3.3	3.3
7	7.7	0	4	10	4
8	11.4	13	2.5	2.5	2.5
9	14.7	13	2.5	2.5	2.5
10	15.1	5.5	3.3	4	4
11	18	6.6	4	4	4
12	14.1	6.6	4	2.9	4

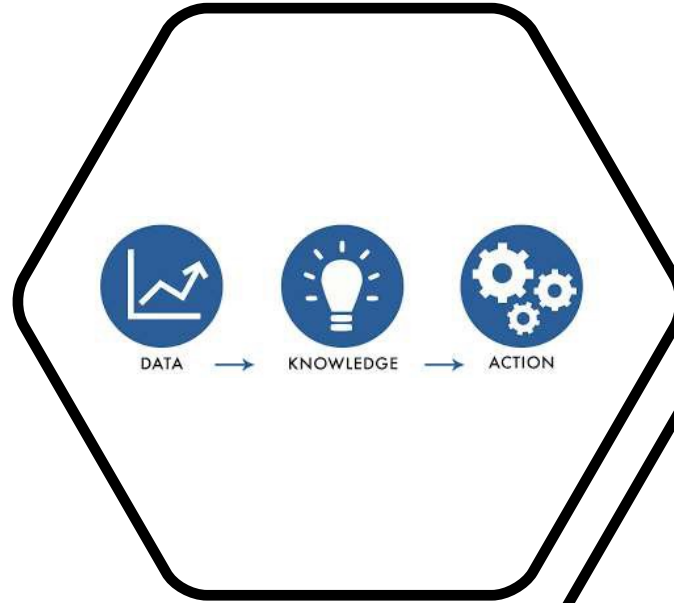
BENCHMARKING

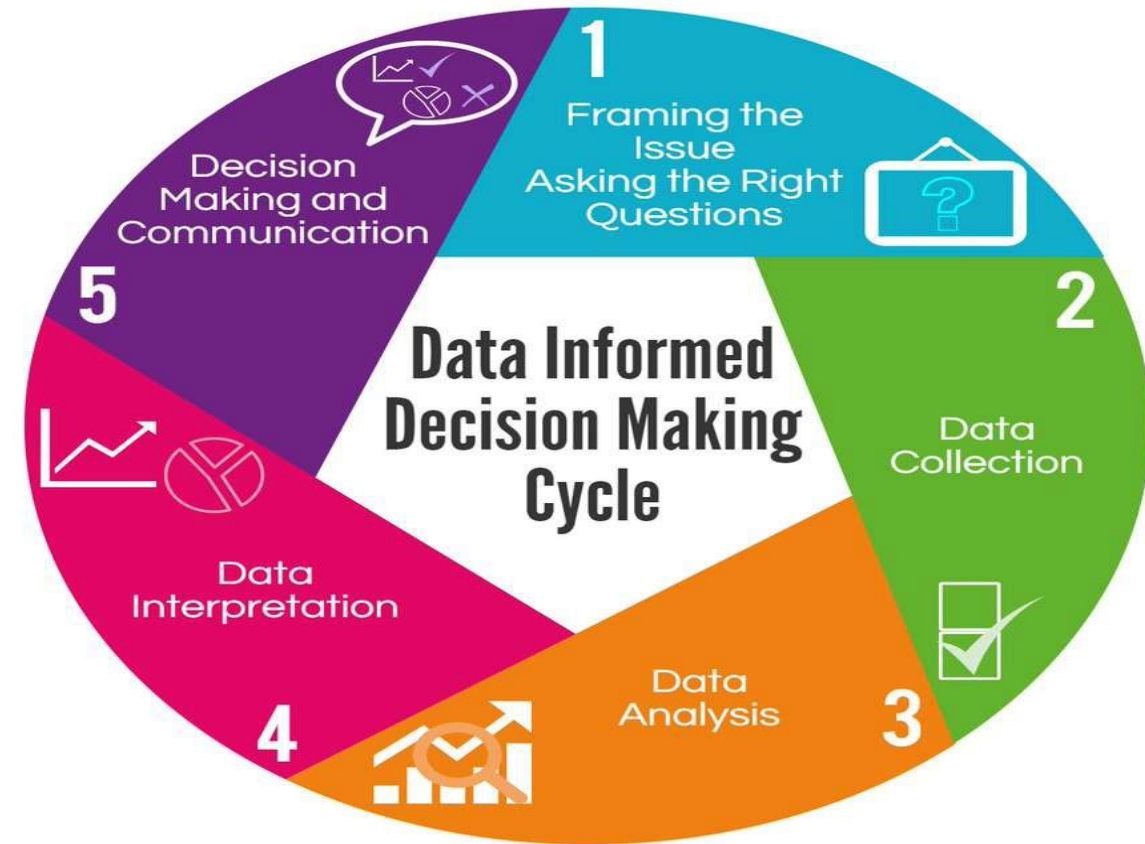
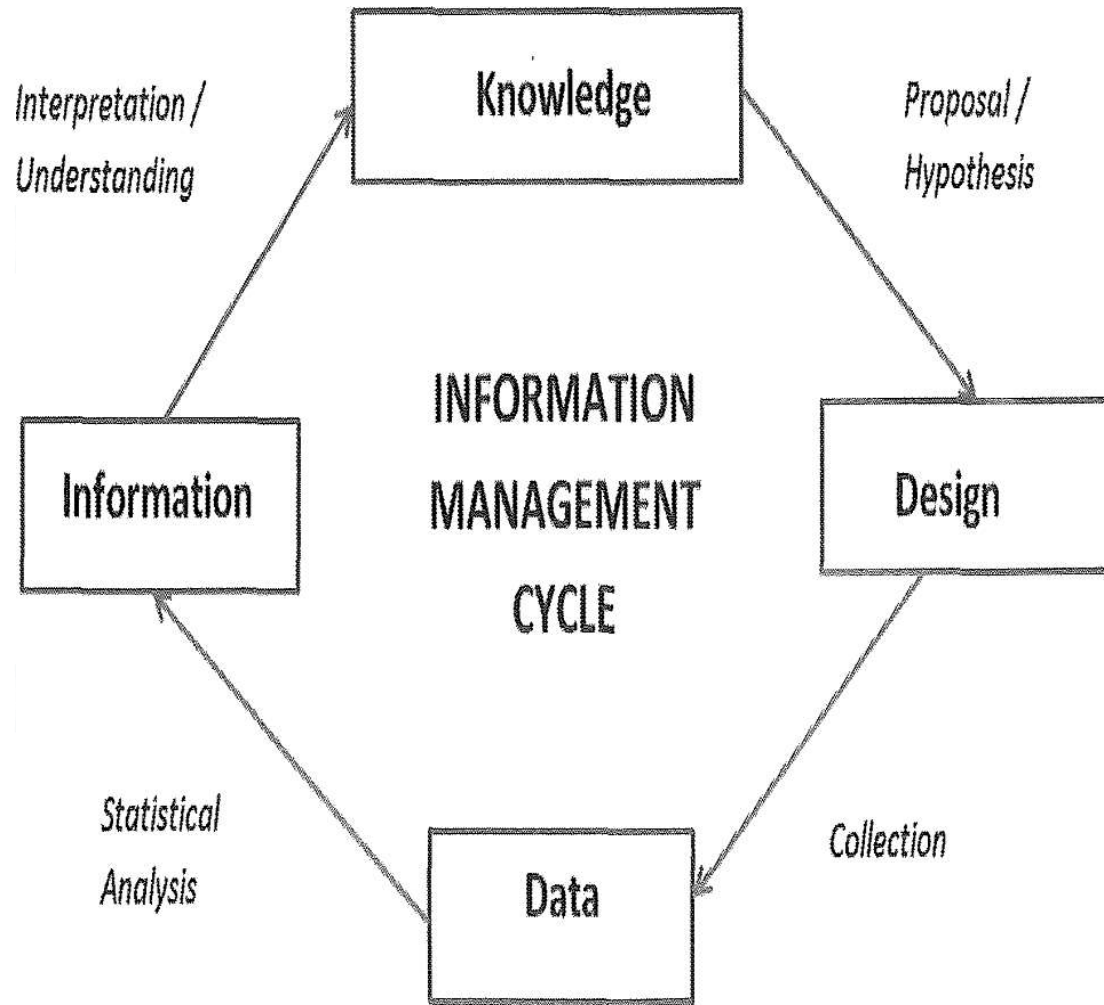




• Goal of IM

- To support decision making to improve:
- Patient outcomes.
- Health documentation.
- Patient safety.
- Performance in patient care , treatment and services.





Data and Information

Data	Information
<ul style="list-style-type: none"> ❑ is the collection of <u>uninterrupted observations</u> or facts (<u>RAW</u>) ❑ (a set of data points that have been collected) <p><u>In example:</u> 3 pts fallen with injury last month.</p>	<ul style="list-style-type: none"> ❑ is what happens when <u>data are aggregated</u> together, <u>analyzed</u>, and <u>interpreted</u> into a form useful for <u>decision-making</u> ❑ (determine what needs to be done to make improvements) <p><u>In example:</u> apply statistics to define the rate, severity, and outcomes.</p>

➤ **The goal of information management is to utilize data to support decision-making to improve processes and outcomes.**



Data Aggregation

Define what will be collected & target of data collection & target population

What groups (teams) are responsible for the data

Define tool of data collection & time frames established for tabulation

Display of raw data, statistical analysis & summarizing and trending over time

Reporting (how and to who)(Graphical way)

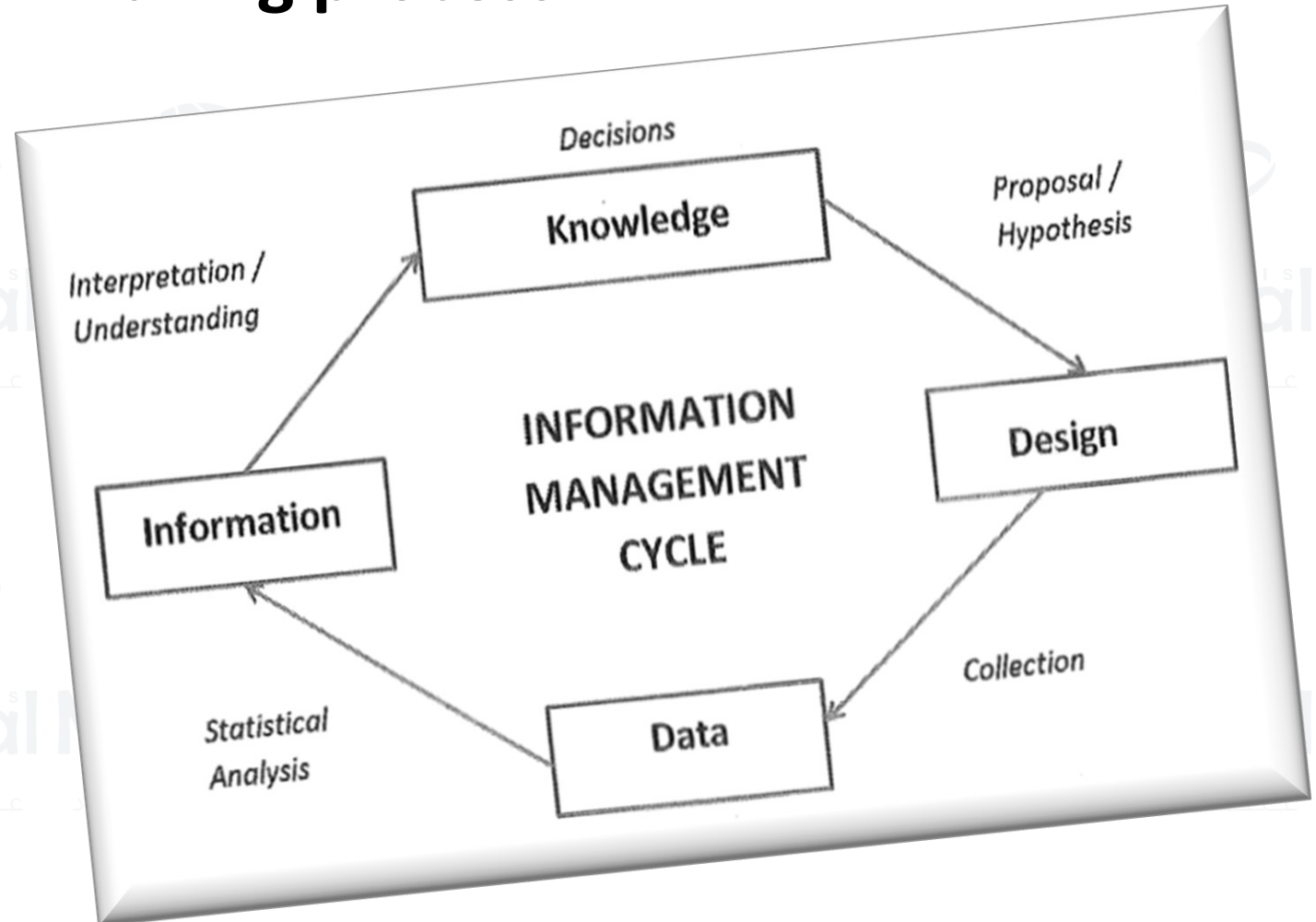
determine the type, cause, or extent of problems, and to determine the type and cause of best practices.

The data must be summarized in ways to permit meaningful interpretation and formulation of accurate conclusions



Decision making process:

- ❑ **Without good data, we rely upon our opinion, logic, intuition, rationalization we had no defined process for decision-making.**
- ❑ **Quality professionals must collaborate with other collectors, analyzers, and users of data to learn of all information resources available.**





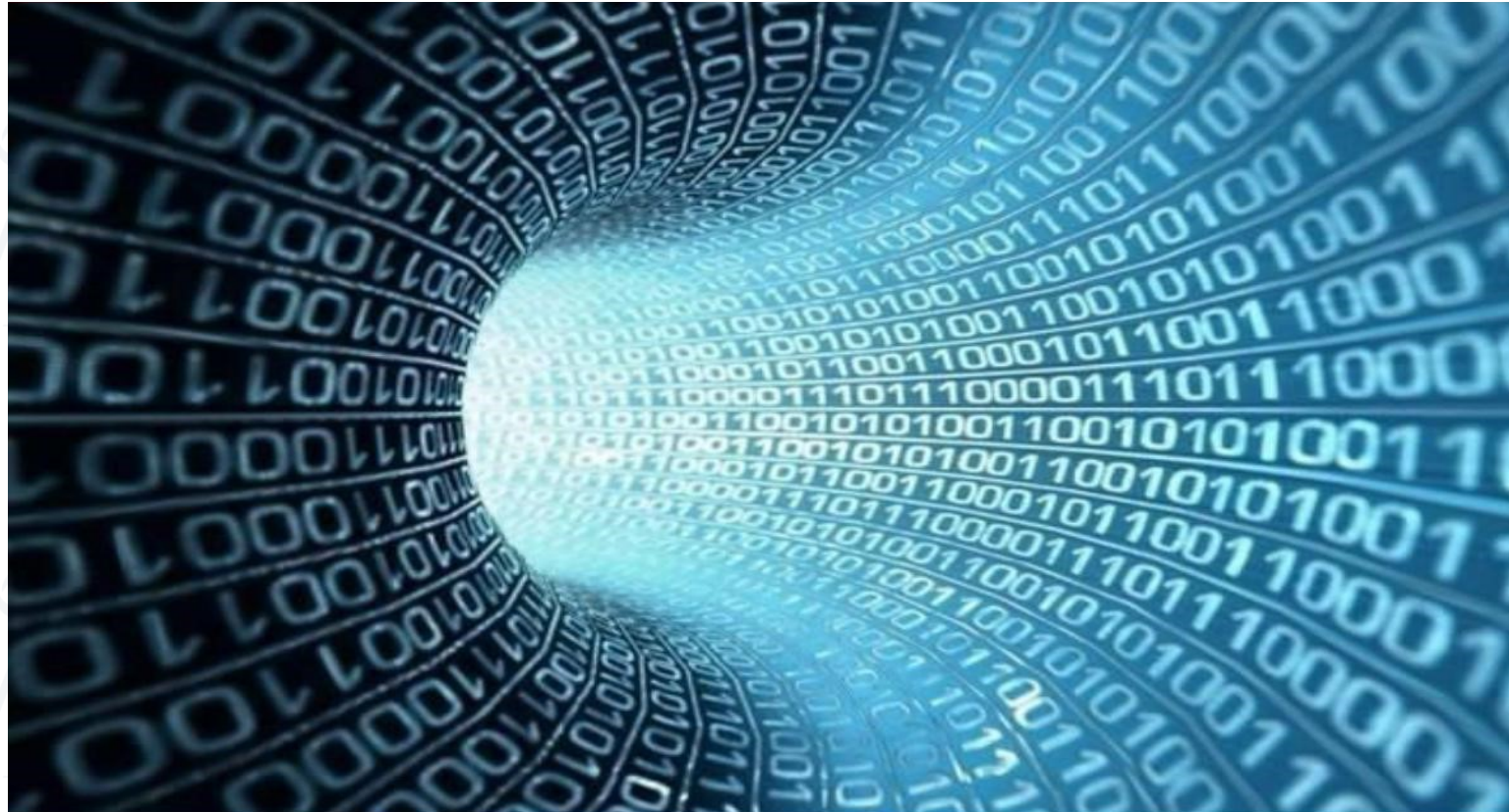
Data management process steps:

- Identify the current available data sources.
- Identify the critical information needs and confidentiality
- Define data collection plan
- Collect, aggregate, and display data.
- Analyze and interpretate data/information
- Act on information/knowledge
- Report decisions.
- Collect more data to monitor decision





Data inventory



Data inventory:

➤ utilized to keep track of all data and related documentation and information that is being created or acquired. **The data inventory consists**

of :

- 1-**what** the data means.
- 2-**how** and **where** it was collected.
- 3-**what** definitions were utilized.
- 4-**how** the data was analyzed.
- 5-**who owns** the data.
- 6-**who** has **access** to the data.
- 7-**who manages** the data.
- 8-**how** the data can be used and **shared** . (def. of data) (prevent duplication).





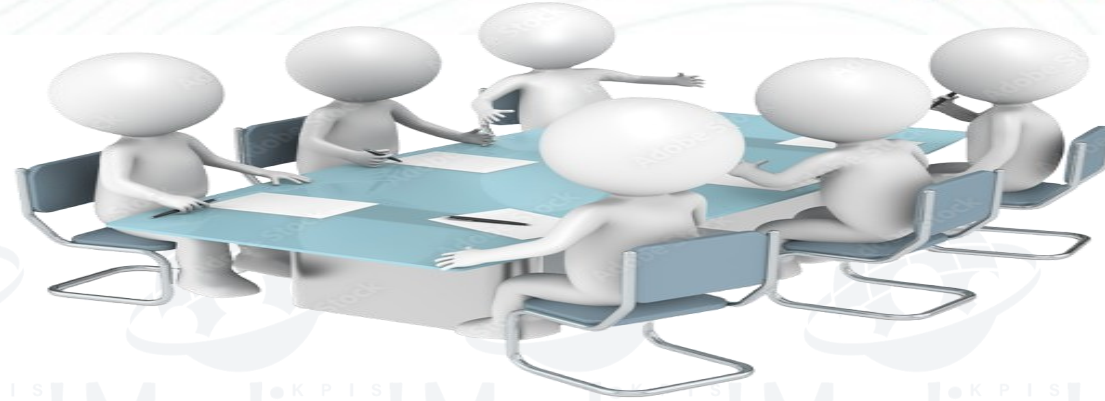
-database application can be utilized to maintain information for use throughout organization.

- Purpose:

to identify data that individuals actually need so that information can be easily accessed without duplication of efforts.

- involved in data inventory cross functional ... all individuals involved in data collection, someone from IT department to create





The **success** of this project will **depend** on the **quality and accuracy of the information** input into the system. In order to obtain high quality and accuracy, the **team members** must be **trained** as to **how to collect** the data. The team must determine **exactly what is to be collected** and **in what format**. The team must also determine if they are going to collect data used for internal and/or external **purposes**.

the departments that will be involved should be included in the design and implementation (clinical or nonclinical individual).

■ Data Rich, Information Poor

➤ when data is collected but not analyzed to information

How can I analyze my data?



Data
Rich
Information
Poor





Data Rich but Information Poor:

- ❑ The **reason** that the data is being collected must also be **determined**.
- There is often data that is collected because it "**always has been collected**". There may not be any current need for the data or information produced from that data

This is called the **DRIP**.





How can we avoid DRIP:

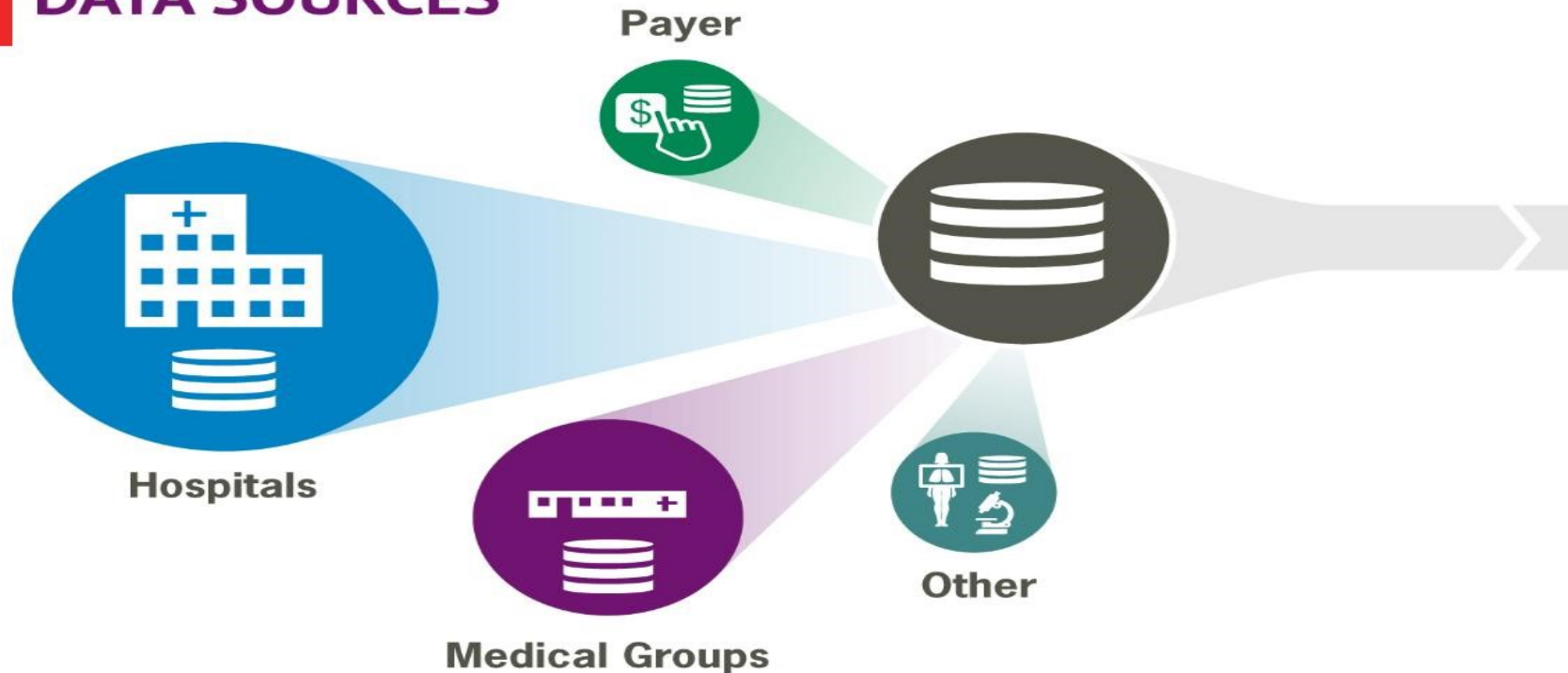
- 1- **scope** of the data needed should **determined** then **collected** and maintained in the data inventory .
- 2- data must be maintained **over time** frequently as determined by the organization
- 3- An individual in the quality department should be assigned the task **of keeping data updated** .
- 4- The inventory should be **updated on an annual basis** or when major changes are implemented .





Potential data sources

DATA SOURCES





Internal data resources

benefits:

1) *data is available for analysis & use as soon as it is collected.*

Weakness:

1) *Little reliability of data collection method so data may be incorrect.*

external data resources

Benefits :

1) *data from organization can be combined with data from other facilities, benchmarking.*

Weakness:

1) *data frequently not available for months after collection, so data becomes less useful.*

2) *Diferent organizations collecting and reporting data may not use data definitions in the same manner.*

3) *External data can be old when published for use & infrequently updated.*



Internal data resources

- *medical record review, mortality reports,*
- *autopsy reports.*
- *Variance reports: clinical pathway*
- *IC reports.*
- *Occurrence, incident, generic screening reports.*
- *RM reports & claim reports.*
- *UM & case management reports.*
- *PS reports & FMEA.*
- *PATIENT BILLS.*
- *Case mix reports.*
- *Financial reports.*
- *Clinical research reports.*
- *Self assessment/pre survey reports.*

external data resources

- *Accreditation reports.*
- *State inspection - licenses reports.*
- *Third party payer reports.*
- *CDC reports.*
- *updated performance measures.*
- *validated clinical pathways.*

Potential Sources of Data

Internal

- •In patient records.
- •QM summaries.
- •Staff/Patient surveys/interviews
- •Indexes, register.
- •Reports (RM, UM, IC, researches, Financial , Claims).
- •Meeting minutes.

External

- •Reference databases.
- •CDC reports.
- •Accreditation/licensure reports.
- •Validated clinical pathways.
- •Evidence based practice guidelines.



Quality data sources

INTERNAL SOURCES

- Patient/client records
- Patient surveys, interviews
- Staff surveys
- QI team reports
- Indexes, registers, and logs
- QM reports and FMEAs
- Patient bills
- Financial reports



EXTERNAL SOURCES

- Reference databases
- Accreditation reports
- Third party payers and employer reports
- CDC reports
- Recent literatures
- Sentinel event alerts
- Evidence-based practice guidelines
- Validated clinical pathways
- Comparative report cards
- Identified benchmarks (best practices)



Source of data:

	INTERNAL	EXTERNAL
Advantages	➤ data is available in timeline	▪ Used as benchmark & verified by other organization
Dis-advantages	➤ Not accurate and not reliable	▪ not available in timeline & different data definition and tool
Examples	<ol style="list-style-type: none"> 1. Patient record 2. Ongoing quality control summaries 3. Staff survey 4. Direct observation 5. Clinical reports (pharmacy/lab/blood bank..) 6. Medication records 7. Clinical review: Blood component use Medication review OR Pharmacy and therapeutic function 	<p>Accreditation report Stat inspection Third party report CDC report Recent and scientific literature Sentinel Event Alert (?????) Evidence based practice guideline</p>



Advantages and disadvantages for the types of data

	Internal	External
Strength	<p>1- data is available for analysis and use as soon as it is collected.</p> <p>2- best utilized when there is a desired change to a process or an outcome.</p>	<p>1- the data from the organization can be combined with the data from other facilities.</p> <p>2- gives the facility an opportunity to benchmark with other facilities that are similar to the one submitting the data.</p>
Weakness	<p>1-frequently is little reliability of the data collection method and thus the data may not be correct.</p>	<p>1- the data is frequently not available for months after it is collected. This makes the data less useful when attempting to change processes or outcomes.</p> <p>2- the different organizations collecting and reporting data may not have used data definitions in the same manner. This could result in data that is not similar to that in the facility that will be utilizing the comparison results.</p>

Register

- These registers are useful in the studying of diseases and disease Prevalence



- Registries have been shown to lead to improved health outcomes and reduced costs of health care





Healthcare Product Index



Indexes

permanent collections of medical record data required by state laws.

Collections of different types of data based on *specific topics*.

used to locate cases for record maintenance, statistics and research

recently many indexes maintained on computer instead of paper.

There are several types of indexes



Master patient index (MPI)

Permanent file of all patients seen in the organization, with dates, names of attending physicians, medical record number, considered most accurate index of patient information in the hospital.



Physician index:

- lists cases attended by individual physicians and are maintained for a minimum of ten years.

Disease index:

- contains the principle and some secondary diagnosis codes with individual patient information, maintained for a minimum of ten years.

Surgery index

- Contains the principle and some secondary procedures in a manner similar to disease index.



Registers:

1. **Permanent chronological** listing, to maintain certain Statistics.
 2. **ED register:** list each patient who comes to ED for treatment, order of arrival, other patient information.
- *Registers include the following information:*
1. patient identification.
 2. Medical record number.
 3. Diagnosis.
 4. Tests performed.
 5. Name of physician who saw patient.
 6. Discharge site.



Types of registers

1. *Patient registers for inpatients or outpatients.*
- 2) *Deaths/autopsies/fetal deaths.*
- 3) *Births.*
- 4) *Deliveries.*
- 5) *Surgical/procedural **logs.***
- 6) *Cancer & other disease registers.*



Benefits of registers:

1) Useful in studying diseases and disease prevalence.

2) Improved health outcomes.

3) Reduced costs of health care.

Index vs Register

Index

Are permanent topical collections of medical record data to locate cases for record maintenance, statistics and research. **(in brief)**

Examples:

- ✓ **Master patient index MPI:** a permanent file of all patients seen in the organization, with dates, names of attending physicians, and medical record numbers. .The most accurate index of patient information. ABCD
- ✓ **Physician index:** a file of cases attended by individual physicians, maintained for a minimum of 10 years.
- ✓ **Disease index:** a file of principal diagnosis codes with individual patient information, maintained at least 10 years.
- ✓ **Surgery index:** a file of principal procedures similar to the diagnosis index.

Register

Are permanent chronological listings for maintaining certain statistics. **(in details)**

Examples:

- ✓ **Birth register**
- ✓ **Death register**
- ✓ **Deliveries register**
- ✓ **Surgical log**
- ✓ **Emergency register**




Differences between risk index and risk register:

Indexes

- **Pointer**, or **indicator** to **locate information** on disease, physicians, and procedures/operations.
- They refer to **collections of different types of data based on specific topics**
- The most common & accurate one is the **Master Patient Index (MPI)**. This is a **permanent file of all patients** seen in the organization, with dates, names of the attending physicians, and medical record numbers
- Common indexes include **the Physician Index, Disease index, and Surgery Index**
- **The aim of indexes**: record maintenance,

Registers

- **Permanent listings** for maintaining certain statistics.
- Information contained in this type of register would be the patient's identification, medical record number, diagnosis, tests performed, name of physician who saw the patient, and the discharge site
- The aim: maintaining certain statistics



Medical Record

The primary legal document, as well as the primary data source for recording and ascertaining the quality of healthcare delivery to Patients Purpose of the medical record

Clinical

Continuity of care

Communication among practitioners

Patient identification

legal protection for the patient, practitioner, and the organization

Non Clinical

Finance

Peer review

Clinical research

Reimbursement

Accreditation

RM/UM QM



Medical record

➤ **DEF.:** The medical, clinical, or health record is the **primary legal document**, as well as the **primary data source** (either electronic or paper) for recording and ascertaining the quality of healthcare delivery to patients.

❑ **Medical record department is responsible for:**

Stored, coded, transcribed, all components verified and data transmitted to external agencies as required by law.

❑ August 2003, (IOM) and the Department of Health and Human Services started a movement towards electronic medical records.

❑ set of **eight core care** delivery functions which the electronic health records (EHR) systems should be capable of performing in order to **promote greater safety, quality and efficiency** in health care delivery:

- (1) health information and data
- (2) result management
- (3) order management
- (4) decision support
- (5) electronic communication and connectivity
- (6) patient support
- (7) administrative processes and reporting
- (8) reporting and population health.





➤ The purpose of Medical record:

1. *continuity of care: communication among practitioners;*
 2. *legal protection for the patient, practitioner, and the organization;*
 3. *data/information for quality/performance measurement, assessment, and improvement.*
 4. *It also confirms the identity of the patient,*
 5. *supports for the diagnosis and justification of need for treatment.*
 6. *documents of the course and results of treatment, and is used to determine the reimbursement rate and justification of claims.*
- *The **contents** of the medical record must be **sufficiently detailed and well organized** to get its purposes.*
 - *The medical record is used as a **monitoring or review tool** in the electronic or paper format.*
 - *Both **concurrent** and **retrospective** monitoring are commonly utilized*

Medical record information involved

- Name, ID, birth date
- medical record number
- a history complaint and physical examination
- Diagnostic orders and reports
- Progress notes Medical Record
- Final diagnosis and conclusions at discharge
- Discharge instructions to the patient or family
- When performed, results of autopsy



- Course of action planned
- Therapeutic orders and results
- Evidence of appropriate informed consent
- Consultation reports
- The type of facility where the patient is receiving care determines the exact contents in the medical record



- Medical records are stored in the Health Information Management department (Medical Records Department), unless the records are electronic
- There is a close relationship between the Health Information Management department, the Quality Management department, and the Information Technology department
- Medical records officers should develop appropriate policies for
 - Documentation issues
 - Time frames Correcting errors Late entries
 - Documentation must be legible For every entry time, date and signature should be identified
 - Use of abbreviations
 - Retention of medical records
 - Destruction of medical records



ERROR CORRECTION





Types of information systems

➤ **The Administrative Information System** : includes the financial ,billing ,inventory ,supplies management, human resources, risk management, and quality management.

➤ **The Clinical Information System** : includes the electronic medical record , pharmacy , and laboratory data.

➤ **The Decision Making Information System** : takes information from the other two systems and additional information and uses it to assist the organization in the decision- making processes.

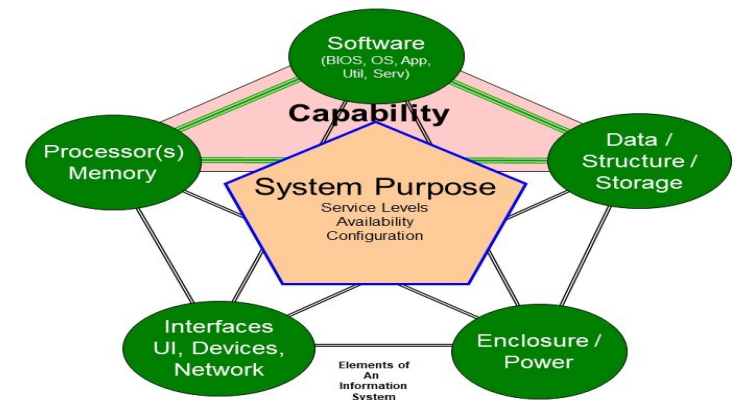
Information technology & system

1. An information system is the **sum of all manual and/or automated systems**.
2. These systems are designed to **provide and coordinate information** that can be used in **decision-making**.
3. The goal is to encourage use of **integrated electronic information systems**.

➤ Framework for Enterprise Information Management

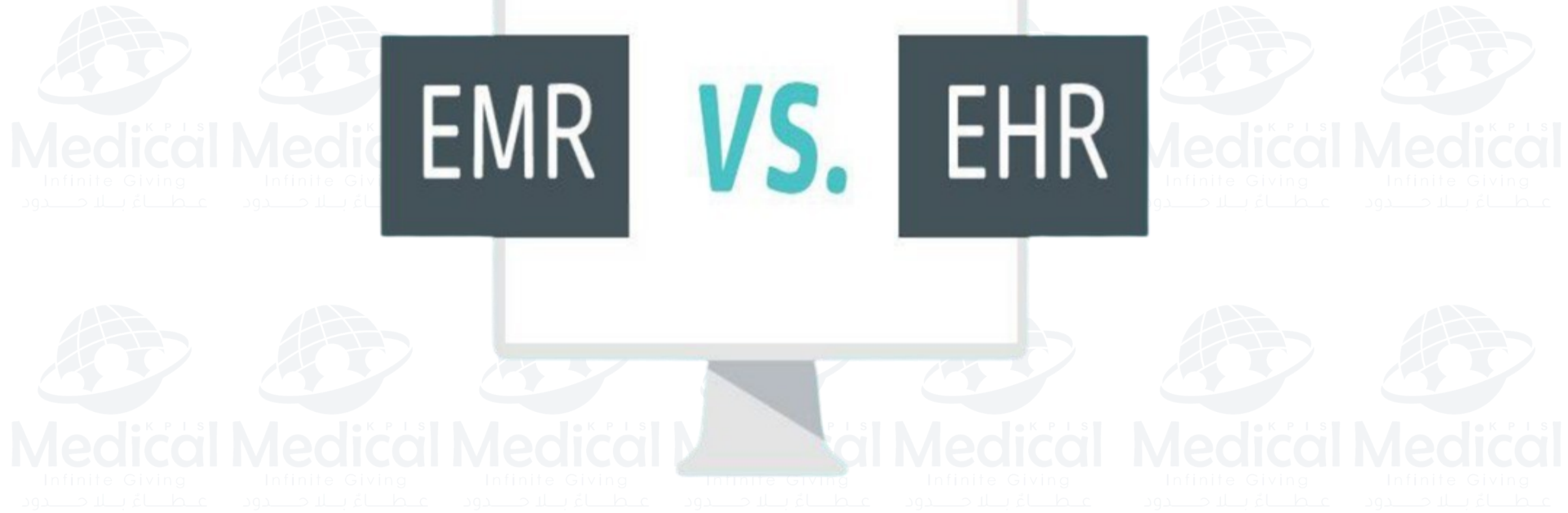
1. Information Integrity
2. Information Use.
3. Confidentiality and Protection
4. MR Life Cycle
5. Information Governance (P&P regulate legal, ethical, and business practice serving stakeholders)

Information Technology System (Building block for DA / AA / TA Architectures)





EMR **VS.** **EHR**



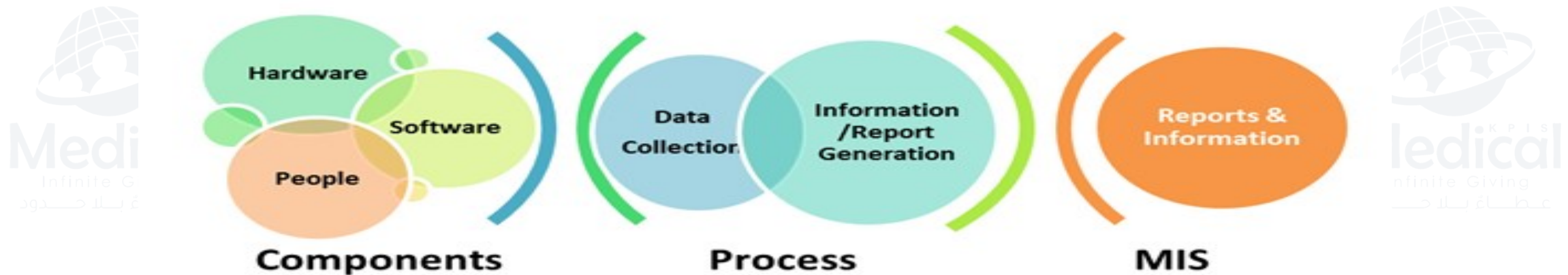
Differences between EMR and EHR

EHR (electronic health record)	EMR (electronic medical records)
A digital record of health information	A digital version of a patient chart
Allows access to tools that providers can use for decision making	Is mainly used by providers for diagnosis and treatment
Allows a patient's medical information to be accessed from different places	Patient record cannot easily be sent outside the practice
Simplified sharing of updated, real-time information	Not designed to be shared outside the individual practice

➤ Selection process is organized in six steps

1. obtaining a **commitment** from senior leadership,
2. selecting a **team**
3. identifying **system requirements**
4. **evaluating** potential **vendors**
5. evaluating and **selecting the software**
6. **negotiating** a contract.

Relationship between business process and health information





computerization & Software Selection and implementation

There are multiple aspects of selecting a computer system and software for use in the organization:

1. requires a **team** (*All parties* who could be affected by the choice should be represented)
2. The *present* performance and *future* computer **needs**
3. *If the organization is part of a larger healthcare system, there may be a need for all the facilities to utilize the same quality management system so that the data can easily be shared.*
4. the **cost/benefit** and *cost/effectiveness analysis*.
5. the software company will **maintain** and provide **updates** to the software
6. **data storage** (both on-site and off-site), **data back-up**, and system downtime to make the necessary updates. The organization must also consider *the computer knowledge, capability, and training needs of staff*.
7. *senior leadership* should **mandate** that all players who may be involved in the input, throughput or output of the automated system.
8. *Senior leaders* of the organization will also have strategies and concerns that must be incorporated into the **decision making process**.



Evaluate Potential Vendors

1. ***satisfactory performance with other organizations***
2. ***product history and implementations***
3. ***product maintenance***
4. ***education and training of users***
5. ***help desk response time***
6. ***upgrade service capabilities***
7. ***Representatives of the team should conduct enough site visits in similar institutions with the software already in place to evaluate each vendor software.***

Confidential Information

- information that one keeps or entrusts to another with the understanding that **it will be kept private and not shared** (secret or private; trusted with secret).

EXAMPLE: Social Security number

Personal information such as name, birthday, sex, address.

Contact details.

Medical history

Protected Information

(privileged information)

- information that **cannot be obtained by others or used in a court of law** (cover or shield from exposure, injury, damage, or destruction).
- Such communication cannot be disclosed without the consent of the client

EXAMPLE: Peer review

It is the intent of every healthcare organization to prevent unauthorized access to individually-identifiable health information.





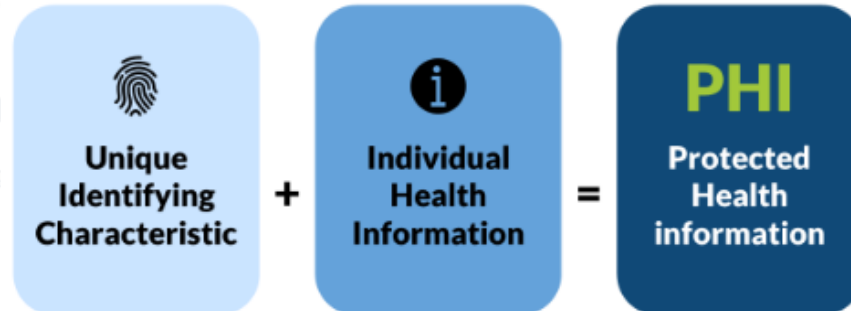
LIST OF **PHI** PROTECTED HEALTH INFORMATION

Names	Medical Record Numbers	Device Identifiers
Dates	Health Plan Beneficiary Numbers	Vehicle Identifiers
Addresses / zip codes / Geocodes	Account Numbers	URLs
Phone Numbers	Certificate / License Numbers	IP Addresses
Fax Numbers		Biometric Identifiers
Email Addresses		Facial Images
Social Security Numbers		Any Other Unique Identifiers



Most Common HIPAA Violations Causes

Professional Hackers		Business Associate Disclosure	
Incorrect Admin Procedures		Unauthorized access to records	
Insufficient IT Security Measures		Unauthorized Access	
Employee Dishonesty		Lost or Stolen Devices	
Employee Accidental Disclosure		Improper Disposal	





Informed consent:

Adequate **information** is provided to the **patient or legal representative** in order for the patient or legal representative to make a **rational, informed decision** to permit medical-surgical treatment (agreement).

The patient **is free to reject recommended treatment**.

Touching a patient without authorization to do so may be considered a legal wrong called a "**battery**."

Certain **exceptions** apply in emergency situations.

Information for special procedures must be provided by the practitioner performing the procedure and must include:

1. the full extent of the treatment **plan**
2. the extent of the **side effects** and risks involved
3. **alternative** treatments available
4. the **risks** of non-treatment

Meaningful Use:

- qualification in order to receive federal funding for health information technology. Implementing provisions of **the American Recovery and Reinvestment Act of 2009 (Recovery Act):**

There are three parts of the meaningful use portion of this act:

- 1) Using certified electronic health records **in a meaningful way** such as e-prescribing.
- 2) Using certified electronic health record technology to **electronically send and receive** health information to improve quality of care.
- 3) Using certified electronic health records technology to **send clinical quality and other measures** to required organizations

What are the goals of Meaningful Use?

Improve *quality, safety, efficiency, and reduce health disparities*

Engage patients and families

Improve care coordination

Ensure adequate privacy & security protections for personal health information

Improve Population and Public Health



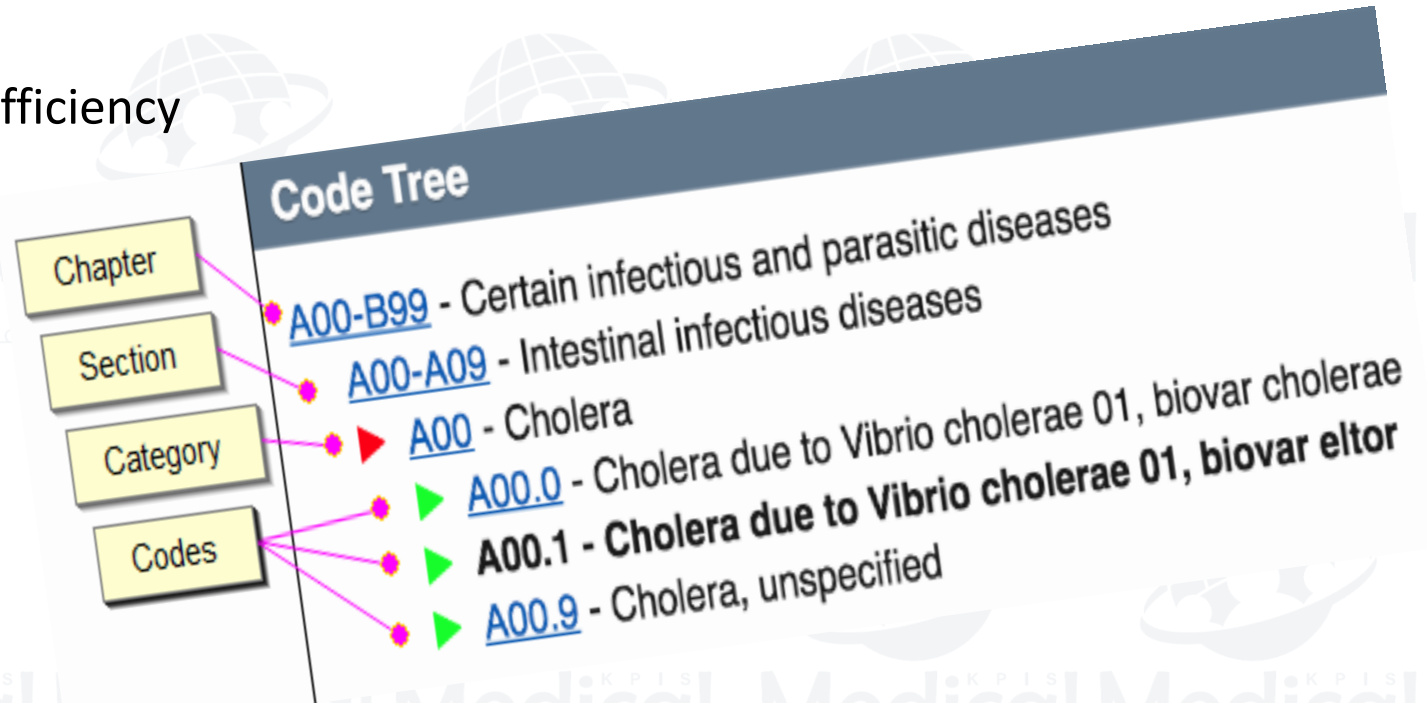
Criteria demonstrate Meaningful use:

1. Capturing health information data
2. Clinical decision support
3. Improvements in quality, safety and efficiency

International Classification diagnosis

the ICD-10 is a **diagnostic coding scheme/system**, developed and published by the World Health Organization (WHO), has been used in most other developed countries for morbidity applications for years.

All healthcare organizations that are required to adhere to the Health Insurance Portability and Accountability Act (**HIPAA**) must convert to ICD-10.



Confidentiality of patient information

- Confidential Information
- Secret
- Kept private and not shared Shield from exposure, injury, damage, or destruction
- Protected information
- context of the physician patient relationship
- Given with the expectation that it remain confidential
- Necessary for the diagnosis and treatment of the patient



Confidentiality of patient information

- The patient's physical medical record is the property of the organization
- The information included in the medical record is the property of the patient
- Examples of confidential information
 - Patient information
 - Medical staff information e.g peer review documents
 - QI meeting minutes



**MEETING
MINUTES**

Authorization

Generally written authorization by patients is not required for use of the patients' personal health information by the provider Organization

A Internal review (use Activities that doesn't need authorization)

Treatment Payment Healthcare operations

The consent for treatment completed at the time of registration provides the consent for many internal activities



Who can access the medical record without patient s authorization?



Physicians involved in patient s care

Governing body



Governing Bodies

CEO

Clinical department directors



Peer review

Health information management/medical record personnel



Confidentiality of patient information

External review

A written authorization by the patient is required for the release of information outside the organization

Exceptions

- Reporting of communicable diseases, births, death:
- Regulatory and accrediting bodies
- To other providers for treatment
- For payment

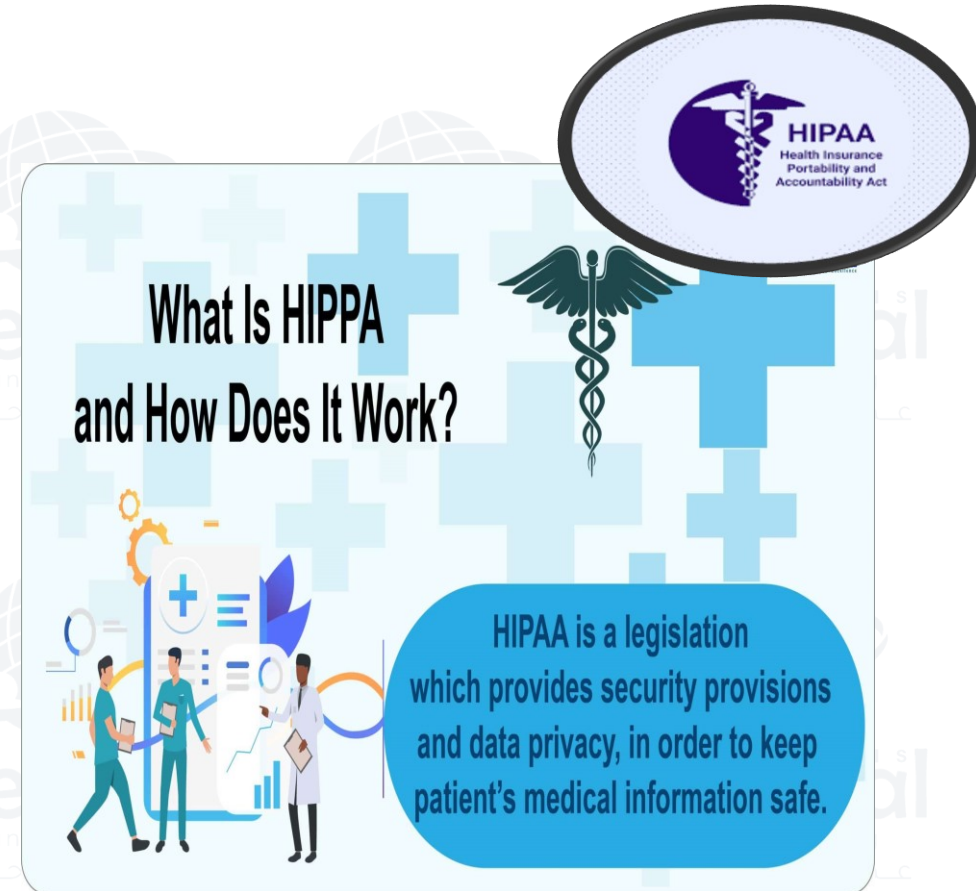


A primary principle is that it is unlawful to use patient information in ways that are inconsistent with the patient's original authorization

The law does permit both use and disclosure for treatment, payment, or health operations

The Health Insurance Portability and Accountability Act of 1996 (HIPAA)

- A primary principle of HIPAA is that it is **unlawful to use** patient information in ways that are **inconsistent** with the patient's original authorization.
- “Minimum necessary” Rule: **access to "protected health information" (PHI)** is to be **limited** to those **persons** or classes of persons who have a need to know in order to carry out their roles and responsibilities.
- psychiatric cases, psychotherapy information is **maintained separately** and made available as necessary.
- The **provider** is responsible for safeguarding both the record and the informational content against **loss, defacement, tampering, and unauthorized use**.
- The patient is considered the **"owner"** of the information and can **access** and **copy** that information by **signing a release form**.



What Is HIPAA and How Does It Work?

HIPAA is a legislation which provides security provisions and data privacy, in order to keep patient's medical information safe.

HIPAA Health Insurance Portability and Accountability Act



Data management process steps:

- Identify the current available data sources.
- Identify the critical information needs and confidentiality
- Define data collection plan
- Collect, aggregate, and display data.
- Analyze and interpretate data/information
- Act on information/knowledge
- Report decisions.
- Collect more data to monitor decision



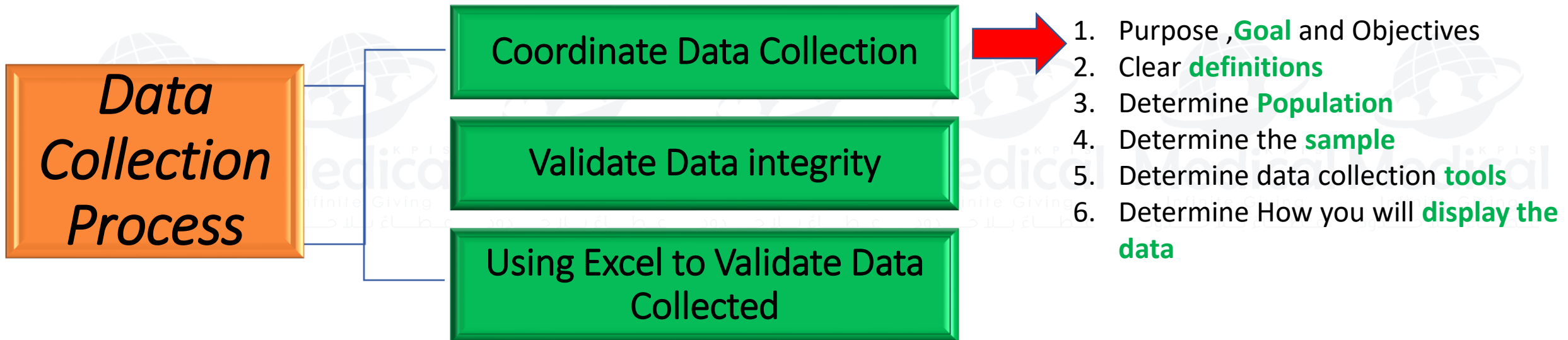


Collection Principles and Concepts

□ Organizational leaders identify interdisciplinary quality teams to:

1. **oversee the design** of data **collection methods**
2. maximize the **use of data already being collected**
3. **minimize duplication** of effort
4. maximize **accuracy**, maximize the organization's **computer capabilities**
5. **coordinate** data collection efforts **across departments**, services, and QI Team activities.

□ The group (department, service, committee) or QI Team with the most knowledge of the process being measured will be best able to set triggers.





Define data collection plan

- Healthcare data must be carefully defined and systematically collected and analyzed
- Tremendous amounts of healthcare data and information are available; not all is useful
- Mature quality improvement information revolves around clearly established patterns of care, not individual cases



Data Collection Plan

The Data Collection Plan is a roadmap detailing how to collect each piece of desired data.



Measure Name

What would you call it?



Data Type

Is it discrete or continuous?



Operational Definition

What is the airtight description?



Stratification Factors

Will you slice data by who, what, where and when?



Sampling Notes

How much data will you collect?



Who and How

Who is responsible and what method will they use?

Constructing data collection plans

- Determine who, what, when, where, how, and why
- Structure the design of the collection methodology
- Choose and develop the sampling method
- Determine and conduct data collection training
- Delegate responsibilities for data collection
- Facilitate coordination among involved groups
- Forecast budget
- Conduct pilots of forms and collection process

Data collection Timeframes

1. Prospective data collection:

- Occurs prior to care being rendered.
- Before a patient is accepted in a Rehabilitation facility, someone from the receiving facility goes to the patient to assess if the patient meets the requirements for admission.



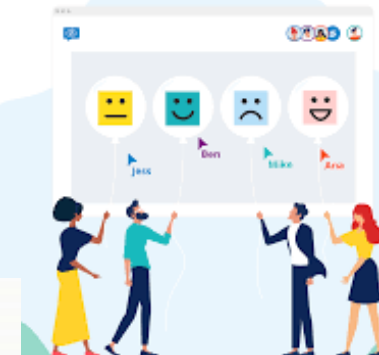
2. Concurrent data collection:

- Occurs while care is being rendered.
- -Medical record review is best conducted while the patient is still receiving care.



3. Retrospective data collection :

- Occurs after the care is rendered.
- For example, mortality data can only be collected retrospectively.



4. Focused data collection :

- Occurs when only certain topics are the focus of the data collection.



General data Collection Methodology:

Prospective

data collection occurs **prior** to care being rendered.

Before a patient is accepted in a Rehabilitation or Home Health facility, someone from the receiving facility **goes to the patient to assess** if the patient meets the requirements for admission.

Concurrent

data collection occurs **while** care is being rendered

Medical record review is best conducted while the patient is **still receiving care** need sah gnihton fl . detcerroc eb nac ti ,enod lltis si tnetiap eht elihw detaert gnieb.
(Open Medical record review)

Retrospective

data collection occurs **after** the care is rendered.

mortality data can only be collected retrospectively. Sometimes quality monitoring occurs **retrospectively as a chart review to determine** if there are patterns and trends in the data.

Focused

data collection occurs when only **certain topics** are the focus of the data collection .

Infection control and prevention utilizes focused data collection based on the types of infections that occur in the facility.
High volume
High risk
Problem pron



Interviews



Focus Groups



**DATA
COLLECTION
TOOLS**

Observation



Usage Data

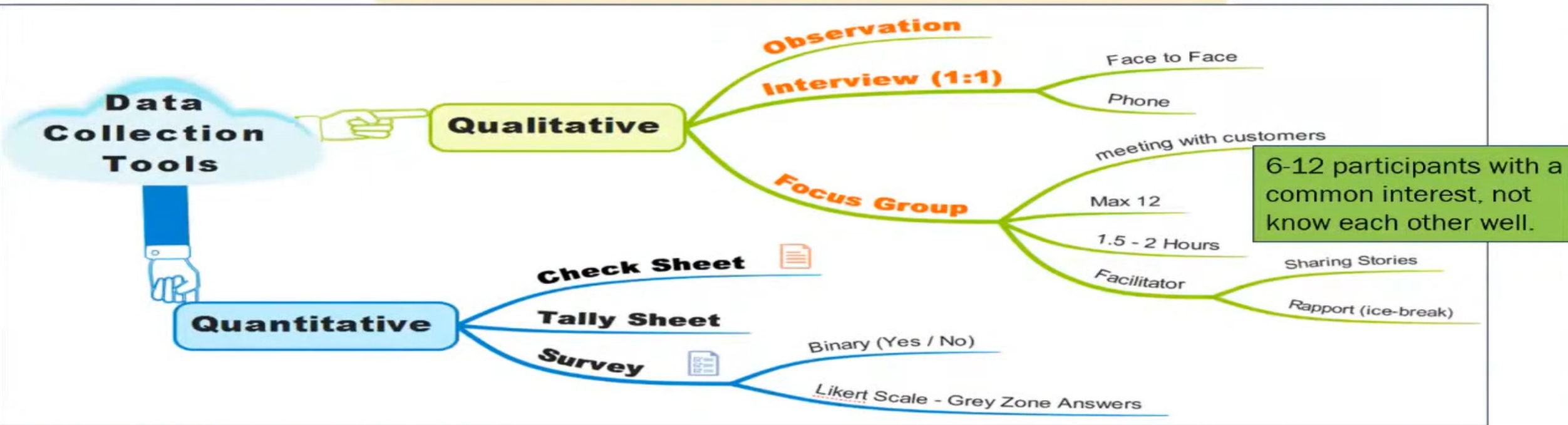


Surveys





Data collection Tools



Data collection tools should be

- 1- **Integrated** : allowing the identification of patterns , trends , and opportunities across departments / services and the healthcare network.
- 2- **Coordinated** : Systematic , reducing duplication of efforts.
- 3- **Comprehensive** : covering all aspects of quality management and performance improvement activities.



Data collection tools:

The **type of tool** used to collect data will depend upon **what you are trying to measure**. When selecting a tool to utilize or develop, you want to keep the tool **as short and simple as possible**. However, you need to make sure you include all the data elements that you want to measure.

Definitions



Computerizing



Data Sheets/Work Sheets

- need to **pilot** it before it is used for data collection
- risk of data **entry errors**

Check Sheets/Tally Sheet

- facilitate **interpretation** directly from the form
- useful when you are counting something
- limits the details collected so limits the amount of analysis

Transport	Tally	Frequency
Walk		15
Bus		12
Car		7
Bike		6

Surveys/Questionnaires

- used to get **feedback** from a large group or assessment of
- customer needs, expectations, or satisfaction (qualitative data).
- open ended questions, **yes or no** responses or use of a Likert scale.
- (-ve) low level of response typically received & time frame
- the **length of the survey**, the difficulty and **language** of the survey

Likert Scale PowerPoint Template



Focus Group

- Groups consist of 6-12 participants with **a common interest**. The persons in the focus group should **not know each other well**.
- determine how a particular group of representative individuals feels about a certain topic, product, used to generate ideas and help formulate interview questions to be utilized later. Focus Groups use open-ended questions (**qualitative data**)
- A focus group is typically audio or visually recorded
- the barriers to the use of focus groups is that the recording, transcription and analysis can be very expensive and time consuming. In addition, since participants were purposively selected

Data collection Methods

Medical records	Concurrent (preferred) or retrospective review of inpatient, outpatient, emergency, home health medical records, etc.
Summary reports	Retrospective of patient and staff occurrences (incidents or critical events), clinical complications, infections, committees, research, special studies
Daily logs	Concurrent review of surgical, neonatal, emergency, cancer registry, urgent care, clinic, etc.
Monthly data logs, check lists	Statistical data to be tracked over time , e.g., number of admissions, referrals or transfers newborns <500 gms, etc. Rates can also be calculated and tracked, then summarized and displayed in graph form.
Financial reports	Concurrent and retrospective data including case mix, claims, reimbursements, denials, costs per case, etc.
Direct observation and referral	Informal or criteria-based surveillance (concurrent) of process of care and compliance with established procedures or standards
Surveys or interviews	Patients, staff (concurrent or retrospective) written or face-to-face questions concerning perception of care delivery, outcomes, and problems
Reports from external agencies or reference	Retrospective data, which are usually received months after the data, has been collected



Characteristics of Data Collection Tools



Valid

- The accuracy with which a measurement tool measures what it is supposed to measure.



Reliable

- Yields the same results on repeated measures. (are producible way)
- Are liable measure will give you the same information each time you measure ,but it may not be valid for the intended use.





Data characteristics:

When **developing** a questionnaire or other **data collection tool**, there are **certain terms that need to be understood** and considered, especially if clinical performance measures are being collected .

Sensitivity

The ability of a measure, test, or tool (study design, screening tool, or lab test) to identify and select all positive cases or specified variations or deviations (all cases in the category), with few "false negatives".

Specificity

ability of a measure, test, or tool to differentiate between the cases wanted and those similar, but not in the desired category, and to exclude those negative cases - fewer "false positives".

		Predicted Class		
		Positive	Negative	
Actual Class	Positive	True Positive (TP)	False Negative (FN) Type II Error	Sensitivity $\frac{TP}{(TP + FN)}$
	Negative	False Positive (FP) Type I Error	True Negative (TN)	Specificity $\frac{TN}{(TN + FP)}$
		Precision $\frac{TP}{(TP + FP)}$	Negative Predictive Value $\frac{TN}{(TN + FN)}$	Accuracy $\frac{TP + TN}{(TP + TN + FP + FN)}$

A type I error (false-positive) occurs if an investigator rejects a null hypothesis that is actually true in the population; **a type II error** (false-negative) occurs if the investigator fails to reject a null hypothesis that is actually false in the population



Stratification

classification of data into homogeneous groups or subsets. If the user wants to stratify the results, then the collection tool must be able to gather all the needed information to allow for the stratification of the data.

Usability

The relative ease with which the indicator can be understood or the tool can be used. (the ability of a user to derive useful information from data.)

Recordability

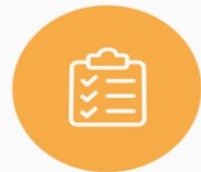
The ability of the indicator or tool to identify, capture, and measure the needed information.

Core Elements of Usability Testing



Facilitator

Guides the participant through the test process



Tasks

Realistic activities that the participant might actually perform in real life



Participant

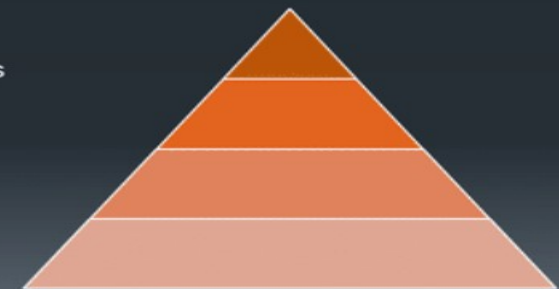
Realistic user of the product or service being studied

Social Stratification

Re-cap – social stratification is the idea that people are divided into different hierarchies, where some are deemed more important (and have more power) than others.

TYPES:

- Social class
- Gender
- Ethnicity
- Age



MOST POWER

LEAST POWER



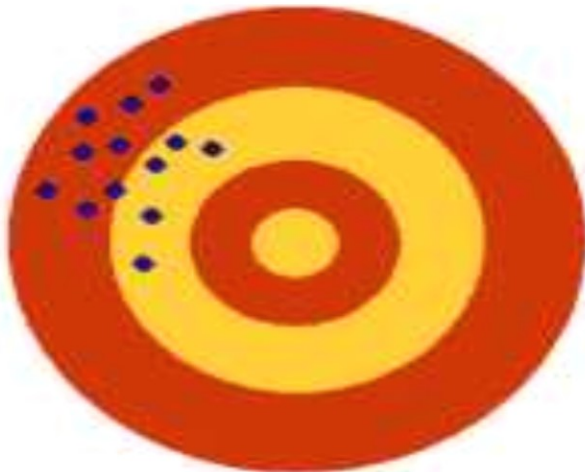


Validity

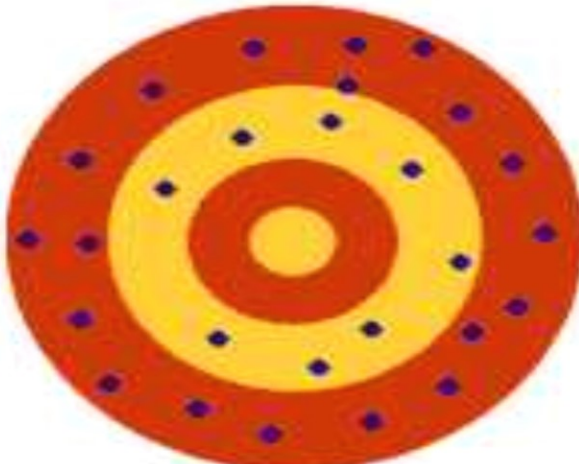
The capability of the indicator or collection tool to measure what it is supposed to measure; its predictive value as a measure of quality. accuracy of a measure

Reliability

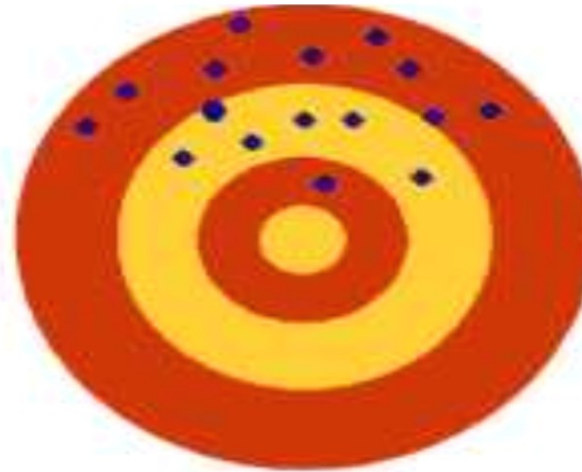
The ability of the indicator or collection tool to measure in a reproducible way what it is supposed to measure. ((degree to which an assessment tool produces stable and consistent results.)) consistency of a measure



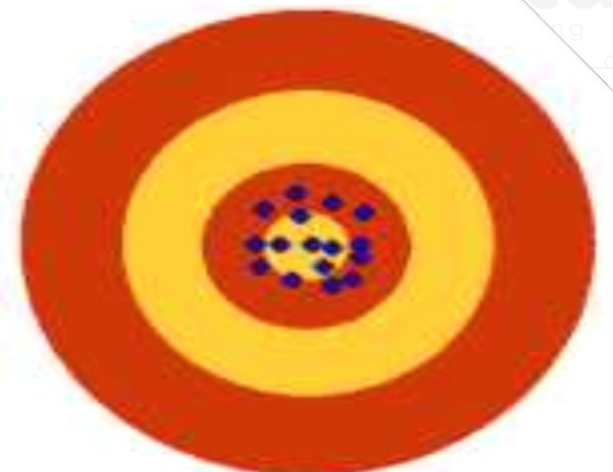
Reliable, not Valid



Valid, not Reliable



**Neither Valid,
nor Reliable**



**Both Valid,
and Reliable**



Goal

A numerical value that defines the significance level of the data that is desired for decision-making

Trigger

A numerical point at which there should be some action taken

Threshold

A numerical point below which the data should not fall or the point or level at which something begins or changes.

Benchmark

A standard or point of reference against which data may be compared or assessed. (((the best)))



Characteristics of a Performance Measure



Valid

The Accuracy to Measures The Concept it is Intended to Measure.



Reliable

The Extent to Yields The Same Results on Repeated Measures

The probability that each of the steps will occur when, where & how it needs to occur



Specific

Able to Avoid the Negative Values

No False Positive



Sensitive

Able to Detect the Positive Values.

No False Negative

Usability: The relative ease with which the indicator can be understood or the tool can be used.

benchmarking

- ❑ In brief it's the **best practice**
- ❑ It is very useful when using data since a benchmark sets the standard the org. **wishes to achieve** and gives guidance to the usefulness of its own data.
Sometimes the benchmark is 0 or .100%

How can select benchmark:

- There are several factors that need to be considered when using internal or external **data to compare outcomes**:
 - 1-The first is **similarity between institutions**.(similar **scope** of service)
 - 2- it is useful to **compare** only rate based information.
 - 3- **updated**





Information management lecture outline

- Goal of IM
- Data/information management process steps
- Basic concepts related to IM
- Quality data sources
- Data collection tools
- epidemiological measures.
- Apply sampling methodology for data collection
- Use statistics to describe data.
- Be able to interpret data to support decision making
- Discuss 7 tools of quality and their function and uses



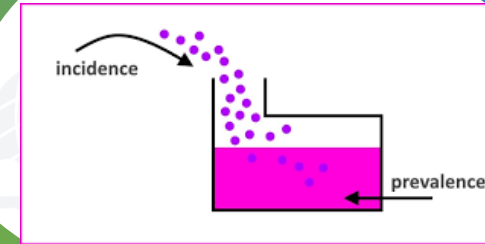
DEFINITIONS OF EPIDEMIOLOGY

- Have first been used to describe the study of epidemics (prevalent and rapid-spreading , human contagious disease).
- Now is widely applied to cover the description and causation of:
- epidemic disease.
- disease in general.
- many non-disease, health-related conditions , such as obesity , alcohol or smoking.



Incidence

- Incidence measures the rate of occurrence of new cases of a disease or condition during a specified time period.



Incidence proportion(IP):

- it is calculated dividing the number of new cases during a given period by the number of subjects at risk in the population initially at risk at the beginning of the study.

Incidence Proportion

$$IP = \frac{a}{N}$$

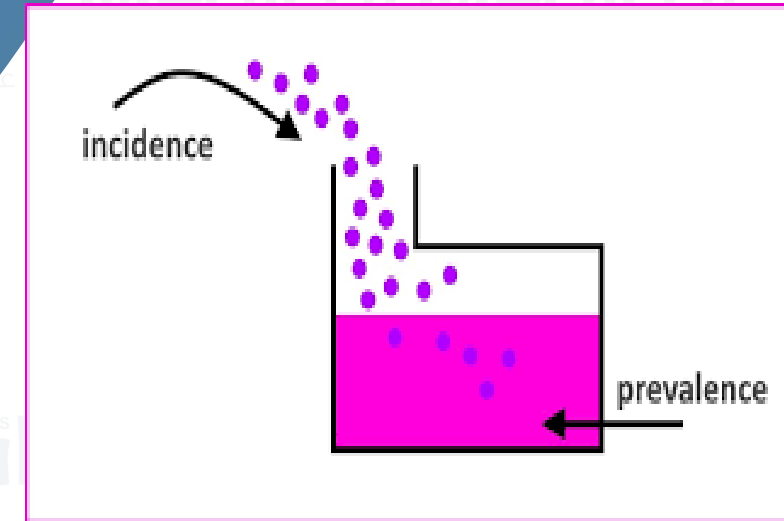
Where:

a = number of **new onset cases** (events)
 N = population-at-risk at beginning



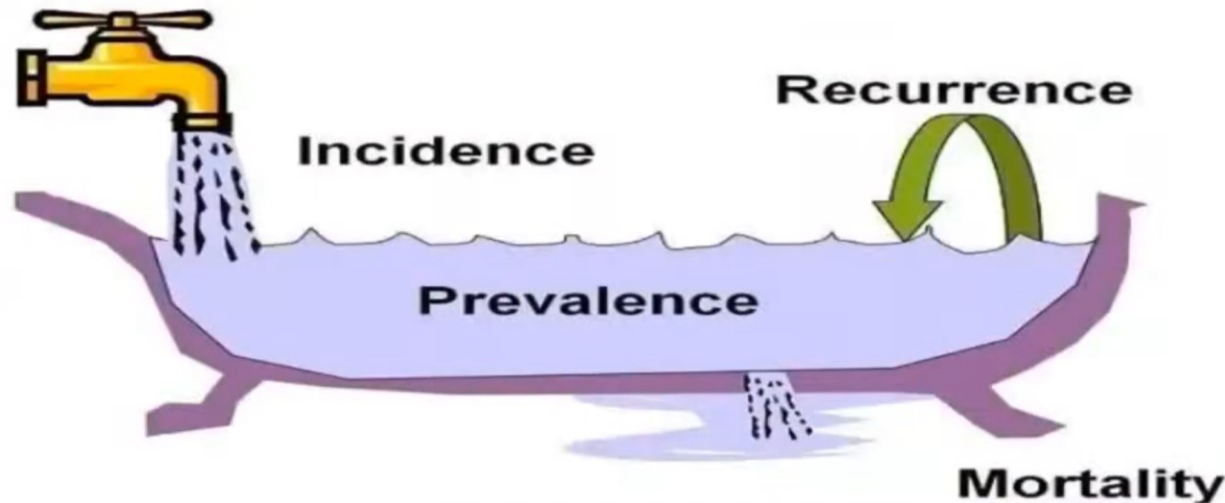
Prevalence

- Refers to the total number of individuals in a population who have a disease or health condition at a specific period, usually expressed as a percentage of the population.
- Prevalence answers "How many people have this disease right now?"
- "or "How many people have had this disease during this time period?"
- Incidence answers "How many people acquired the disease during [a specified time period]?"
- **Incidence** conveys information about the risk of contracting the disease
- **Prevalence** indicates how widespread the disease is.



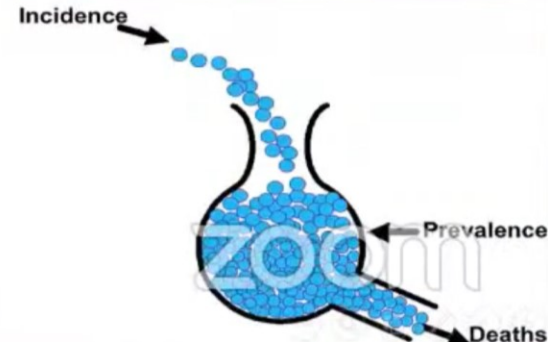
Incidence/ Prevalence Rate

- **The incidence rate** is the number of new cases per population at risk in a given time period
- **The Prevalence Rate** is the number of cases of a disease per population at risk in a given time period (both new and existing cases).



$$\text{prevalence} = \frac{\text{ALL cases}}{\text{Population @ risk}}$$

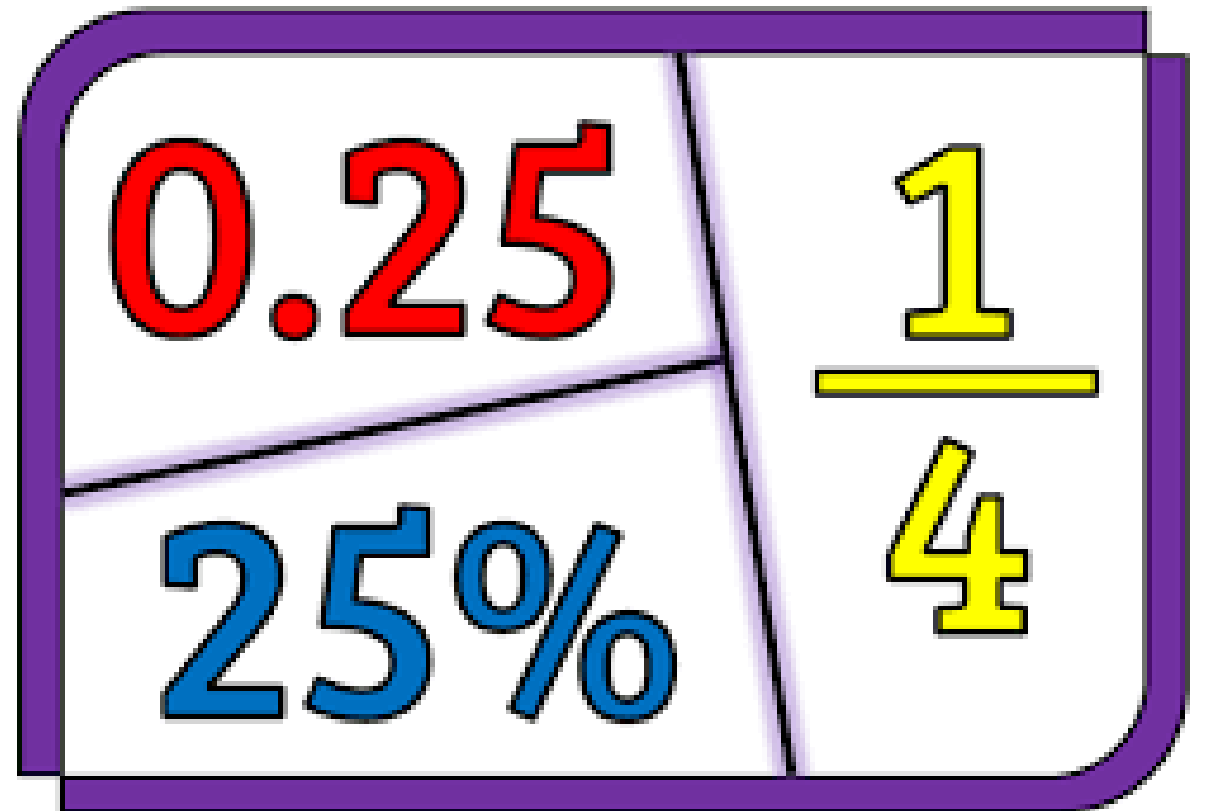
$$\text{incidence} = \frac{\text{New cases}}{\text{Population @ risk}}$$





Proportion

- **Proportion:** A type of ratio in which the events included in the numerator must also be included in the denominator. **It is a part/whole relationship within the same population).**
- -expressed as:
 - 1-Decimal.
 - 2-Percentage.





Ratios

A ratio is a comparison between the quantities of two things.

Example:

There are 3 triangles and 2 squares.



We can write the ratio as

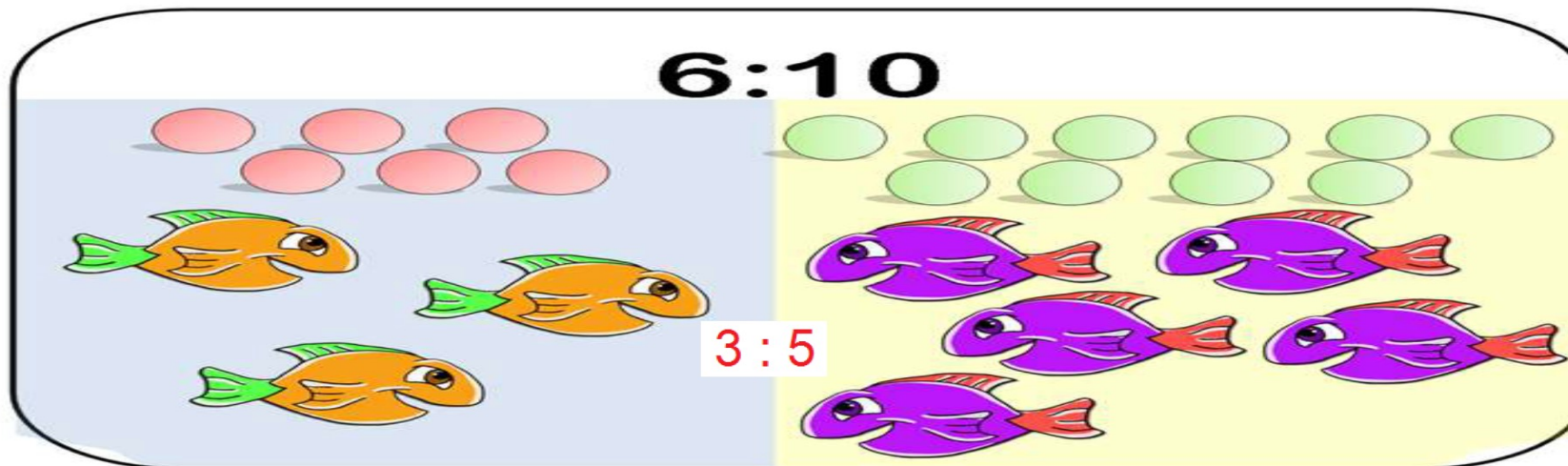
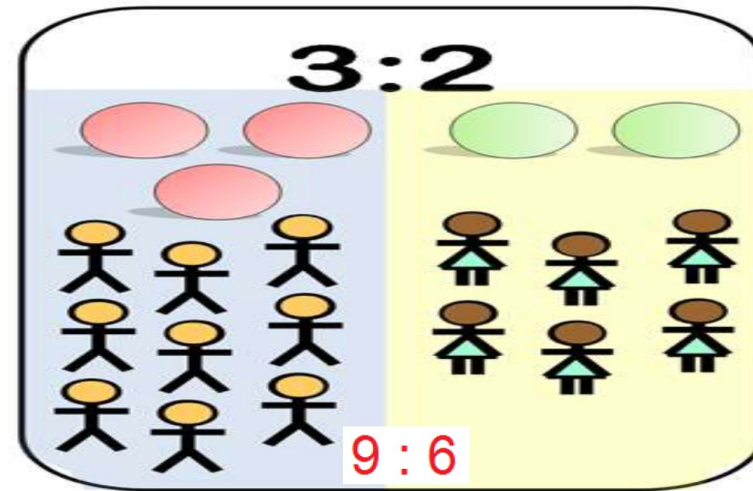
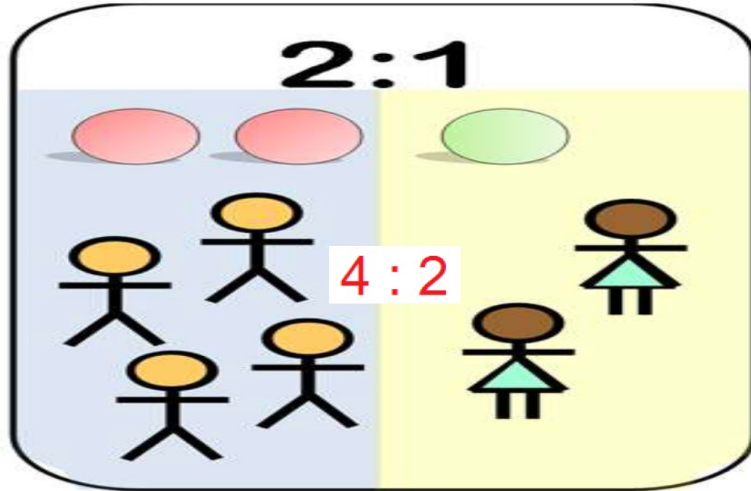
3 : 2 or 3 to 2 or $\frac{3}{2}$





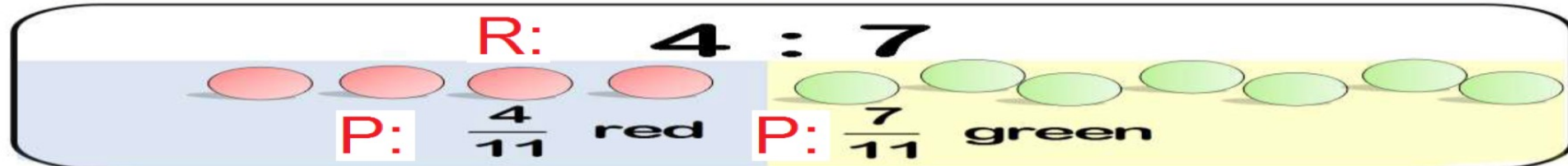
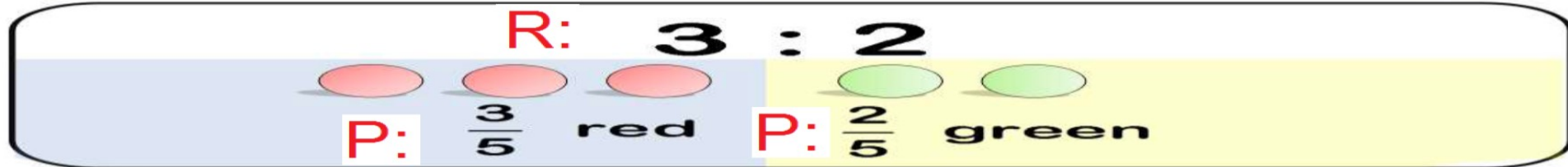
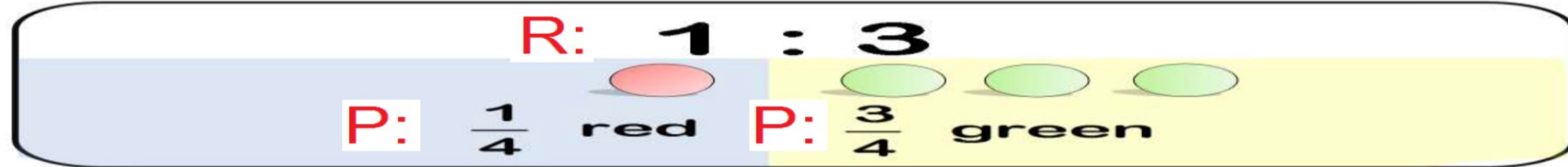
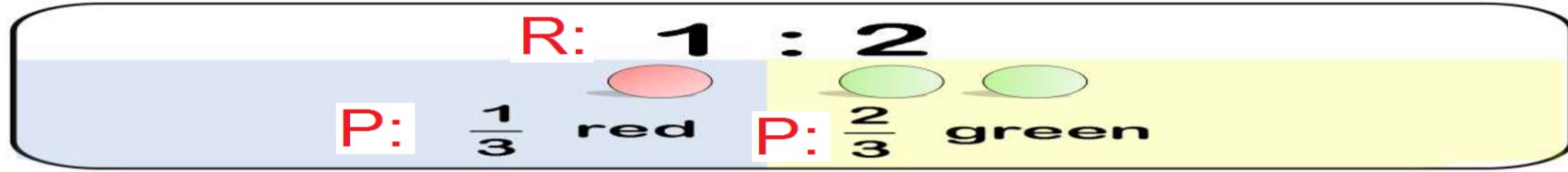
What Is Ratio?

www.cazoommaths.com





Ratio and Proportion

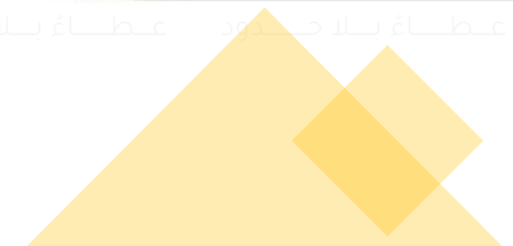


Medical
Infinite Giving
عطاء بلا حدود

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Rate

- It is any frequency comparison in a time period (Placement within a time frame).
- A proportion may be called a "rate" when it has a designated time period.
- Note, that many rates may be stated as percentages, but not all percentages are rates.



- Expressed as
- 1. **Percentage**: e.g. SSI rate is 10% in 2018.
- 2. **Decimal**: e.g. SSI rate is 0.1 in 2018.
- 3. **Wholenumber**: e.g. heart rate is 80 per minute.



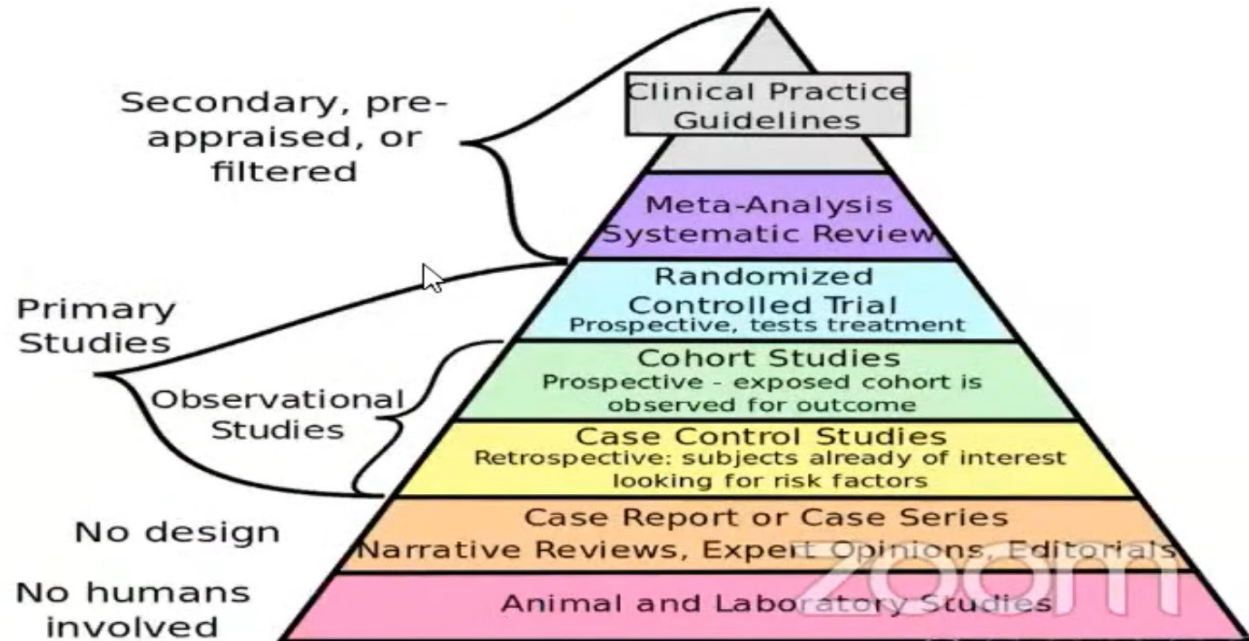


Name	Definition	Expressed as	Example
Ratio	Comparison between 2 things	N: N or N/N	N. To P. ratio 1:2 or 1/2
Proportion	Part/whole relationship	1- Decimal. 2- Percentage.	MP = 0.05 or 5 %
Rate	A proportion within a time frame	1. Percentage: 2. Decimal: 3. Whole number:	MR in 2017 = 5 % MR in 2017= 0.05 HR = 80 per minute
Incidence	- The rate of occurrence of new cases during a specified time period. - The denominator is the number of subjects at risk in the population.	Incidence proportion	HIV Incidence= 28 cases per 1,000 persons per two years, i.e. 2.8 % per two years.
Prevalence	the total number of individuals in a population who have a disease at a specific period of time	1. a percentage of the population. 2. Per 10,000 or 100,000 population.	HIV Prevalence = 5 % 500 / 10,000 5000 / 100,000



Evidence Based Medicine

It is the best evidence in making decisions about care of patients.



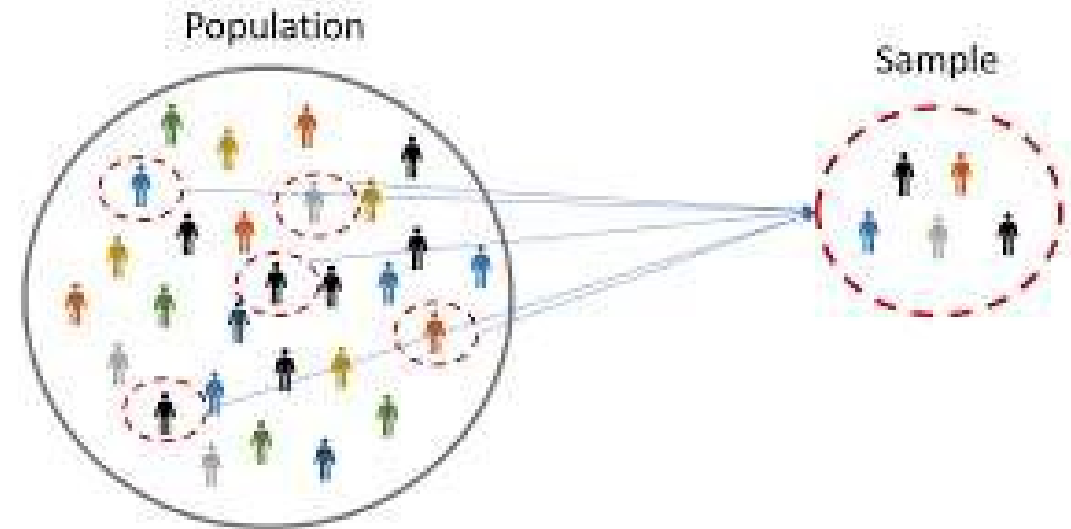
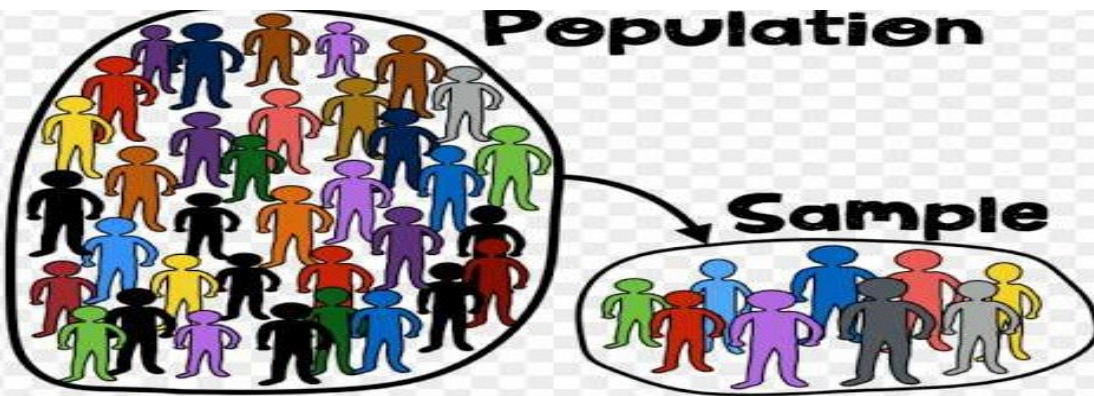
Population & Sampling

-The population is defined as 100% of the possible group to be studied, whether they are individuals, objects, events and soon.

Population & Sampling

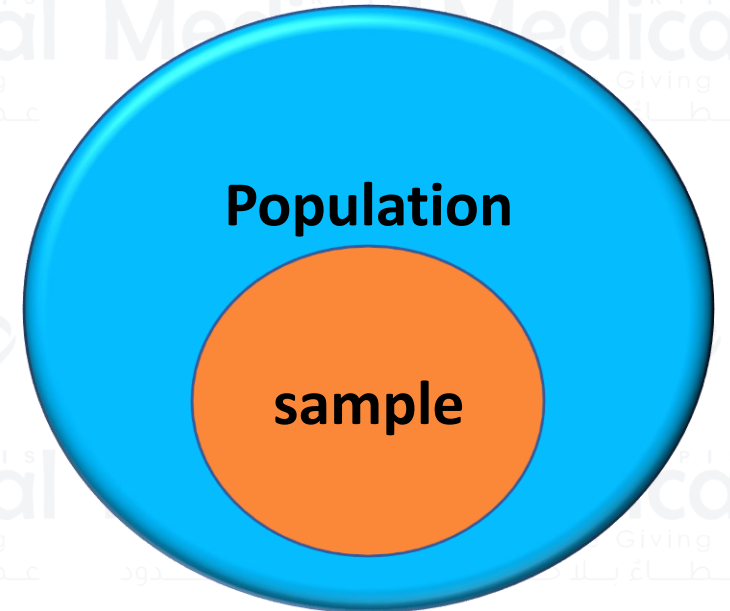
A sample is a subset of a population:

- representative of the characteristics of this specific population.
- consider the location and time period from which the sample must be drawn.



Population & sampling:

- One of the steps in developing the design of a data collection project is **to determine the population** to be studied and **to determine if sampling is required** .
- **Unless the population is small in number, sampling will be utilized**. The type of sampling utilized **has a great effect on what can be done** with the data and information obtained .
- The **population** can be **static** (not changing) or **dynamic** (changing) and this will affect the type of sampling that is utilized .





Sampling

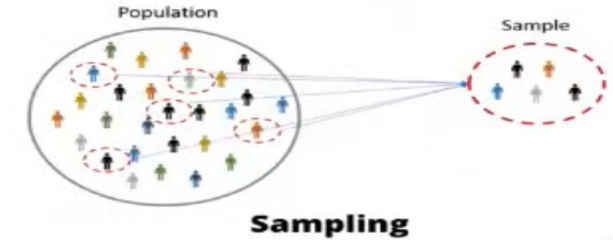
A sample should be representative & unbiased

□ Definitions:

- *Sampling: a subset of a population; a group drawn from a larger population.
- *Population: a complete set of individuals, objects, or measurements having some common observable characteristics.

□ Purposes:

- To measure only a portion of a total group.
- To achieve accurate representation of the entire population.
- To generalize the results to the larger population.



□ **Probability sampling:** each case in the population has a chance of being selected and is, therefore, truly representative of the entire population being sampled. اقدر اعمم النتائج ع الجميع

□ **Nonprobability sampling:** an intentionally-biased way to sample, involving qualitative judgment about an issue that is suspected to be common or widespread, thus the results can't be generalized to the entire population without further study.

بحدد خصائص معينه بختار على أساسها العينات مقدرش اعمم النتائج على الكل

Population & Sampling

Total Population	Sampling
<ul style="list-style-type: none"> ❑ 100% of the possible group to be studied, 1st step in data collection is to determine the population: <ul style="list-style-type: none"> • All cases encountered/admitted for a particular diagnosis • All cases with a particular treatment or procedure performed • All cases with a particular complication identified • All physicians/licensed independent practitioners, or from a certain department or discipline • All the patients who received care in a clinic during the month • All cases with a particular medical device ordered. ➤ Small >>>>>>>> total population. ➤ Large >>>>>>>> Sample. 	<ul style="list-style-type: none"> ❑ a subset of a population or a group drawn from a larger population. ❑ The purpose: <ol style="list-style-type: none"> 1. To measure only a portion of population. 2. To achieve an accurate representation of the entire target population. 3. To generalize the results to larger population based on sample result. ❑ factors should be in our consideration: <ol style="list-style-type: none"> 1. the characteristics of the population that the sample must represent. 2. the location and time period from which the sample must be drawn. <p>(If you are looking at patients with Pneumonia and you only select your sample from those patients seen in three months out of the year, you are not accounting for the effects the weather and other factors that might affect these patients.)</p>



Type of sample

Probability sample	Non-Probability sample
<ol style="list-style-type: none"> The selection of a sample from a population, when this selection is based on the principle of randomization, that is, random selection or chance. Probability sampling gives you the best chance to create a sample that is truly representative of the population. <ul style="list-style-type: none"> Simple random Systematic random (Fixed interval) Stratified random(Homogenous categories) 	<ol style="list-style-type: none"> Sampling technique in which the researcher selects Samples based on the subjective judgment of the researcher rather than random selection. <ol style="list-style-type: none"> Biased sample This sampling method depends heavily on the expertise of the researchers. person might have a better chance of being chosen if they live close to the researcher or have access to a computer. <ul style="list-style-type: none"> Convenience (Available sample at this time) Quota Purposive (Conscious selection on desired characteristic)



Type of probability sample:

Simple random

sampling that uses a **Table of Random Digits** (erawftos lactistiats Ila morf sesac/snosrep eht tceles **a list of every case in the** defined population, with **each case** having **an equal chance** detceles gnieb fo

Stratified random

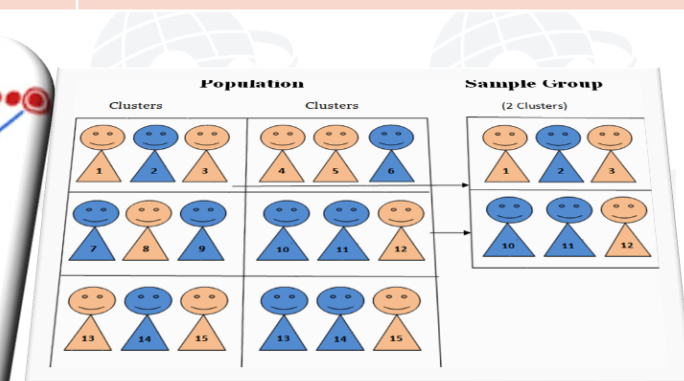
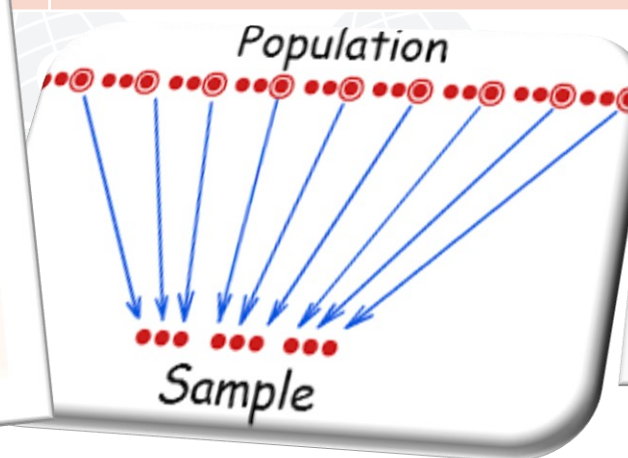
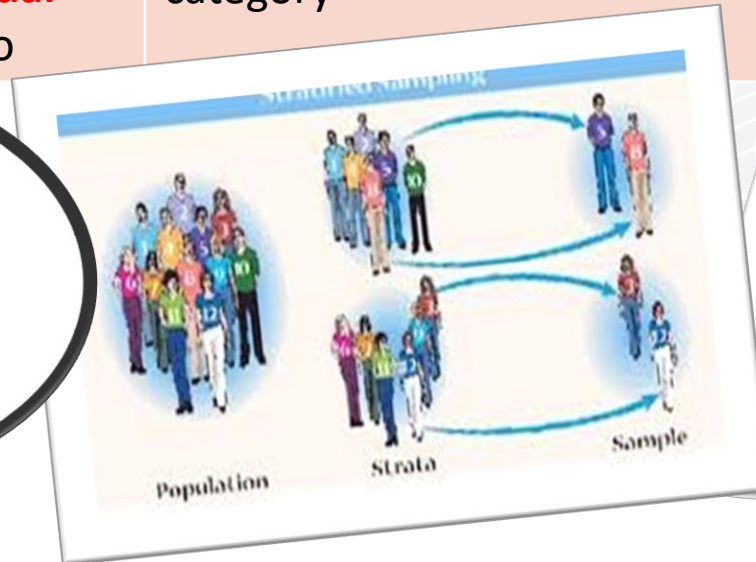
sampling utilizes **two or more homogeneous categories** or dimensions of a population and samples an appropriate number of persons/cases that are representative of the category



Systematic random

Sampling utilizes a **system to select the sample** eht fo IIA . neht dna detsil si notialupop **the first case is randomly selected** gnticeles neht dna ; yreve**nth**, esac based on fixed intervals.

Cluster random

researchers divide a population **into smaller groups known as clusters**. They then randomly select among these clusters to form a sample.

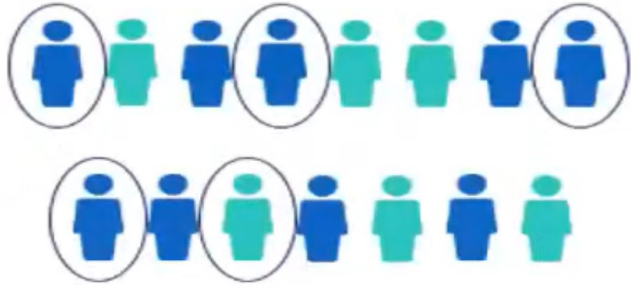


 <p>Probability sampling</p>	 <p>Nonprobability sampling</p>
Random sampling (no bias)	Non-random sampling (bias)
Does not involve human judgment.	Involves human judgment.
Each case in the population has an equal chance of being selected	No equal chance
The final sample is "representative" of the entire population	Nonrepresentative.
It increases the probability that the finding can be generalized to other populations	Lessens the probability that the finding can be generalized to others

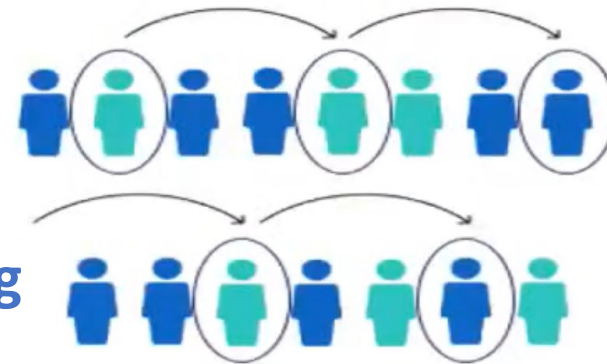
In healthcare, we typically use a combination of probability and nonprobability sampling.



Simple random sample

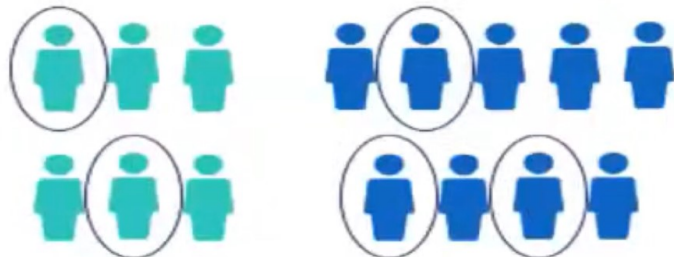


Systematic sample

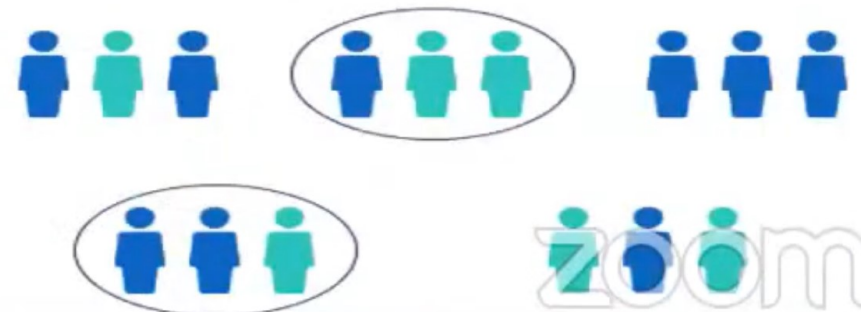


Probability sampling

Stratified sample

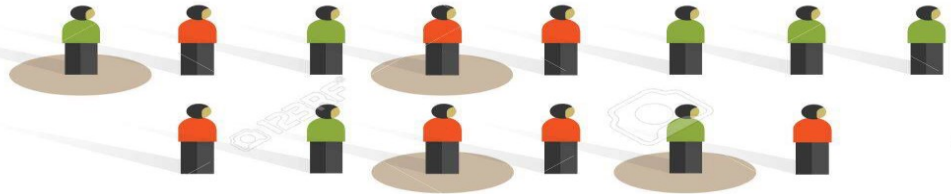


Cluster sample



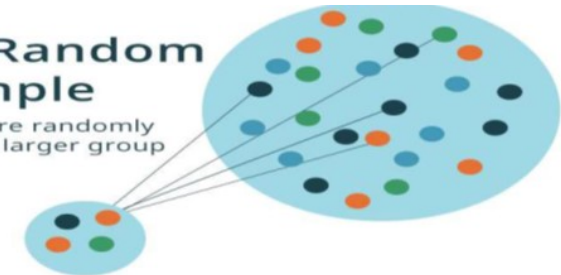


Simple random sampling



Simple Random Sample

Respondents are randomly selected from a larger group

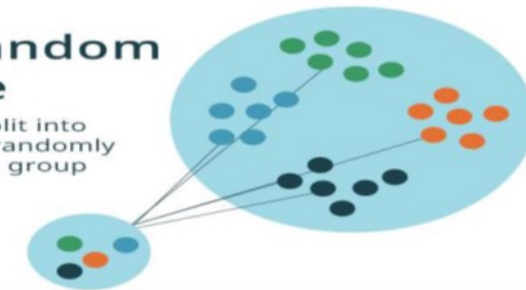


Stratified sampling



Stratified Random Sample

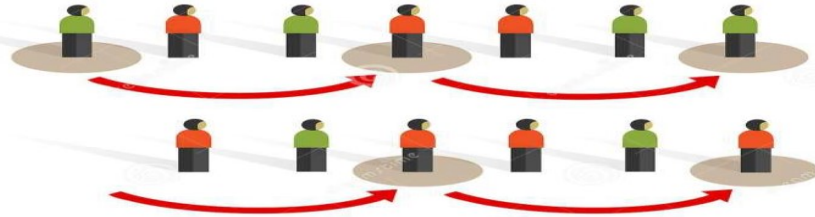
Respondents are split into sub-groups and then randomly selected from each group



Two or more homogeneous categories or dimensions of a population and samples an appropriate number of persons/cases.



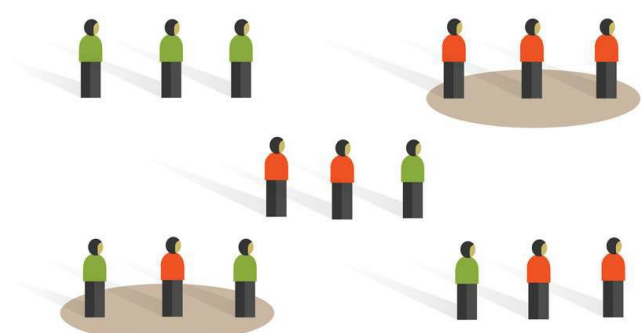
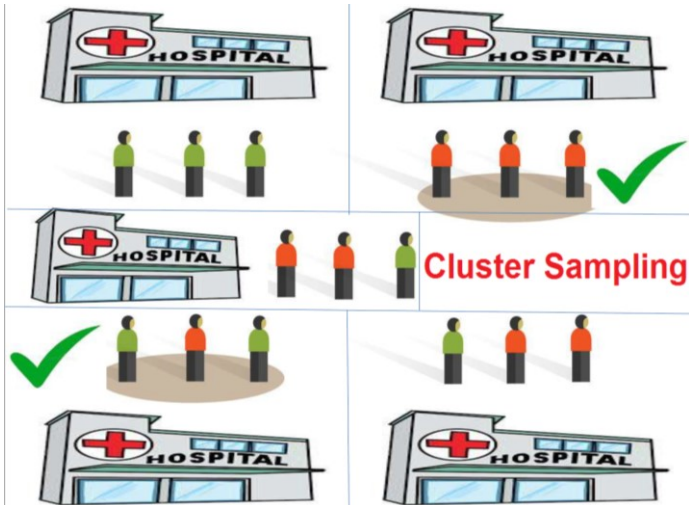
Systematic sampling



All of the population is listed and then the first case is randomly selected and then select every (nth) case.



Cluster sampling



Our entire population is divided into clusters or sections and then the clusters are randomly selected.

Stratified and Cluster Sampling

Stratified

- Population divided into few subgroups
- Homogeneity within subgroups
- Heterogeneity between subgroups
- Choice of elements from within each subgroup



Cluster

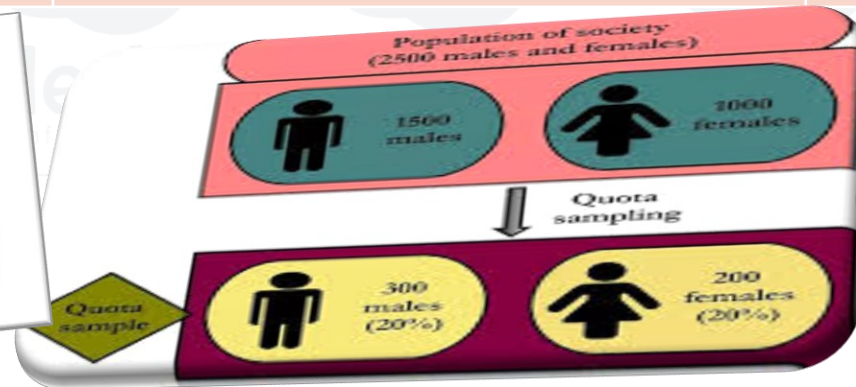
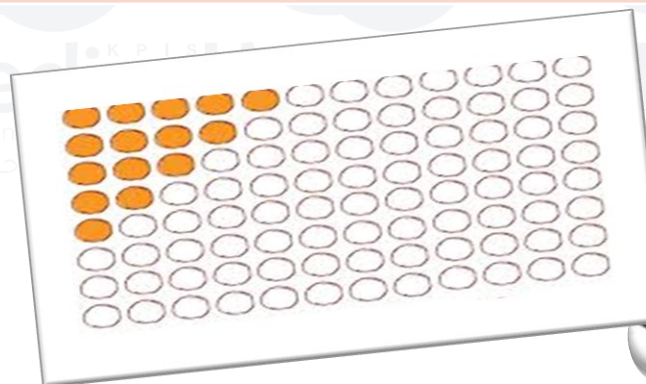
- Population divided into many subgroups
- Heterogeneity within subgroups
- Homogeneity between subgroups
- Random choice of subgroups





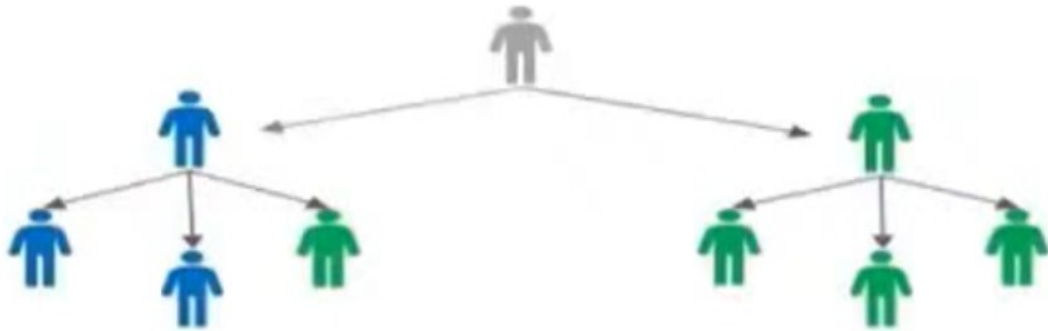
Type of Non-probability sample:

Convenience	Quota	Purposive
<p>sampling utilizes data that is most readily available.</p> <p>All patients seen in the Emergency Department (ED) in a given week. If convenience sampling is utilized, the findings could not be generalized easily to patients that come to the ED at any other time .</p>	<p>Sampling utilizes portions or percentages of persons/cases in a stratified population (subset)</p> <p>%10 of male patients with both diabetes and heart disease. A quota sample limits the ability to draw conclusions outside of those studied because there may be differences between those who were chosen and not chosen</p>	<p>Sampling selects persons/cases/issues because they demonstrate a desired characteristic that can be measured against specific, predetermined criteria.</p> <p>all patients over age 60 with total hip replacements</p>

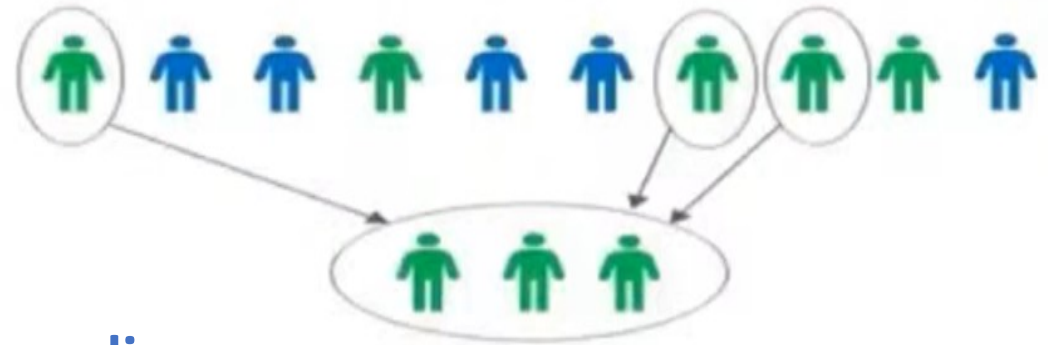




Snowball sample

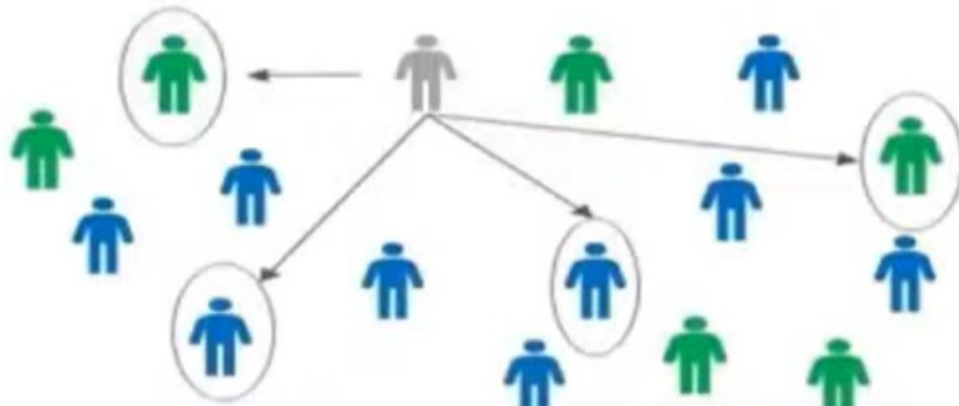


Quota sample

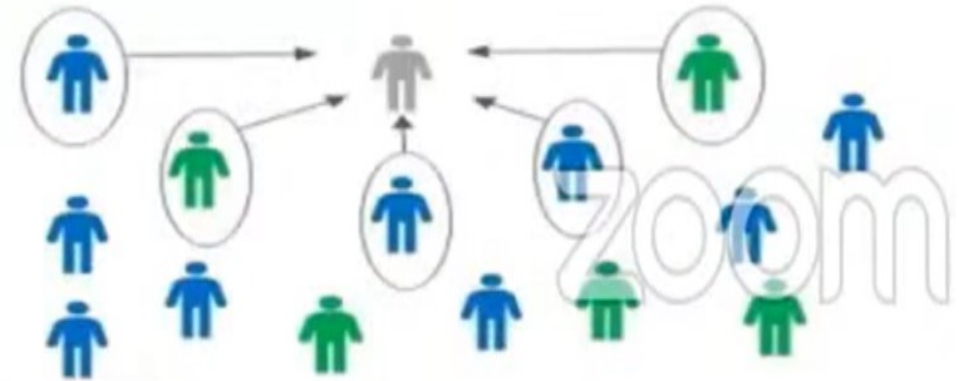


Non-Probability sampling

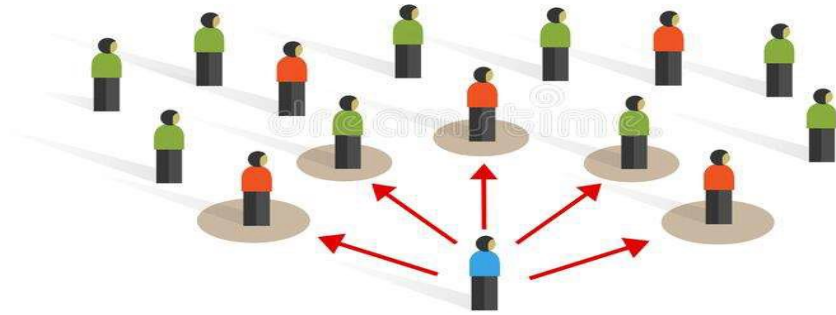
Judgement sample



Convenience sample

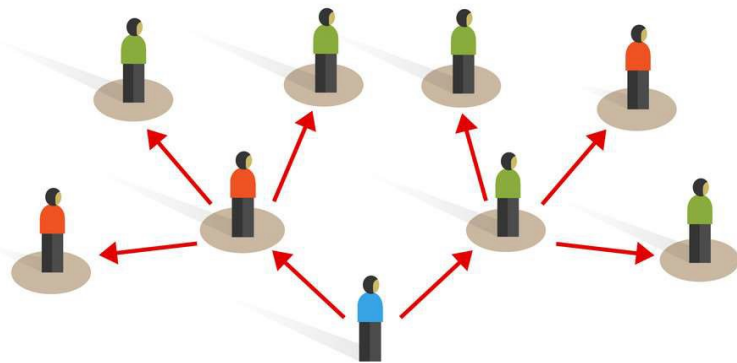


Convenience sampling



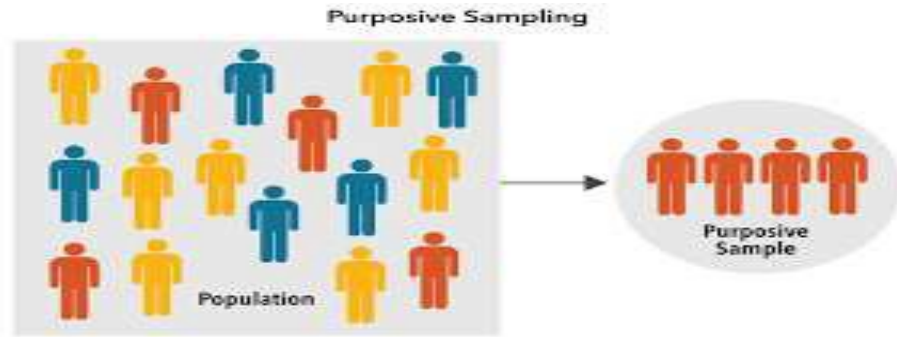
The subjects are selected because of their **convenient accessibility and proximity**. Example: all patients seen in the Emergency Department(ED) in a given week. The findings could not be generalized easily to patients that come to the ED at any other time.

Snowball sampling



- Used where subjects are **hard to locate**.

judgement sampling



Sampling selects persons/ cases/ issues because they demonstrate a **desired characteristic (judgement)**.

QUOTA SAMPLING

A judgment is made about the most representative sample
 –15 charts per month
 –**5% or 30 –whichever is greater**

- Similar to stratified sampling, population is divided into mutually exclusive subsets
- Then judgement is used to select the participants from each stratum based on specified proportion



Sample size:

There are no such rules for to determining the best sample size of quality monitoring and performance improvement projects. However, there are several general guidelines. In general, **the larger the sample size the more predictive the findings will become.**

A **general rule of thumb** that has been followed by many organizations is **5% or 30** whichever is greater in the population being studie .

If this rule is followed, thirty records, events, etc., can be measured and deemed adequat.

Total monthly initial pt population size (N) for the selected measure	Required monthly
≥ 640	128
320-639	20% of total population
64-319	46
< 64	100% population



Determine Sample Size

Confidence Level: 95% 99%

Confidence Interval:

Population:

Sample size needed:

Sampling Size


• The larger the sample size the more predictive the findings will become.



• 5% or 30, whichever is greater in the population being studied.

100

1st Sampling Size
5% or 30, whichever is greater in the population being studied.

400  **5%** = **20**

30

Calculate your sample size

Population size

Confidence level (%)

Margin of error (%)

Sample size
357





Which of these sampling methods is NOT probability sampling?

- A. Simple random sampling**
- B. Quota sampling**
- C. Systematic sampling**
- D. Stratified random sampling**

The quality professional evaluated hypertension rates in their internal medicine clinic, looking at ages <35, 35-50, 50-65 and >65. He evaluated a sample from each age group. What type of sampling did he use?

- A. Purposive sampling**
- B. Systematic sampling**
- C. Simple random sampling**
- D. Stratified random sampling**



The quality team is evaluating handwashing rates in the three intensive care units. They use a checklist and have someone stationed for 1 hour daily covering both 12-hour shifts for one week. What type of sampling best describes this method?

- A. Simple random sampling
- B. Convenience sampling
- C. Purposive sampling
- D. Systematic sampling



DATA

Not measured. It is based on counts, The data can then be expressed in %

Measured on a continuous scale, expressed in specific measurement units

Categorical
Categorical data can be stored and identified by **names** or **labels**.

Numerical
data are **numbers**, not words or descriptions.

Nominal
No ranking, Sex, Race

Ordinal
Good, better, satisfaction survey

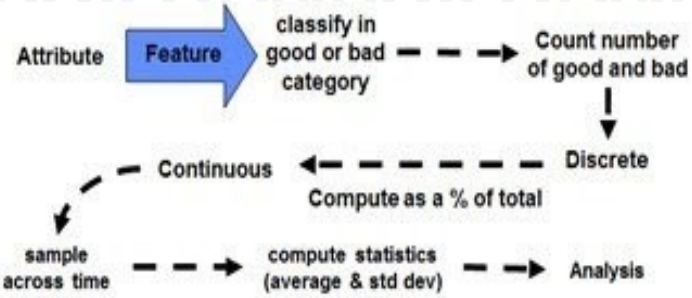
Continuous
Weight and height

Discret

- Categorical Variables**
Take on names or labels
- Eye color
 - Gender
 - Breed of dog
 - Level of education
 - Marital status

VS

- Quantitative Variables**
Take on numeric values
- Number of students in a class
 - Number of square feet in a house
 - Population size of a city
 - Age of individual
 - Height of individual



Continuous vs Discrete Data

Any Value	Specific Values
"Measured"	"counted"
5.6, 2.489	1, 2, 3, 4, 5, 6
Temperature	# of cats



Types of Data



Quantitative

Data that can be measured with numbers, such as duration or speed



Discrete

Whole numbers that can't be broken down, such as a number of items



Continuous

Numbers that can be broken down, such as height or weight



Interval

Numbers with known differences between variables, such as time



Ratio

Numbers that have measurable intervals where difference can be determined, such as height or weight



Qualitative

Non-numerical data that is categorical, such as yes/no responses or eye colour



Nominal

Data used for naming variables, such as hair colour



Ordinal

Data used to describe the order of values, such as 1 = happy, 2 = neutral, 3 = unhappy



Categorical data Non-parametric

Also Known As:

- Attribute - Discrete - Nominal - Ordinal - Qualitative

Examples:

Members, Patients, Births, Procedures, Occurrences, Gender

Measure of central tendency:

median (ordinal) or mode (nominal)

Usual statistical test of difference between 2 groups:

Chi Square

Usual display tools:

- Table
- Scorecard
- Bar graph
- Pareto

Continuous data parametric

Also Known As:

- Variable - Quantitative - Interval - Ratio

Examples:

Age, Height, Weight, Temperature, Time, Charges (money), LOS

Measure of central tendency:

mean

Usual statistical test of difference between 2 groups:

T test

Usual display tools:

- Histogram
- Run chart
- Control chart
- Scorecard (not the best to use)



Categorical Nominal -Also known as count, discrete, qualitative; considered attributes data with no quantitative value

Nominal Values	Categories
Surgical patients	Preoperative or postoperative
Gender	Female or male
Patient education	Attended or did not attend class
Ordinal Values	Categories
Nursing staff rank	Nurse level I, II, III,IV, V
Education	AD, BS, MS, PhD
Attitude toward research scale	Agree, neutral, disagree

Categorical Ordinal –Nominal data put into categories and rank-ordered

Continues Interval – Measured on scales that theoretically have no gaps; considered variables data; no true zero

Interval Data

Equal distance between each point (e.g., values on a thermometer); no true zero

Continues Ratio – Measured on scales that theoretically have no gaps; considered variables data; has a true zero

Ratio Data

Equal distance between each point , but there is a true zero –no value goes below zero (e.g., height and weight)

Statistical power

A critical issue is whether right data are measured or counted

- Most quality improvement data (continuous/count) readily available are analyzed because they are easy to retrieve but are not always the best data to use

Categorical Data

Continuous Data

Least statistical power

Example: hypertensive versus non-hypertensive

Most power and need fewer data points

Example: systolic and diastolic BP values





Are the following data categorical or continuous?

- How many patients had surgery this month? YES OR NO CATEGORICAL
- A patient's temperature was 103 degrees. You medicated the patient with Tylenol and his temperature came down to 101 degrees. INTERVAL
- You want to know what the average length of stay was for patients in the intensive care unit in the first six months of the year. RATIO





Statistical handling of data

Measures of Central Tendency

Measures of Dispersion

Data Comparison Techniques (test of statistical significance)

Ordering(Frequency distribution)

- Arithmetic Mean
(Average)
- Weighted Mean
- Mode
- Median
(50th percentile)

- Range
- Inter-percentile Range
- Variance
- Standard Deviation (SD)

- Student t-test
(compare the means)
- Paired t-test
- Chi-square test
(compare the rates)
- ANOVA test
- Regression Analysis
(compare 2 distributions)

- Rate
- Ratio
- Proportion
- Simple frequency distribution
- Grouped frequency distribution
- Bar graph
- Histogram
- Frequency polygon
- Pareto
(cumulative frequency distribution)

zoom



1) Sensitivity:

The sensitivity of a test (also called the **true positive rate**) is defined as the **proportion of people with the disease** who will have a positive result. In other words, a highly sensitive test is one that correctly identifies patients with a disease. A test that is 100% sensitive will identify all patients who have the disease. It's extremely rare that any clinical test is 100% sensitive. A test with **90% sensitivity** will identify **90% of patients who have the disease**, but will miss **10% of patients who have the disease**.

2) Specificity:

The specificity of a test (also called the **True Negative Rate**) is the proportion of people without the disease who will have a negative result. In other words, the specificity of a test refers to how well a test identifies patients who do not have a disease. A test that has 100% specificity will identify 100% of patients who do not have the disease. **A test that is 90% specific will identify 90% of patients who do not have the disease.**

3) Stratification:

*classification of data into **homogenous groups** or subsets, so all information must be captured within the collection tool.*

4) Usability:

*relative ease with which **indicator can be understood** or tool can be used.*

5) Record ability:

ability of tool or indicator to identify, capture, measure needed information.



6) Validity :

capability of tool or indicator to measure **what it is supposed to measure**, its predictive value as measure of quality.

7) Reliability:

ability of tool or indicator to measure in reproducible way what it is supposed to measure and produce the same result .

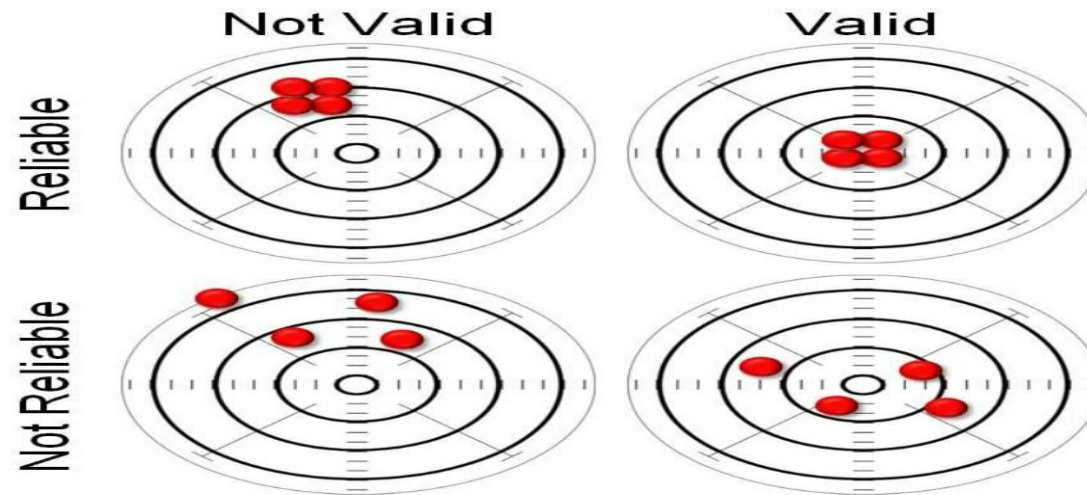
8) Goal:

numerical value that defines significance level of data desired for decision making.



Two Measurement Criteria for Customer Metrics

- 1. Reliability** is about precision/consistency of the metric
- 2. Validity** is about meaning of the metric



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A monitoring system is being designed in which data will be collected and compared to criteria. Which of the following will best enhance the validity and reliability of the data?

- A. establishing criteria that are based on the most recent changes in medical science and technology*
- B. using a computerized system to substitute data for missing responses*
- C. assigning one staff member to identify, collect, enter, and interpret all data*
- D. providing a practice-based definition and specific instructions for each element*



A valid data collection tool should incorporate

A. a minimum of 20 data elements.

B. a reliable graphic presentation.

C. the definition of data elements.

D. allowance for variance of interpretation.

9) Trigger:

numerical point at which there should be some *action* taken.

10) Threshold:

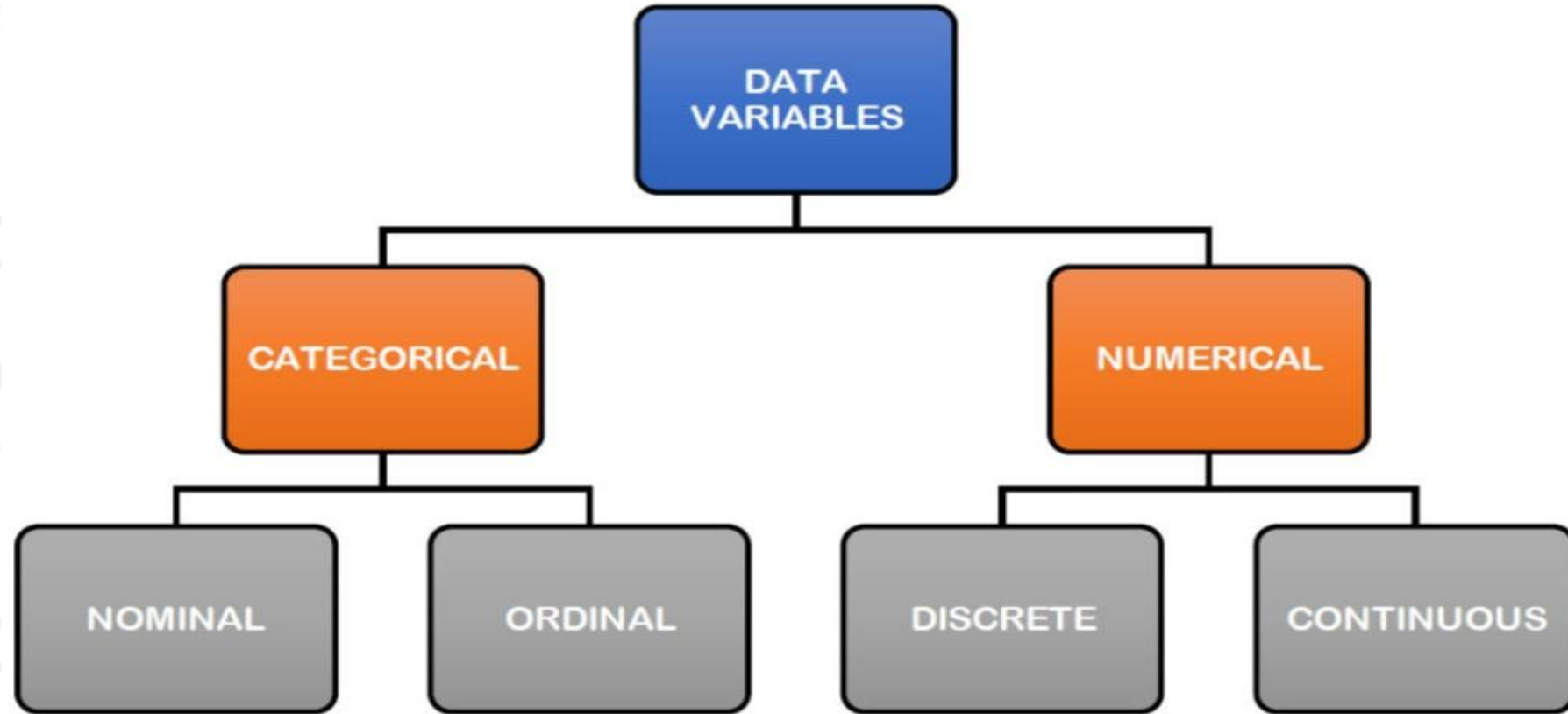
- *numerical point* below which data should *not fall*.
-Or the point or level at which something begins or changes.

11) Benchmark:

standard or *point of reference* against which data may be compared or assessed.

Data variable

- A data variable is "something that varies" or differs from person to person or group to group.
- Data variables are the items that we collect data about. Examples for data variables are sex, age, weight, marital status, satisfaction rate, etc.
- **recognize the type of each data variable for the following reasons:**
 - **Summarizing data:** describing a variable in mean with standard deviation or in frequency with percentage depends on the type of data variable.
 - **Graphical presentation:** choosing the proper graph to represent the data depends on the type of data variable.
 - **Analyzing data:** choosing the suitable statistical tests also depends on the type of data variables.





1) categorical data – attribute data – discrete data – ordinal – nominal -qualitative

- data **categorized & counted.**
- Nominal & ordinal data.
- they have **NO unit of measurement**
- based on counts of members of discrete categories.
- Categorical data exist only as whole numbers (number of procedures, members, patients, deaths, events)
- can be expressed as percentages, e.g. : CHF 20% of patients.
- Qualitative data, describe qualities of categories as blood type, intensity of burn, physician specialty.
- Qualitative data includes observations as data from case studies, focus groups, interviews.
- **Nominal:** counting things of different names.
- **Ordinal data:** scores on ordered scale.



We can describe one patient as belonging to the males' group or the females' group, and one customer as belonging to the satisfied group, the neutral group, or the unsatisfied group.

Sometimes, categorical variables are coded in numbers like:

1 for females and 2 for males, or 0 for No, and 1 for yes.

Even if they are coded or represented as numbers, they are still categories, and the data type is categorical.

Sex: (female, male), can also be presented as (male, female)

Blood groups: (A, B, AB, O) can also be presented as (A, B, O, AB) or any other order.

Nationality: can be presented in any way; there is no order for the countries.

those are categorical variables that have an order, and that order has a meaning.

Examples:

BMI status: (underweight, normal, overweight, obese, extremely obese)



Table 4-8 Examples of Nominal

Nominal Variable	Values
Surgical patients	Preoperative
	Postoperative
Gender	Male
	Female
Patient education	Attended via
	Did not attend

Table 4-9 Examples of Ordinal Variables

Ordinal Variable	Values
Nursing staff rank	<ol style="list-style-type: none"> 1. Nurse Level 1 2. Nurse Level II 3. Nurse Level III
Education	<ol style="list-style-type: none"> 1. Diploma/Associate Degree 2. BS 3. MS 4. PhD/DNSc/DNP
Attitude toward research (Likert scale)	<ol style="list-style-type: none"> 1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree



2) Continuous data, variable data , ratio , interval , quantitative data

- measured on continuous scale
- expressed in specific measurement units (whole or fraction)
- indicating amount or quantity of what being measured.
- Quantitative data, because measure interval between any two points as quantity.
- Blood glucose & oxygen consumption quantitative data.

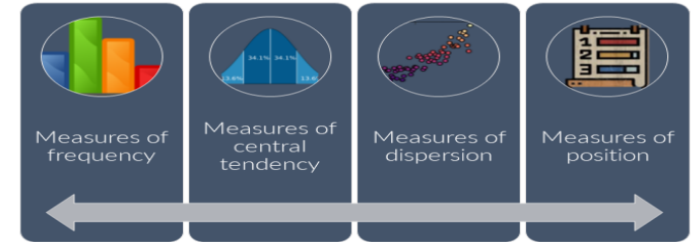
Table 10: Types and Uses of Data

Types and Uses of Data		
Type	Categorical /Count	Continuous / Measured
Also Known As (AKA)	Attribute Discrete Nominal Ordinal Qualitative	Variable Quantitative Interval Ratio
Examples	# Members, Patients, Births, Procedures, Occurrences, Gender	Age, Height, Weight, Temperature, Time, Charges (money), LOS
Usually Reported as	% in each category (whole numbers)	Mean Median Minimum Maximum Percentiles (whole and fractional units)
Usual statistical test of difference between 2 groups	Chi Square	T test
Usual display tools	Table Scorecard Histogram Pareto	Run chart Control chart Scorecard (not the best to use) Data display over time = use run or control chart



Descriptive statistical data

Descriptive Analysis



Central Tendency (Mean, Median, Mode, Weighted Mean)

DEF. a set of measures that indicate what is the 'middle' value or the typical value of data.


1. **Mean (average)** = $\frac{\text{add all the numbers}}{\text{the set of numbers}}$

Example: $123456 = \frac{1+2+3+4+5+6}{6} = 3.5$

The mean is **affected by outliers or astronomical point**
123456 80

Mean = $1+2+3+4+5+6+80/7 = 14.5$


the mean is **'pulled'** toward these astronomical numbers.



Descriptive Statistics

[di-'skrip-tiv stə-'ti-stiks]

Statistics that summarize or describe features of a data set, such as its central tendency or dispersion.



Mean

['mēn]

The mathematical average of a set of two or more numbers.

Investopedia

2. Median: is the 'middle number' with an equal number of values above and below the median.

To calculate the median:

1. Arranging your numbers from lowest to highest.
2. In odd numbers: 1 2 3 4 5 6 7 the median is 4.
3. In even numbers: 1 2 3 4 5 6 7 8 0 the median is $4+5 / 2 = 4.5$.


With astronomical or outlier data, the mean does not really indicate the middle of the data. Therefore, it is better to utilize the median.

3. Mode: is the most frequently appearing number. The data may have one or more modes.

With the numbers 3, 3, 4, 5, 5, 5, 6, and 8, the **value 5 occurs** three times so it is the mode.

In the numbers 23, 23, 34, 45, 45, 56, and 88, the values 23 and 45 both appear twice so 23 and 45 are both the mode.

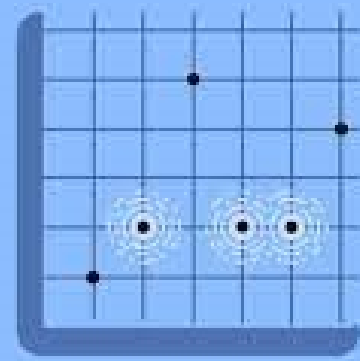
the numbers 29, 56, 109, 110, 375, 390, 444, and 663, each number appears only once, so there is no mode in this data set.



Median
[mē-dē-ən]

The middle number in a sorted, ascending or descending list of numbers. It can be more descriptive of that data set than the average.

Investopedia



Mode
[mōd]

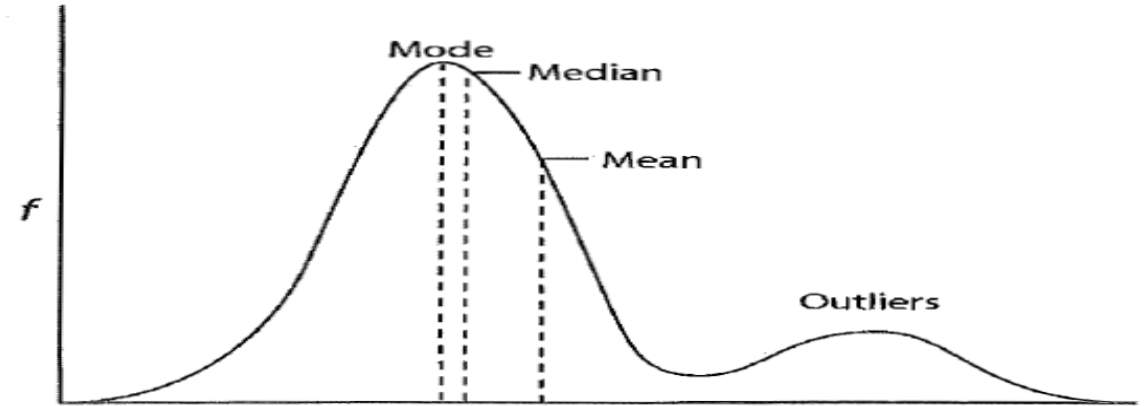
The value that appears most frequently in a data set. A set of data may have one mode, more than one mode, or no mode at all.

Investopedia

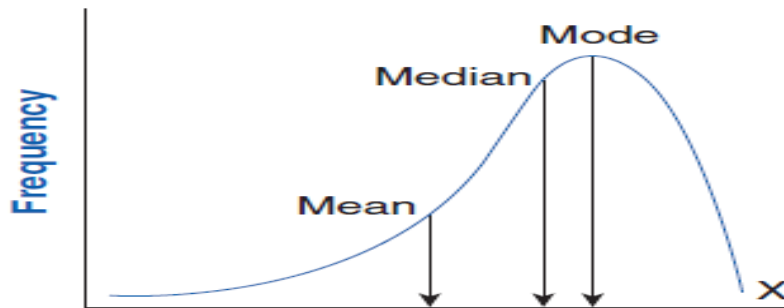


In a 'normal' unimodal symmetrical distribution, the values of the **mean, median and the mode** are the same.

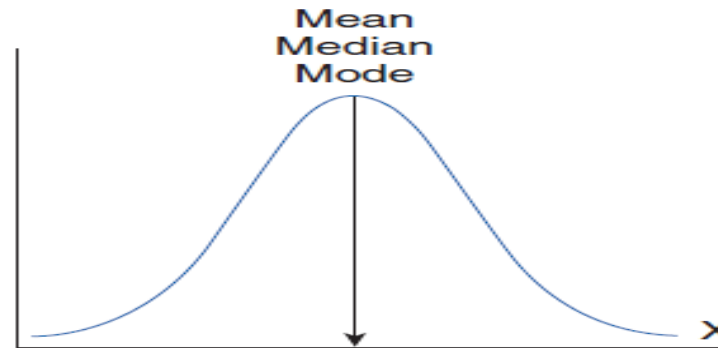
In an asymmetrical or skewed distribution or curve, the **mode** falls at the highest point, the **mean** falls towards the tail of the distribution, and the **median** lies between the mean and the mode



(a) Negatively skewed

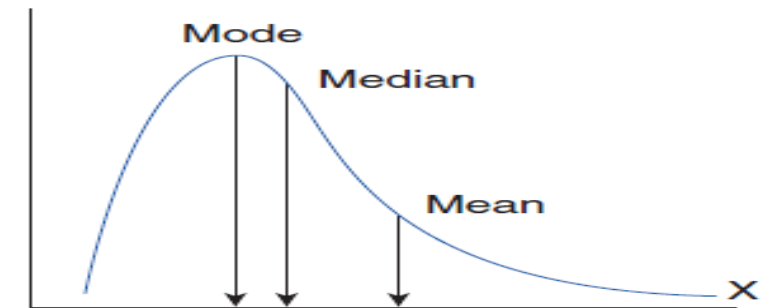


(b) Normal (no skew)



The normal curve represents a perfectly symmetrical distribution

(c) Positively skewed





(1) Measures of central tendency

MEASURES OF CENTRAL TENDENCY



Mean

Median

Mode

Mean (Average)

Add all the numbers then divide by the amount of numbers

9, 3, 1, 8, 3, 6

$$9 + 3 + 1 + 8 + 3 + 6 = 30$$

$$30 \div 6 = 5$$

The mean is 5

Median (Middle)

Order the set of numbers, the median is the middle number

9, 3, 1, 8, 3, 6

1, 3, 3, 6, 8, 9

The median is 4.5

$$\frac{N+1}{2}$$

2

Mode (Most)

The most common number

9, 3, 1, 8, 3, 6

The mode is 3

zoom



Central tendency

Measures of central tendency are statistical indexes that describe where a set of scores/values of a distribution **cluster**

- Central refers to middle value
- Tendency refers to general trend of the numbers
- Type and distribution of the data determine which measures of central tendency are most appropriate –mean, median, or mode

- **Mean** = average
- **Median** = middle
- **Mode** = most frequently occurring



Mean = average

- The mean of a set of measurements is the sum of all scores/values divided by the total number of scores
- Most commonly used
- Most sensitive to extreme scores
- Used with interval and ratio data
- These types of data are
 - A. Categorical or count data
 - B. Continuous or measurement data

Example 1	Example 2	Example 3
Values: 2, 2, 3, 4, 5, 6, 6, 8, 9	Values: 2, 2, 2, 3, 4, 5, 6, 6, 8, 9	Values: 2, 2, 2, 3, 4, 5, 6, 6, 8, 84
Mean = 5	Mean = 4.7	Mean = 12.2



4. Weighted Mean

Some numbers are carry **more weight**, than others carry.

When calculating the weighted mean, there are two numbers per set of data.

The **first** number is the **value** of what was **measured**, and the **second** is the **weight** assigned to the measure as a portion of the whole.

Domains	Score	Weight (%)	Multiply S x W
Clinical Process of Care	82	10	820
Pt. Experience of Care	58	25	1450
Outcome	92	40	3680
Efficiency Measure	67	25	1675
TOTAL		100	7625
Total Performance Score	76.25	(7625/100)	



Weighted Mean

We use the weighted mean when we want to assign different weights to different data.

For example: we want to calculate the average grade. The student has obtained the grades of 70, 85, and 90 in three quizzes, 80 in the midterm, and 95 in the final. The syllabus specifies that the midterm is 5 times more important than each quiz, and the final, 8 times more important. We assign these weights to the grades:

	quiz 1	quiz 2	quiz 3	MT	final
grades	70	85	90	80	95
weights	1	1	1	5	8

To calculate the average grade, we do the following:

$$\text{average grade} = \frac{1 \times 70 + 1 \times 85 + 1 \times 90 + 5 \times 80 + 8 \times 95}{1 + 1 + 1 + 5 + 8} = \frac{1405}{16} = 87.8125$$

Ex 7 Solution: Finding a Weighted Mean

Source	Score, x	Weight, w	$x \cdot w$
Test Mean	86	0.50	$86(0.50) = 43.0$
Midterm	96	0.15	$96(0.15) = 14.4$
Final Exam	82	0.20	$82(0.20) = 16.4$
Computer Lab	98	0.10	$98(0.10) = 9.8$
Homework	100	0.05	$100(0.05) = 5.0$
		$\Sigma w = 1$	$\Sigma(x \cdot w) = 88.6$

$$\bar{x} = \frac{\Sigma(x \cdot w)}{\Sigma w} = \frac{88.6}{1} = 88.6$$

Your weighted mean for the course is 88.6. You did not get an A.



Median = middle

- Measure that corresponds to middle score; does not take quantitative value of individual scores into account
- Point on a numerical scale above and below which 50% of data falls
- Arrange values in rank order
- If number of values is:
 - Odd, count from ends to middle value
 - Even, compute mean of two middle values

Example 1	Example 2	Example 3
Values: 2, 2, 3, 4, 5, 6, 6, 8, 9	Values: 2, 2, 2, 3, 4, 5, 6, 6, 8, 9	Values: 2, 2, 2, 3, 4, 5, 6, 6, 8, 84
5 is the middle number	Add 4 plus 5 (middle numbers) and divide by 2 = 4.5	Quantitative values of individual #s not taken into account
Median = 5	Median = 4.5	Median = 4.5
Mean = 5	Mean = 4.7	Mean = 12.2



Mode = most frequently occurring

- Score or value that occurs most frequently and is easiest to determine
- Can be calculated quickly and easily
- Can vary widely from sample to sample (unstable)

Examples

Values: 30, 31, 31, 32, 33, 33, 33, 33, 33, 34, 35, 36

Mode= 33

Values: 2, 3, 6, 8, 10

Mode = no mode



Measures of central tendency

Mean

Mode

Median

Example

Dataset = 7, 3, 4, 1, 7, 6

Summing up all the values in the dataset and dividing by the total number of values

$$\text{Mean} = (7+3+4+1+7+6)/6$$

$$= 28/6$$

Most common value

$$\text{Mode} = 7, 3, 4, 1, 7, 6$$

$$= 7$$

Arrange in order and pick the middle value

$$\text{Median} = 7, 7, 6, 4, 3, 1$$

$$= 6+4 / 2$$





A.2,4, 6, 8, 10	Mean =	Median =
B.2, 4, 6, 8, 100	Mean =	Median =
C.0, 2, 4, 6, 7, 8, 10	Mean =	Median =
D.2, 4, 6, 6, 8, 10	Mode =	
E.2, 4, 4, 6, 6, 8, 10	Mode =	
F.2, 4, 4, 6, 6, 6, 8, 8, 10	Mode =	
G.2, 4, 6, 8, 10	Range =	
H.102, 104, 106, 108, 110	Range =	



A. 2, 4, 6, 8, 10	Mean = 6	Median = 6
B. 2, 4, 6, 8, 100	Mean = 24	Median = 6
C. 0, 2, 4, 6, 7, 8, 10	Mean = 5.28	Median = 6
D. 2, 4, 6, 6, 8, 10	Mode = 6	
E. 2, 4, 4, 6, 6, 8, 10	Mode = 4-6	
F. 2, 4, 4, 6, 6, 6, 8, 8, 10	Mode = 6	
G. 2, 4, 6, 8, 10	Range = 8	
H. 102, 104, 106, 108, 110	Range = 8	

Dispersion of Data

(Range, Frequency, Standard Deviation)

DEF: The term Dispersion refers to **how variable, scattered, or spread** the data is in a distribution.

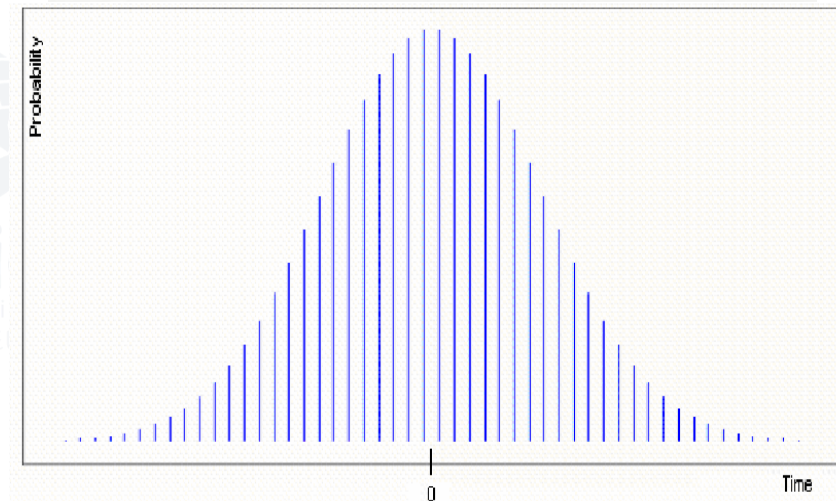
1. The range: tells you **the lowest and highest** numbers in a set of numbers

Example: 2, 4, 6, 8, and 10, then the range can be expressed as 2, 10 or as 8 ($10-2=8$)

2. Frequency Distributions: are a logical and **systematic arrangement** ("rank-ordering") of numerical data from the **highest to the lowest, or lowest to highest, values.**

Frequency distributions are commonly seen in three formats:

- I. Simple
- II. Grouped (used with interval, each containing an equal number)
- III. Cumulative frequency distributions (sum of the frequency of that value + f of all smaller value)





SIMPLE FREQUENCY DISTRIBUTION TABLES

<u>Individual Test Scores</u>	<i>f</i>
(Ranked highest to lowest)	
125	1
124	3
123	2
122	2
121	3
120	4
119	0
118	4
117	1
116	2
115	5
etc.	
	N = 27

GROUPED FREQUENCY DISTRIBUTION TABLE

<u>Grouped Test Scores</u>	<i>f</i>
(Ranked lowest to highest)	
56-65	42
66-75	70
76-85	99
86-95	74
96-105	52
106-115	40
116-125	22
	N = 399
	<i>i</i> = 10

CUMULATIVE FREQUENCY DISTRIBUTION TABLE

<u>Grouped Test Scores</u>	<i>f</i>	<u>cum f</u>
(ranked lowest to highest)		
56-65	42	42
66-75	70	112 (42 + 70)
76-85	99	211 (42 + 70 + 99)
86-95	74	285 .
96-105	52	337 .
106-115	40	377 .
116-125	22	399 .
	N = 399	

grouping the observations into intervals and **tabulating the frequencies for each interval**

The grouped frequency distribution can be modified to show **how many scores fall below (or above) a certain level**
This is done by adding the frequency of a class to the frequencies of all previous classes. The result of doing this is called a cumulative frequency.

3. Relative Frequency/Percentage: calculation of proportion, or a part-to-whole relationship

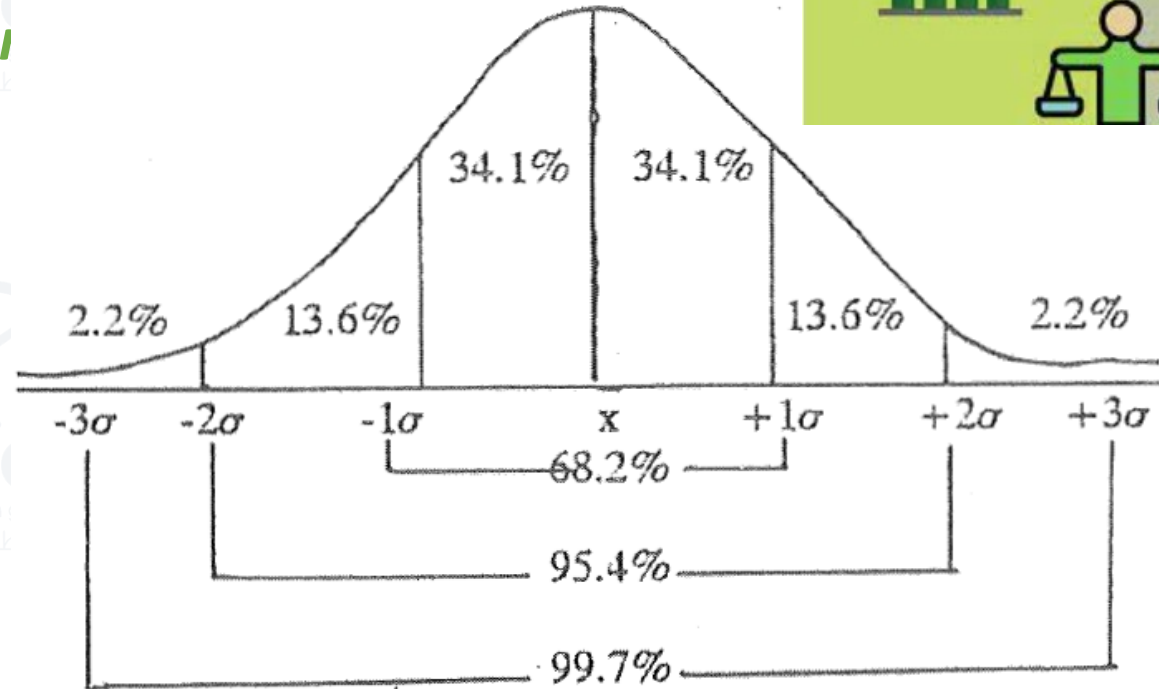
$$\frac{\text{Part [individual case or group]}}{\text{Whole [N; total cases]}} \times 100$$



4. Ratio: is a *fixed* relation in *number of* similar things.

Example: nurse: patient is 1:5

4. Standard Deviation: value describing the amount of variability in a particular distribution (The standard deviation is the square root of a measure called the variance)





(2) Measures of dispersion

(Variability, Variation)

Variability refers to the spread of the scores within a distribution. Along with the central tendency, it helps in understanding the data set as a whole. There are four major measures of variability:

1. **Range**
 - Difference Between the highest and lowest scores [+1]
2. **Interquartile Range**
 - Difference between the 75th and 25th Percentile
3. **Variance**
 - The degree of spread within the distribution (the larger the spread, the larger the variance)
4. **Standard Deviation**
 - A measure of how the average score deviates or spreads away from the mean (defined as the square root of the variance)

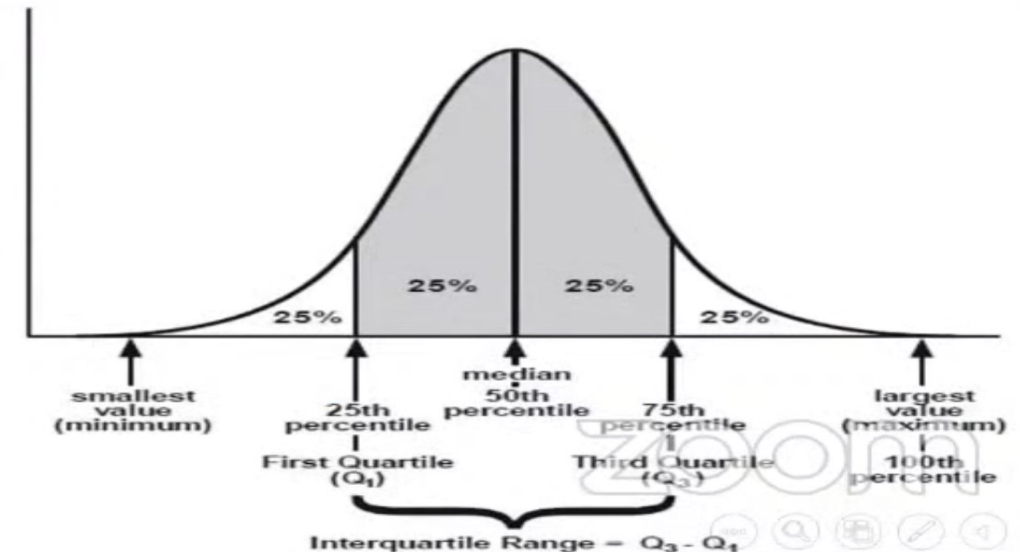
Range

The difference between the highest number and lowest number

9, 3, 1, 8, 3, 6

$$9 - 1 = 8$$

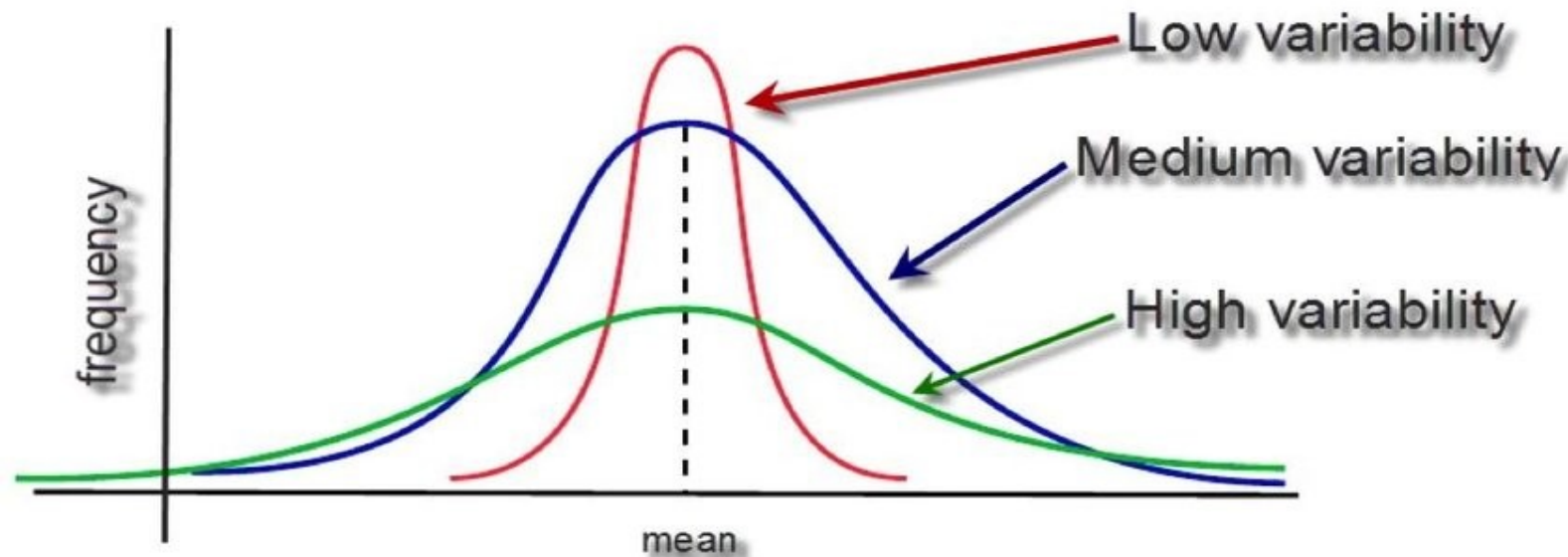
The range is 8





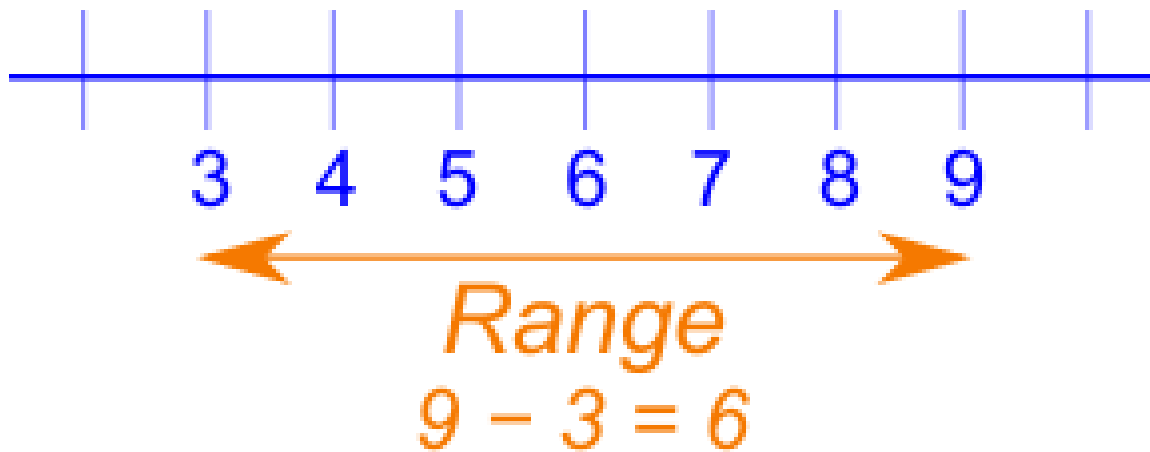
Measures of variability or dispersion

- How measures spread out
- Degree to which values differ



Rang

- Difference between the highest and lowest values in a distribution of scores
- Best reported as the values themselves and not as the distance between the values
- Provides quick estimate of variability
- Varies easily and affected by extreme values



Example

Test scores: lowest score = 60, highest score = 98

Therefore the range is 60 to 98

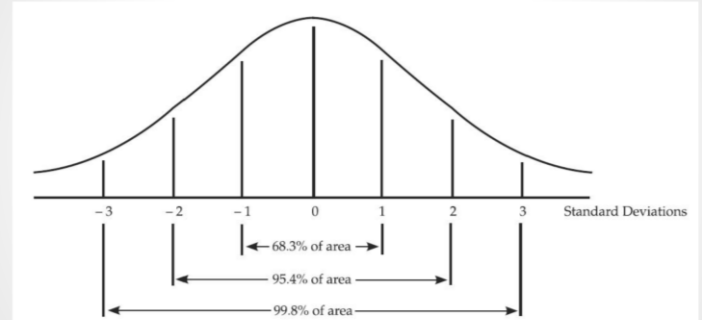
Standard deviation

- Measure of variability –Average of deviations from the mean
- Standard: Average spread of scores around mean
- Deviation: How much each score is scattered from the mean
- Most frequently used statistic for measuring degree of variability
- σ is symbol for standard deviation called 'Sigma'

- A normal distribution is a standard bell curve
- Used with normally distributed interval or ratio data
- The greater the spread of distribution, the greater dispersion or variability from the mean (heterogeneous, more differences)
- The more values cluster around the mean, the smaller the variability or deviation (homogeneous, more similar)
- All scores are taken into consideration

Bell Curve

pp. 224-225



(3) Frequency distribution

Ratios, Rates & Proportions

- **Ratio:** Relationship between two numbers

- **Example:** males/females Numerator is not included in the denominator
- In a **ratio** the values of x and y are independent such that the values of x are not contained in y

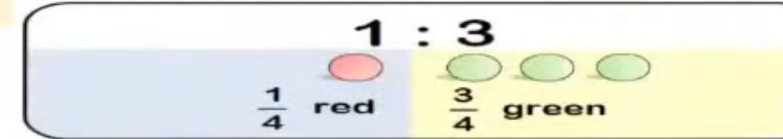
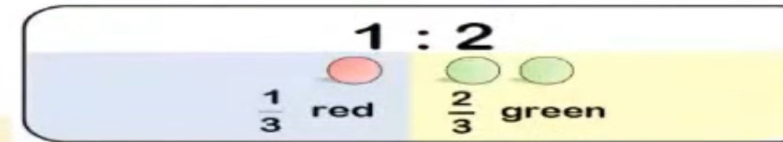
- **Proportion:** A ratio where the numerator is included in the denominator

- **Example:** males/total births
- **Example:** deaths from pod ingestion/deaths from all household cleaning agents

- **Rate:** A proportion with the specification of time

- **Example:** the annual rate of Healthcare Acquired Infection

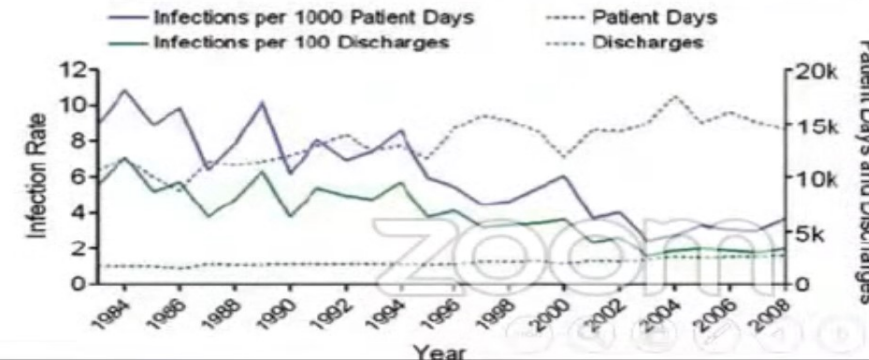
Numerator included in the denominator



Percent Proportion

$$\frac{\text{Part}}{\text{Whole}} = \frac{\text{Percent}}{100}$$

20 is what % of 45 ?





Scores:

1, 1, 2, 2, 2, 2, 2, 3, 3, 3, 3, 4, 4, 5

Score	Frequency	Cumulative Frequency
1	2	2
2	5	7
3	4	11
4	2	13
5	1	14

Cumulative Frequency for Score 3
is $2 + 5 + 4 = 11$

Frequency Distribution Table for Grouped Data

Class Limits	Frequency
25 - 27	5
22 - 24	7
19 - 21	14
16 - 18	11
13 - 15	3
Total	40

18	13	16	21
20	18	23	17
20	22	24	23
20	26	17	16
20	20	25	21
21	19	24	17
20	22	18	28
17	15	20	16
19	18	26	23
20	27	15	19

When the range of values from highest to lowest (or lowest to highest) is **wide**, group the single measures together in blocks (class intervals)

Stem-and-Leaf Plot

To construct a stem-and-leaf plot,

1. Determine what the stems will represent and what the leaves will represent. Usually, the leaf contains the last digit of the number and the stem contains all of the other digits.
2. The stems are listed to the left of the vertical line. Each stem is listed only once and no numbers are skipped, even if it means that some stems have no leaves. The leaves are listed in increasing order in a row to the right of each stem. The leaf number can be repeated.

Example:

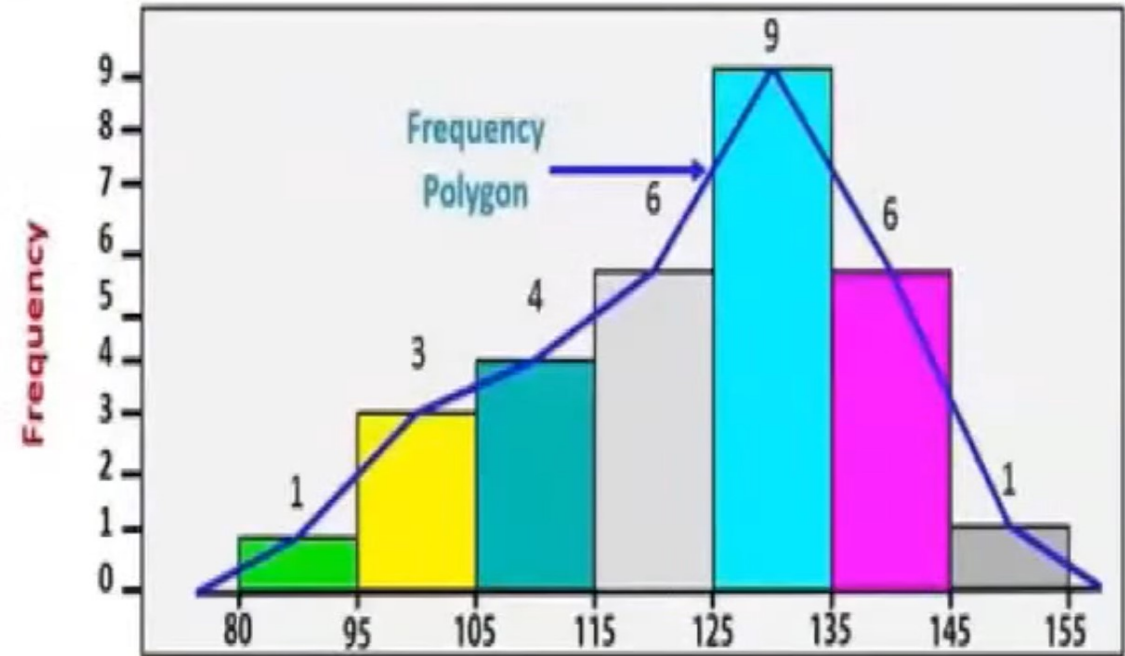
Construct a Stem-and-Leaf plot for the following data

32,51,41,18,16,14,76,54,32,57,33

Stem	Leaf
1	4 6 8
2	
3	2 2 3
4	1
5	1 4 7
6	
7	6

Key: 1 | 4 means 14

Frequency Polygons



- The frequency polygon is **superimposed** on the histogram.
- The **line** segments pass through the midpoints at the top of the rectangles of the histogram.

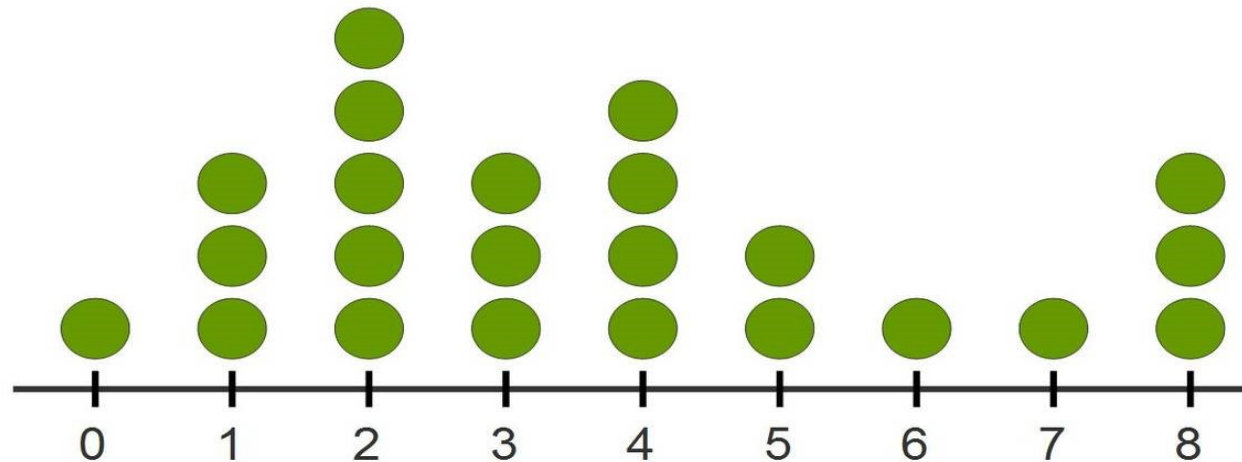


2. Frequency Plots (distribution, dot plot):

a graph, designed to **display the location, spread, and shape of the data.**

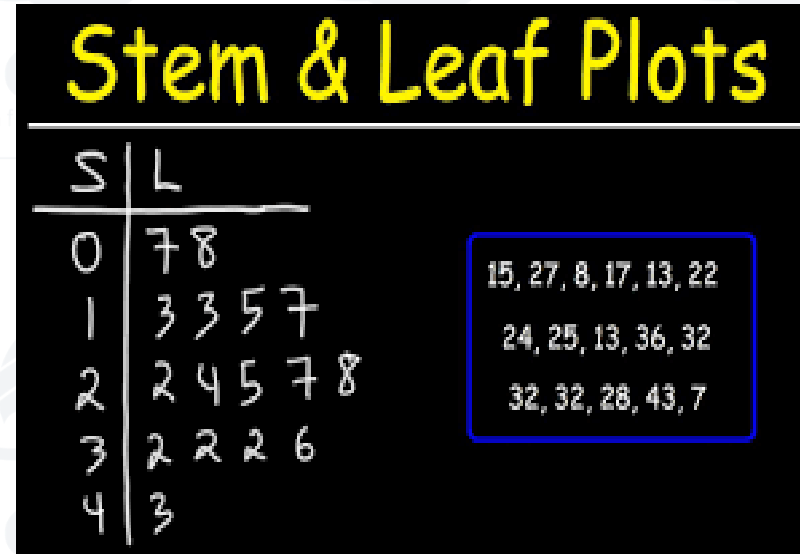
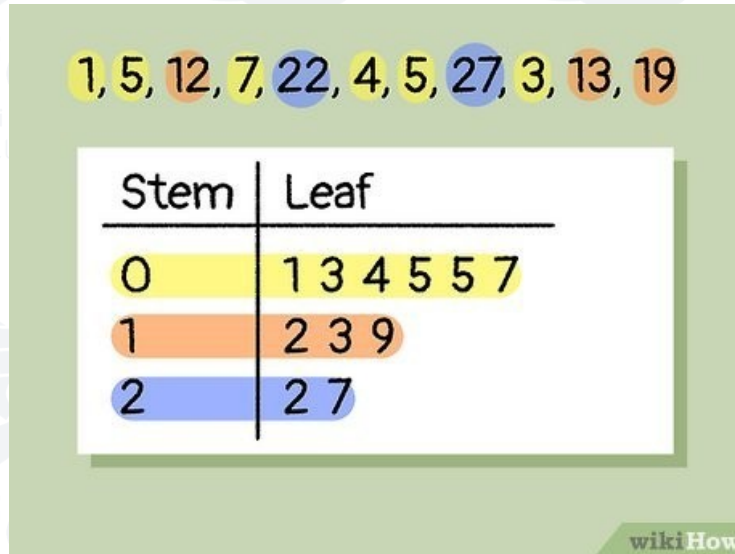
utilized to assist in **data analysis and outcome evaluation.** The frequency plots reveal one of two types of curves of the data (Symmetrical curve, Skewed curve).

Dot Plot for # at Soccer Goals Per Player for Season 2015





3. A Stem-and-Leaf Plot: is more like a table where each data value is split into a stem and a leaf.



Analyzing data

- Report and analyze data regularly
- Consider timeliness of internally gathered data, internal data gathered by external sources, and external data
- Validate accurate data collection
- Display data in easily understood format
- Provide a brief summary of data
- Provide contextual background
- Use graphs to display data and include a table of values
- Explain data collection specifics (how, when, where, from whom)
- Summarize meaning of values and how they were computed
- Identify removed outliers
- Include time order
- Analyze variances and identify unexpected patterns
- Common cause, Special cause



Interpreting data using information

- Step 1: Plan and organize
 - Anticipate barriers, identify responsibilities, and lay groundwork for multidisciplinary collaboration
 - Develop data dictionary
- Step 2: Verify and correct
 - Begin limited data collection as a pilot test
 - Identify data limitations and errors
 - Modify data collection plan, if needed
 - Collect data as planned
- Step 3: Identify and present findings
 - How do data compare with data from other organizations?
 - What is the trend over time?
 - how are data likely to be interpreted?
 - Is there an opportunity for improvement?
 - Who should receive the data?
 - For what purpose?



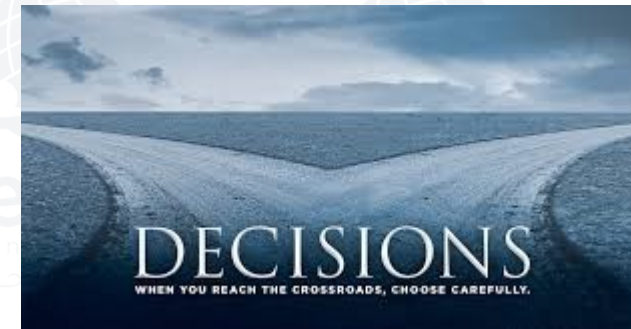
- Step 4: Study and develop recommendations

- Perform variation analysis
- Review additional data
- Conduct retrospective medical reviews
- Perform process analysis



- Step 5: Take action

- Empower teams to make decisions and implement changes based on information discovered
- Educate and train staff
- Report findings
- Make necessary changes in policies and processes
- Implement changes in practice patterns



- Step 6: Monitor performance

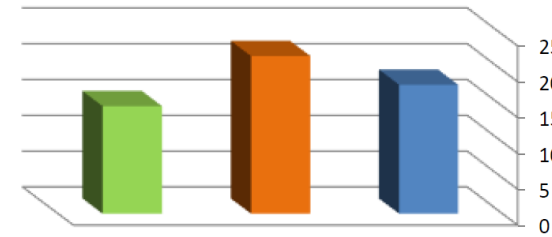
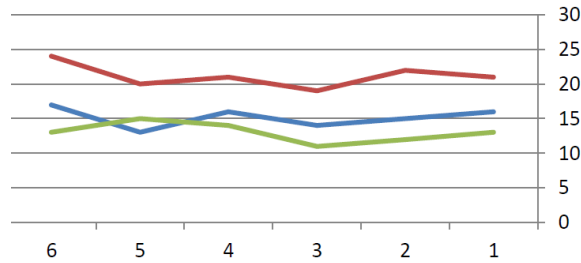
- Have proposed changes actually been implemented?
- How could compliance with changes be enhanced?
- What effect are changes having on patient outcomes?
- Should changes be modified and then tested further, tested longer, or ended?



- Step 7: Communicate results

- Barriers to interpretation and utilization of information
- Human (fear of data, resentment of external data, unrealistic expectations about data such as perfect data)
- Statistical (flawed data, missing data, untimely data, poorly displayed data, difficult to integrate with other organizational data)
- Organizational (data overload, poor data retrieval system, lack of resources such as time people, money)





DYNAMIC VERSUS STATIC DISPLAY OF DATA

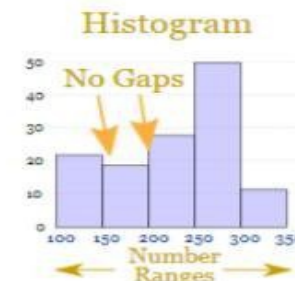
Bar Graphs

A **Bar Graph** (also called Bar Chart) is a graphical display of data using bars of different heights.

We can use bar graphs to show the **relative sizes** of many things, such as what type of car people have, how many customers a shop has on different days and so on.

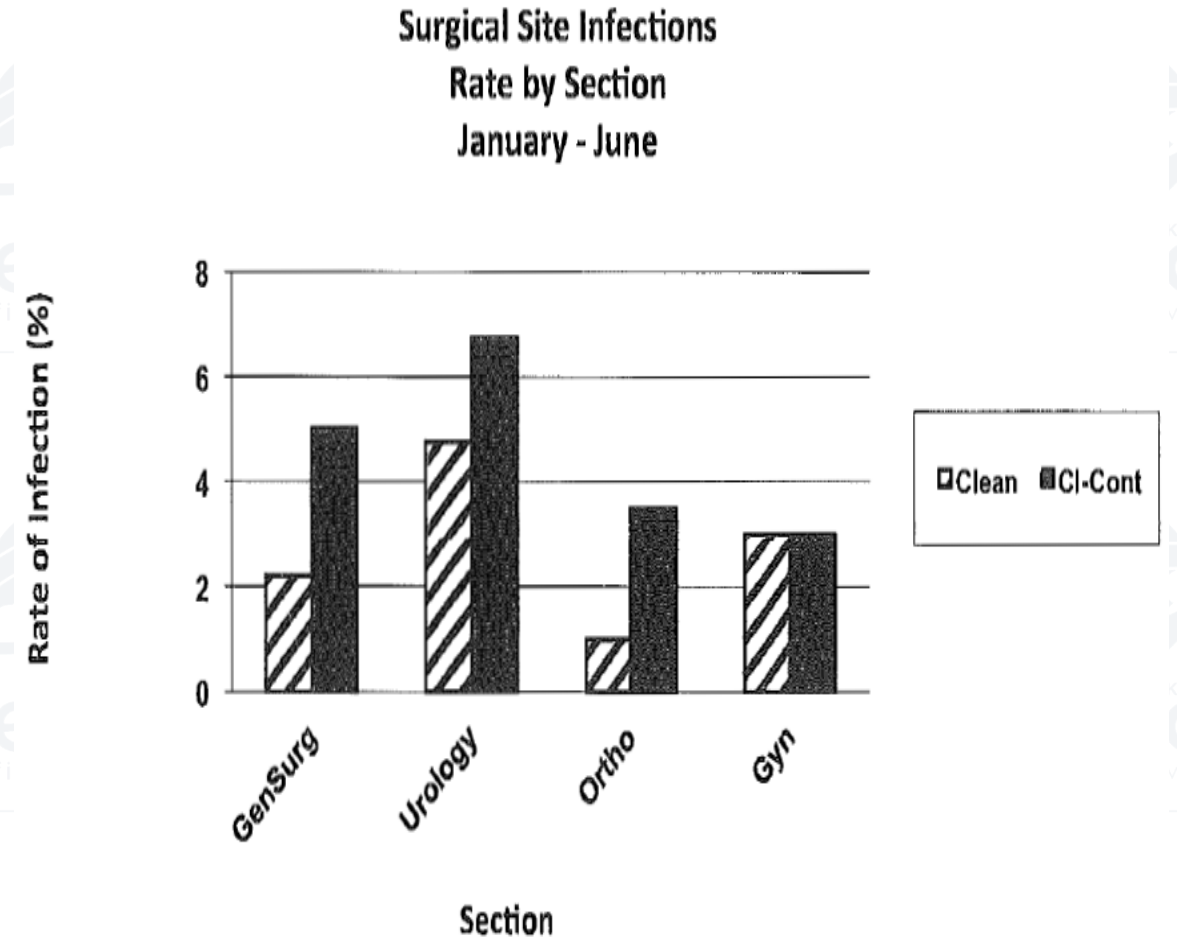
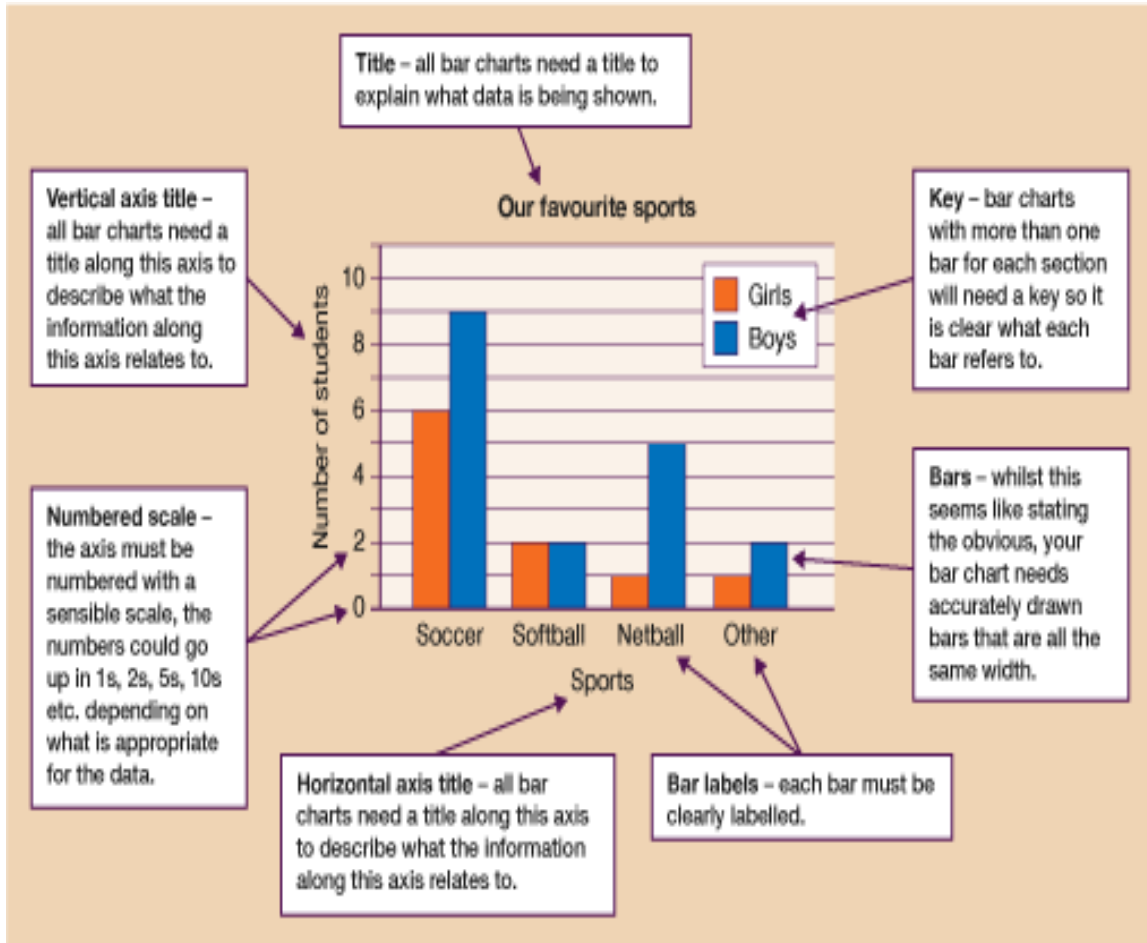
Bar Graphs are good when your data is in **categories**.

It is best to leave gaps between the bars of a Bar Graph, so it doesn't look like a **Histogram**.



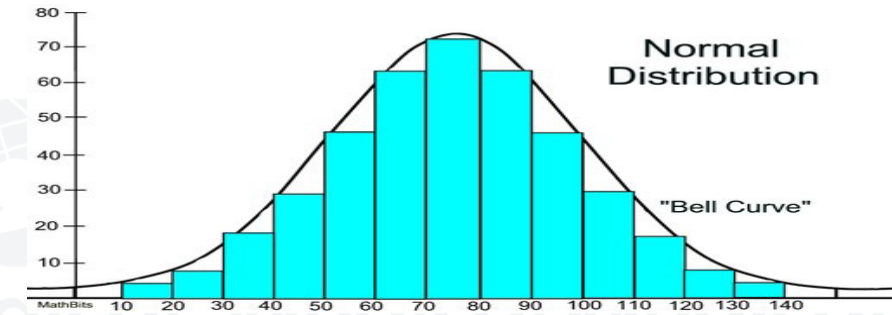
4. Bar Chart:

display of comparisons between different groups or a collection of discrete objects.

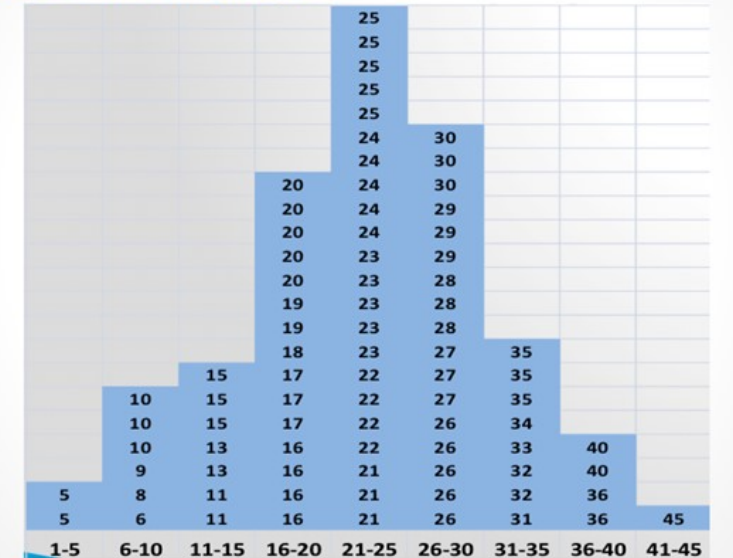


Histogram

- A histogram is a bar graph of the frequency of one other variable.
- Because frequency is actually a continuous variable, the bars are connected, so the bars are no longer discrete.
- A histogram (or frequency plot) is a bar chart (usually displayed with bars touching)
- •Presents information about one measured variable in 6 –12 groups that are equal and mutually exclusive (no overlap)
- •Always about one particular measure and its
- Location
- Spread
- Shape
- Patterns

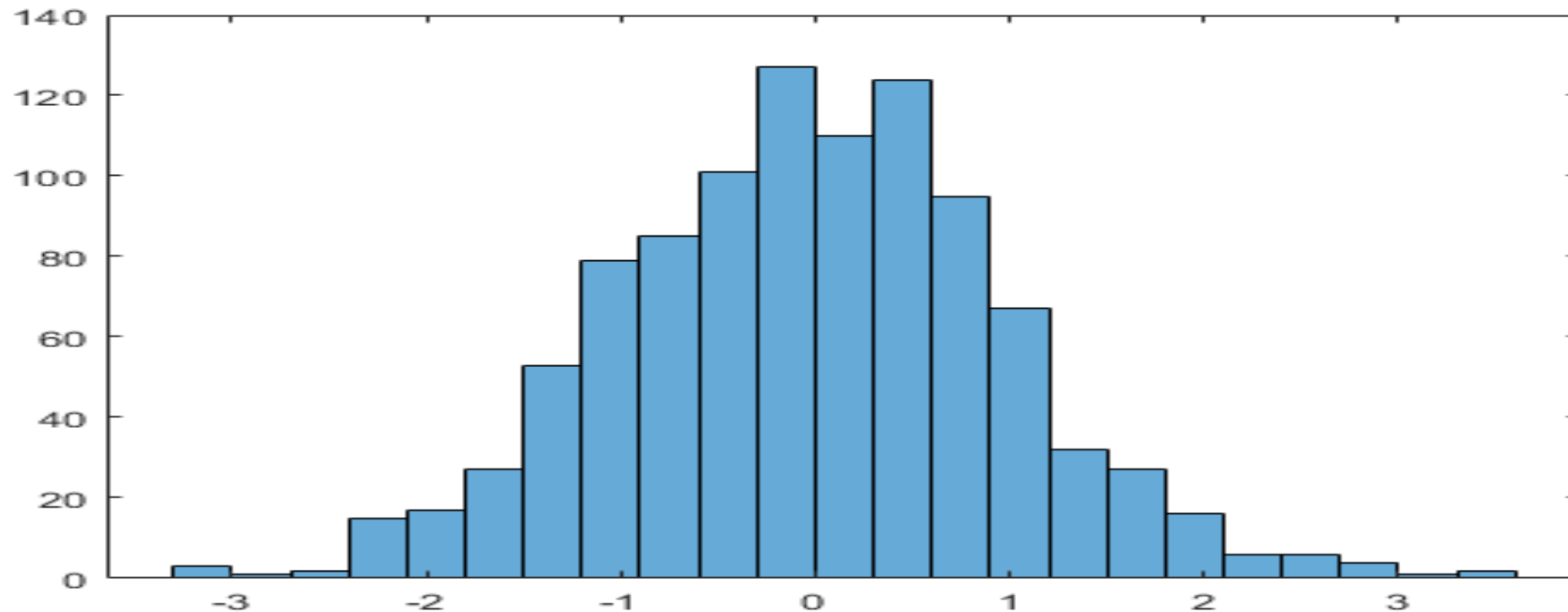


Continuous data displayed



5. Histogram:

Is a bar graph of the **frequency of one continuous variable**. Because frequency is actually a continuous variable, **the bars are "blended"** by connecting them at the frequency midpoints so the bars are no longer discrete.





To present information about location, shape, spread, and patterns of data



What patterns do we see in the data?



What is the data's shape? Where is the peak? Is there more than one peak?



How is the data distributed or spread? Is it clustered around the center or more spread out?

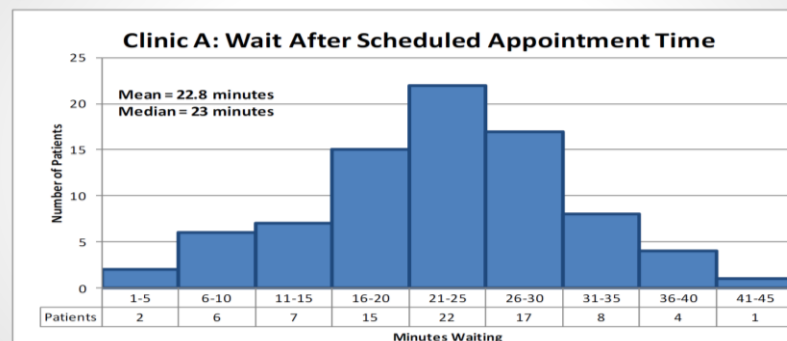


- Look at whether data are symmetric or skewed



- To identify extreme data values

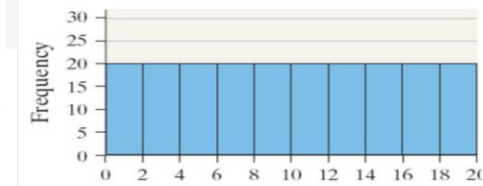
Histogram Example



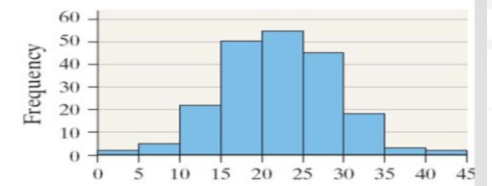


- Distribution of the data collected
- Spread of the data (close to mean, extending out away from mean)
- Shape of the data of what it looks like (normal distribution or bell-shaped curve, two peaks or bimodal, three peaks or trimodal, etc.)
- Location of the data (on one side or the other, in the middle, evenly spread out, etc.)
- • Does NOT tell you if the process is stable

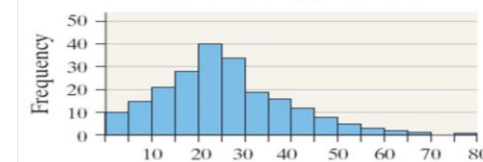
Histogram Shapes



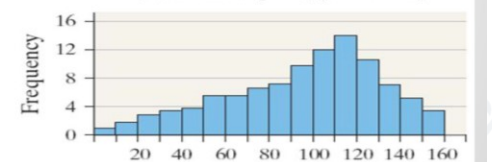
(a) Uniform (symmetric)



(b) Bell-shaped (symmetric)



(c) Skewed Right

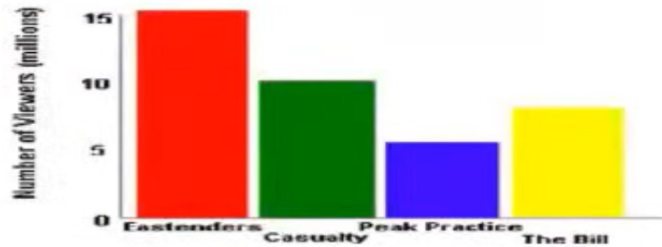


(d) Skewed Left

The Differences

Bar Chart

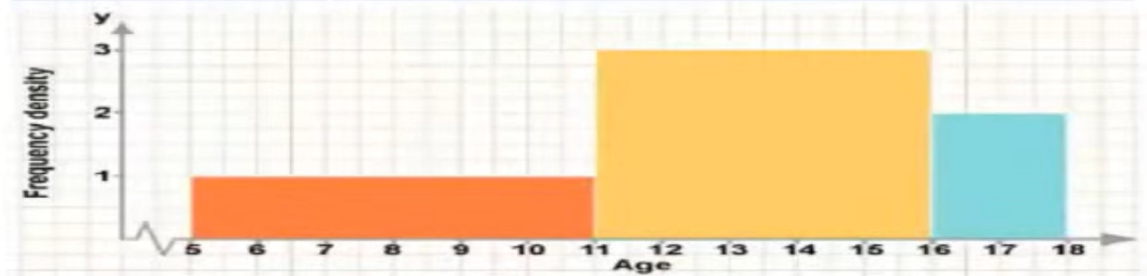
Category	Property
Bars	There are gaps between the bars.
X-Axis	Words or categories. (Discrete)
Y-Axis	Number of people or frequency.



A Bar Graph or Bar Chart is a display of comparisons between different groups or a collection of discrete objects or events that cannot be ordered so it is not considered a frequency distribution, but looks very similar to a Histogram

Histogram

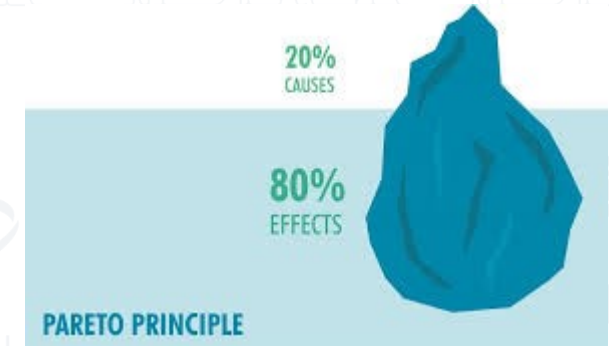
Category	Property
Bars	There are no gaps between the bars and they are different widths.
X-Axis	Numbers. (Continuous)
Y-Axis	Frequency density – what's that?



is a bar graph of the frequency of one continuous variable. Because frequency is actually a continuous variable, the bars are "blended" by connecting them at the frequency midpoints so the bars are no longer discrete

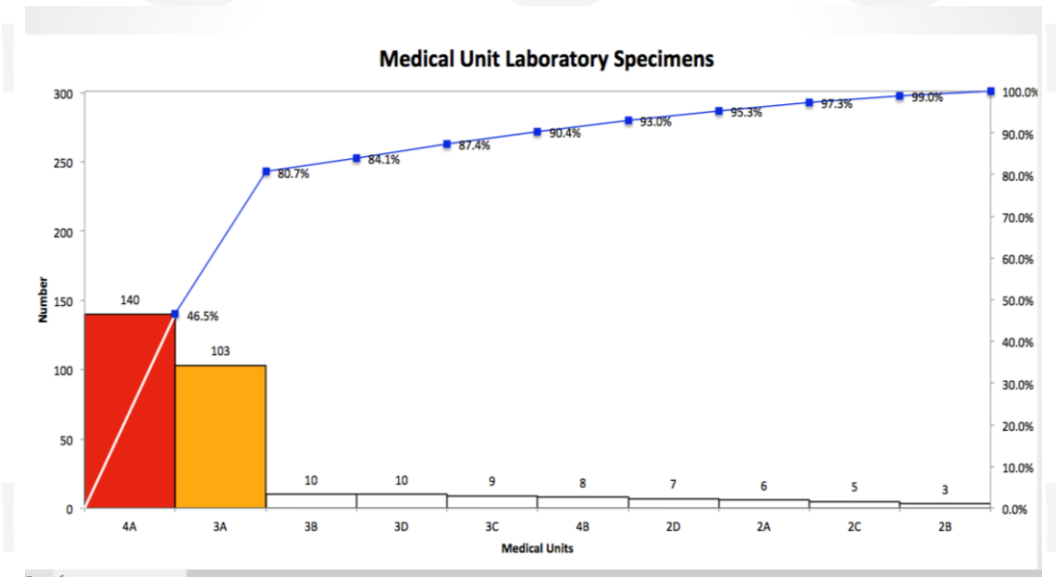
Pareto

- Pareto chart identifies areas of focus for improvement
- Used with attribute data (categorical or count data)
- Display of the 80/20 rule (80% of problems due to 20% of causes)
- Data (problems, defects, adverse drug events, patient complaints) can be organized into categories or classifications
- When it is important to identify the most frequent factors contributing to an issue or problem
- When it is important to know where to focus improvement efforts to make the biggest impact



Pareto

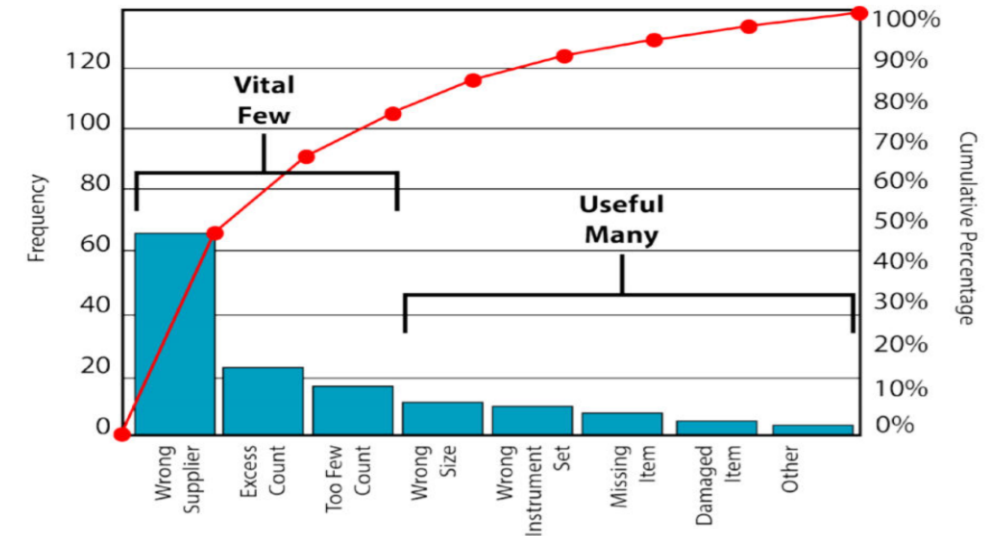
- Identify independent categories and way to compare, either by frequency (count), time, cost, other unit of analysis
- 2. Rank order data in descending categories in a simple table
- 3. Calculate percentage of total each category depicts
- 4. Draw left (vertical) axis with unit of comparison
- 5. Draw horizontal axis with categories from largest to smallest
- 6. Draw a bar for each category
- 7. Draw right vertical axis from 0 to 100
- 8. Draw a line graph of cumulative percentage
- 9. Label axes and diagram



Data Table: Types of Errors Discovered During Surgical Set-up

Error Type	Frequency	Percent	Cumulative %
Wrong Supplier	67	46.5	46.5
Excess Count	24	16.7	63.2
Too Few Count	17	11.8	75
Wrong Size	10	6.9	81.9
Wrong Sterile Instrument Set	10	6.9	88.8
Missing Item	8	5.6	94.4
Damaged Item	6	4.2	98.6
Other	2	1.4	100
TOTAL	144	100	

Pareto Chart: Types of Errors Discovered During Surgical Set-up



Pareto analysis used to identify the vital view factors that contributed to errors during surgical setup

The team identified eight types of surgical set up errors and collected data on the frequency of each type

6. Pareto:

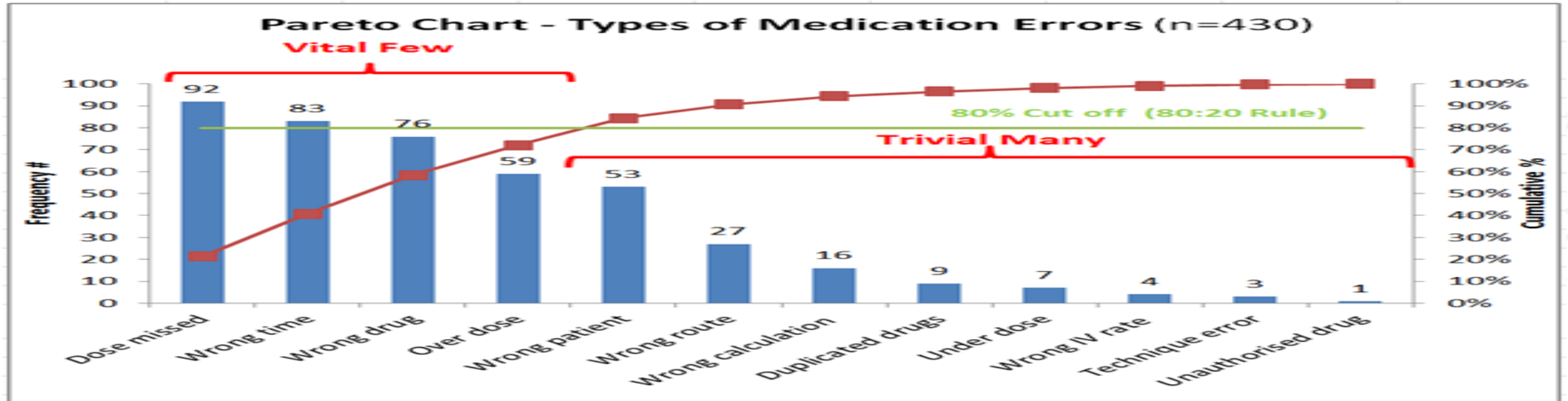
vertical bar graph with bars in rank order of occurrence from highest to lowest.

The purpose of a Pareto Diagram:

1. Prioritization (determine where to focus improvement efforts, vital few.)

Pareto principle (20% of causes lead to 80% of problems)

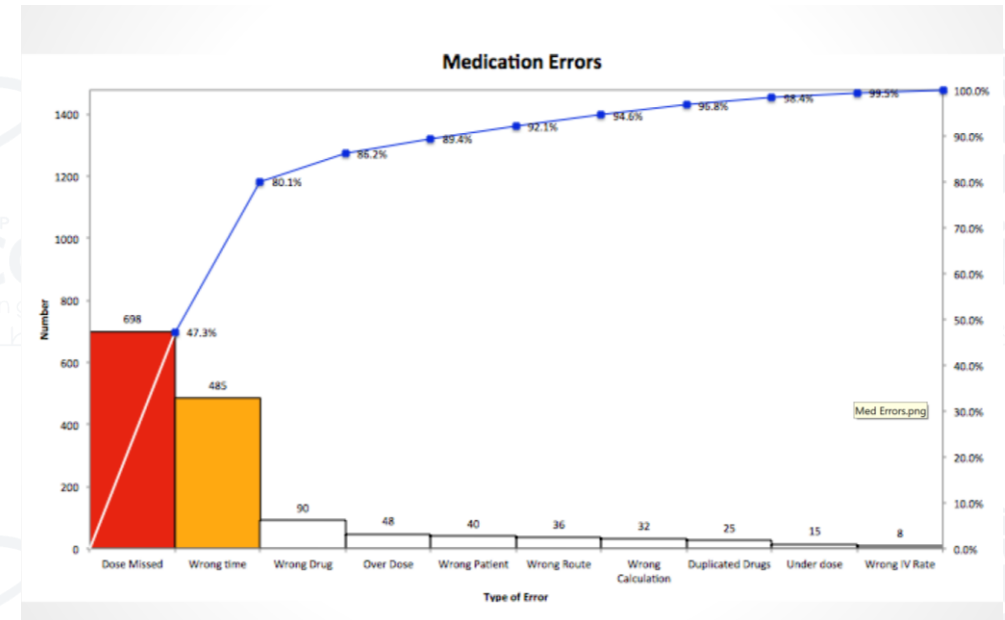
2. comparison of causes of problems





The team at the hospital wanted to work on decreasing the number of medication errors. They gathered data and created the Pareto chart on the next slide. The best action would be:

- A. Focus efforts on Dose Missed only
- B. Gather more data on the first two bars
- C. Focus efforts on Dose Missed and Wrong time
- D. Stratify the data for wrong drug, overdose



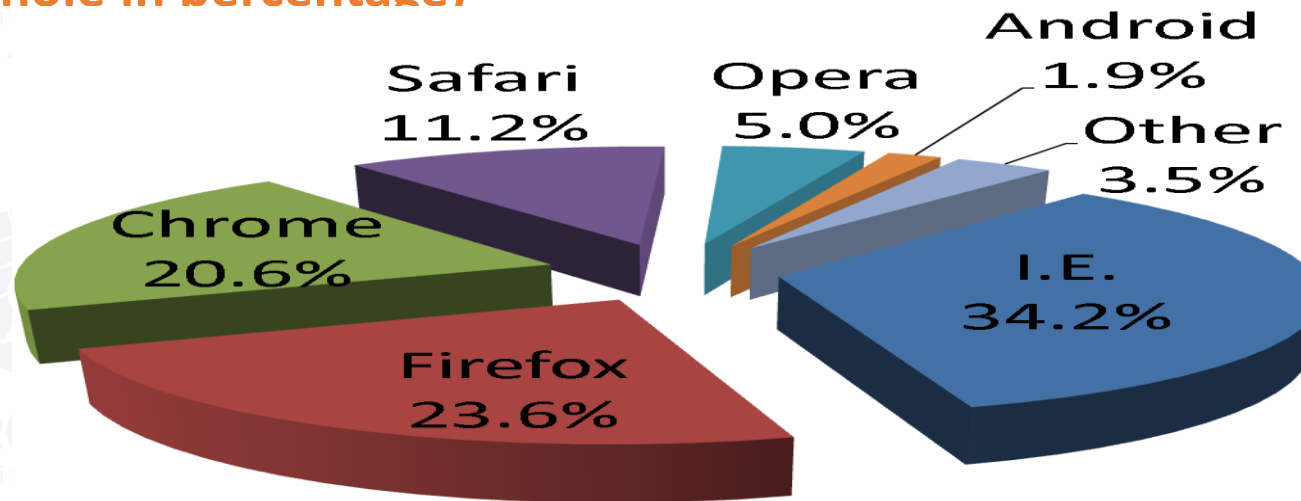


QUALITY IMPROVEMENT TOOLS

A Pie Graph: is a display of (relative frequency, (percentages) of the proportional relationships within a dataset when there are only a few divisions or categories and the total of all categories is 100% (display parts of the whole in percentage)

Pie Chart

- A pie chart (or a circle graph) is a circular chart divided into sectors, illustrating proportion.

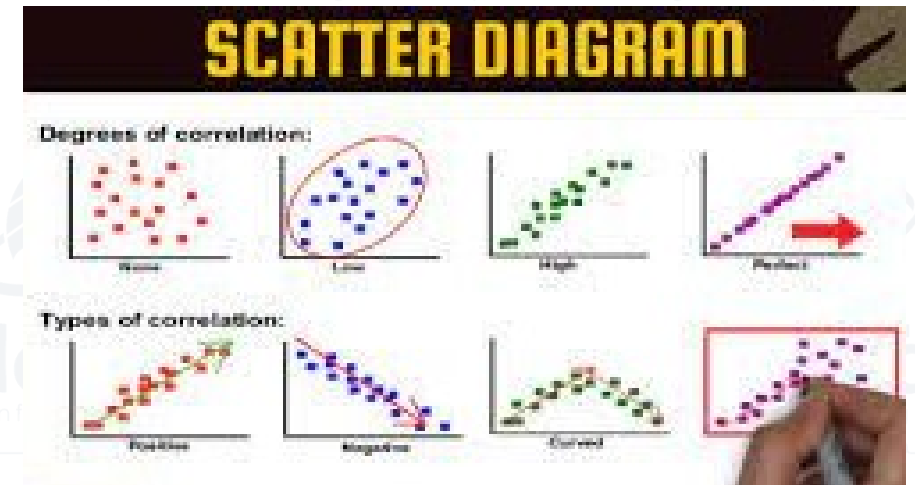


**Browser Usage on Wikimedia
October 2011**

Scatter diagram

- Tool for learning about associations or relationships between two variables
- Identifies cause-and-effect relationships between variables
- Identifies patterns of relationships existing between variables (positive, negative, no relationship)
- Stratification can be used with scatter diagrams

- Can illustrate the strength of relationships between variables
- Independent variable (X): Leader variable
- Does this variable affect or influence the dependent variable?
- Dependent variable (Y): Follower variable
- Is this variable influenced by the independent variable.





The scatter Diagram:

is one way to display the possible relationship between two sets of data (variables), looking at how closely they correlate.

the correlation coefficient (r) expresses the degree to which the dots on the scatter diagram form a straight line.

A regression equation is the formula for the line that best fits the dots of the scatter diagram.

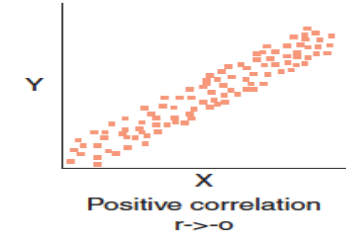
The regression equation can be used to predict the expected value of one variable based on a particular value of the other variable.

Multiple Regression Analysis:

is similar to a simple regression analysis except that it includes multiple independent variables that are predicting (or potentially affecting) the dependent variable.

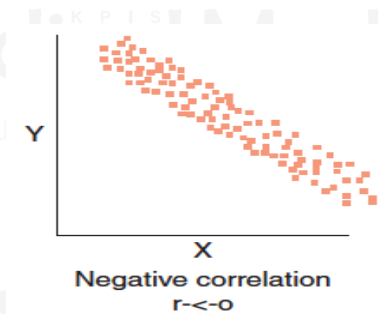
Positive correlation

- Data goes from lower left of chart to upper right of chart
- Not an indication of good or bad (what you want or don't want); just the direction of the line



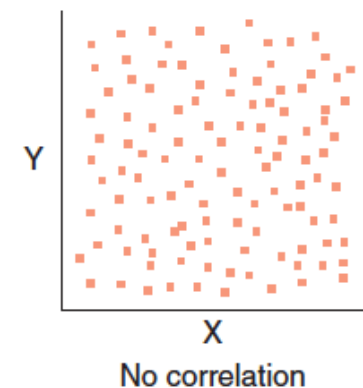
Negative correlation

- Data goes from upper left of chart to lower right of chart
- Not an indication of good or bad (what you want or don't want); just the direction of the line



No correlation

- Can't find a pattern of data
- No relationship between the two variables



- The type and degree of relationship between two variables

The strength of the relationship

- Tight
- Loose
- Outliers

The type of the relationship

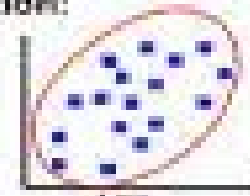
- Positive
- Negative
- No relationship

SCATTER DIAGRAM

Degrees of correlation:



None



Low



High



Perfect

Types of correlation:



Positive



Negative



Curved



Regression Analysis - Scatter Diagrams

- A **Correlation Coefficient (r)** is the value computed in regression analysis that expresses the strength of the relationship between the two sets of measures. The numbers associated with r range between 0 and plus or minus 1.
- A **scatter plot, scatter graph**, and correlation chart are other names for a scatter diagram, We draw this graph with two variables. The first variable is independent and the second variable depends on the first.
- Scatter diagrams are useful to determine the relationship between two variables.

Correlation Coefficient
Shows Strength & Direction of Correlation



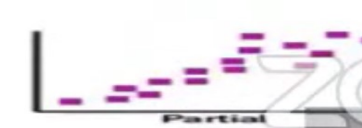
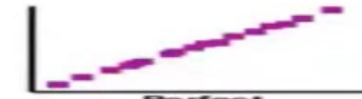
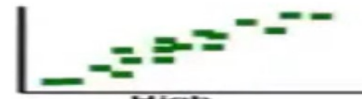
- ✓ Regression analysis determine if there a relationship or not.
- ✓ Correlation coefficient determine the strength of the relation

Regression Analysis - Scatter Diagrams

- **Regression Analysis** is a statistical technique that allows one to **compare** the entire **distribution** of observations of one measurement (or variable) with the entire distribution of another measure in order to determine how strongly the **two** sets of variables are interrelated (correlated) (comparing two distributions).
- A **Multiple Regression Analysis** is similar to a simple regression analysis except that it includes multiple independent variables that are predicting (or potentially affecting) the dependent variable. An example of a multiple regression would be a determination of how much a diabetic diet, medication, and activity affect the HbA1c value.

Scatter Diagram - How do I use it? - Correlation

Degrees of correlation:





Regression Analysis :

determine how strongly the two sets of variables (independent variable or the dependent variable) are interrelated (correlated).

A Correlation Coefficient (r) :

is the value computed in regression analysis that expresses the strength of the relationship between the two sets of measures.

The numbers associated with r range between 0 and plus or minus 1.

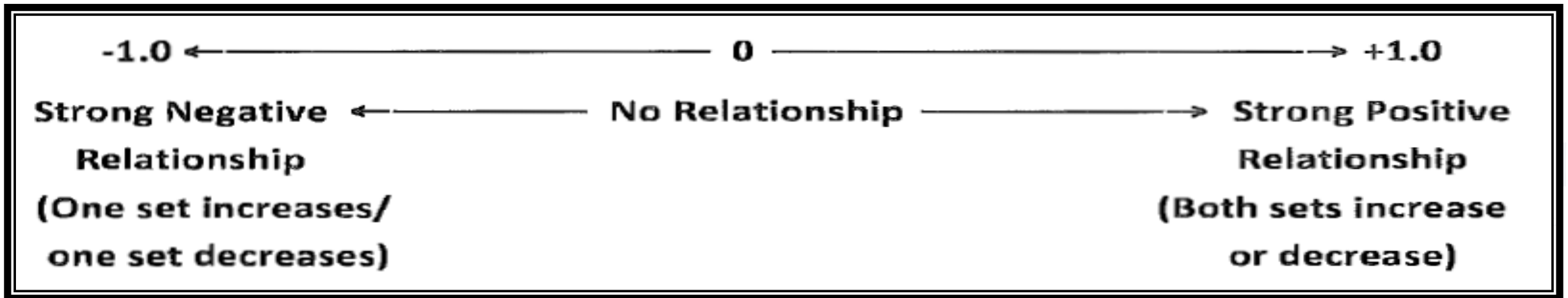




Figure 9: Scatter Diagram - No Relationship ($r = .00$)

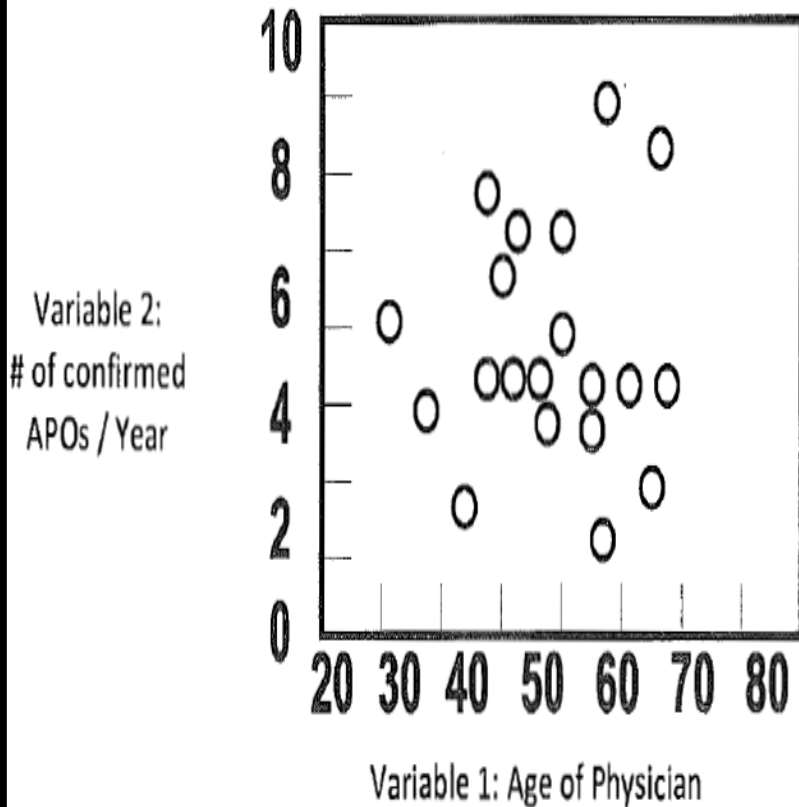


Figure 6: Scatter Diagram - Moderate Negative Relationship ($r = -.45$)

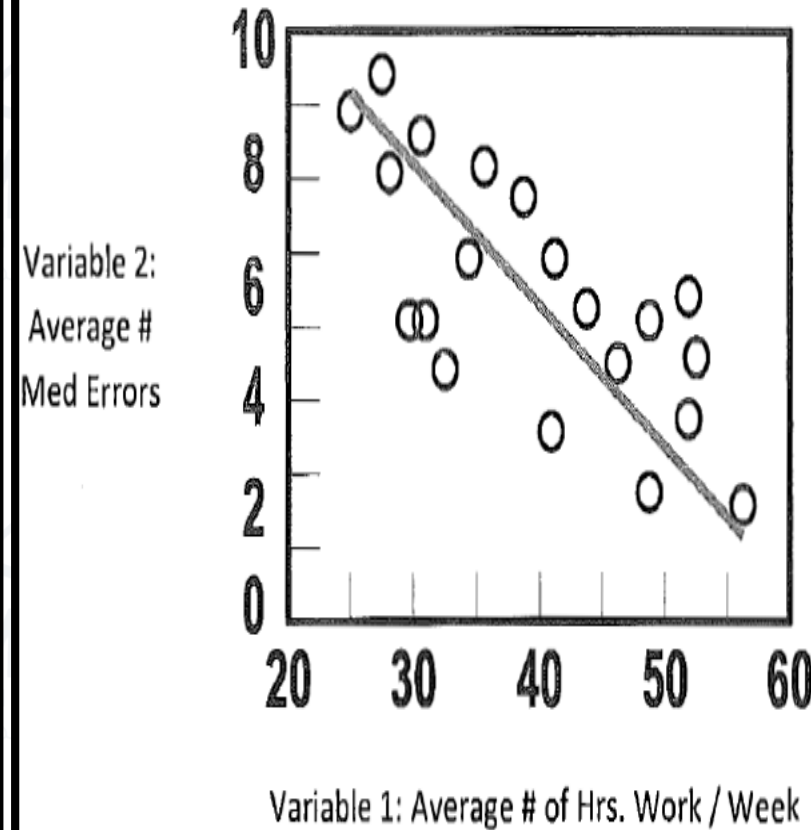
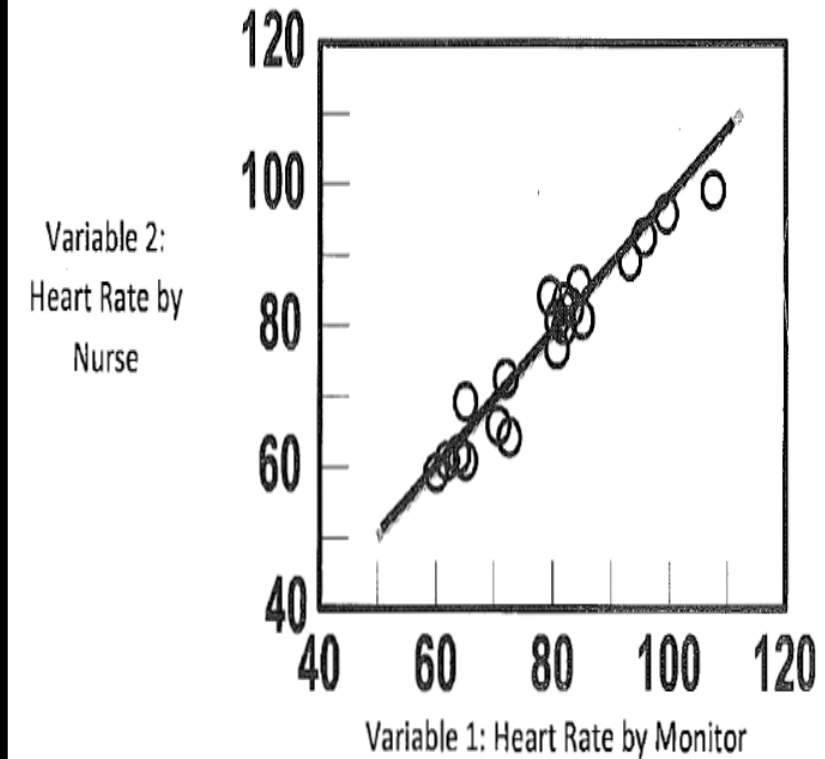


Figure 7: Scatter Diagram - Strong Positive Relationship ($r = +.80$)



What is meant by process variation?

- Variation is "change or deviation in condition from a former or usual state , or from an assumed standard."
- Process variation can be best illustrated using line graphs (run and control charts).

Advantages of dynamic display

- 1.Better understanding of the process.
- 2.How much variation do we have in the process?
- 3.What kind of variation is it , special or common cause?
- 4.Was the change really an improvement?
- 5.Are we holding this improvement?

LINE GRAPH OR TREND (RUN/CONTROL) CHART

(Track changes over time) , dynamic display

- Each data point, plotted horizontally, is a measurement of an output from a process.

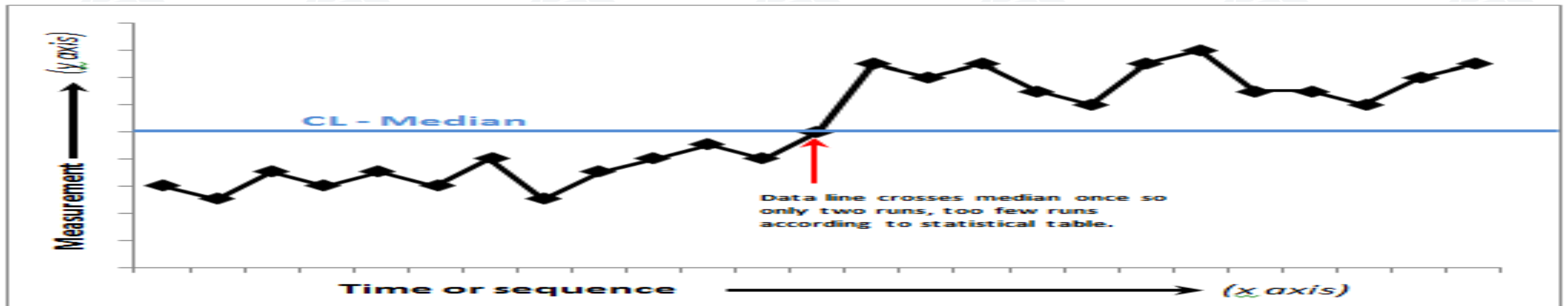


7. Run Chart (Line Graph):

display of performance changes with systematic increases or decreases in the value of some variable over time. It can be either a **comparison** within one group when conditions change over time or a comparison between two groups in the same study.

Simple Rules:

1. Values that fall on the mean/median itself **do not count** in terms of the start, break, or end of a shift, and are not included in the count for a shift.
2. if **two or more** consecutive data points are the same , **one of them** is not counted.





Shift

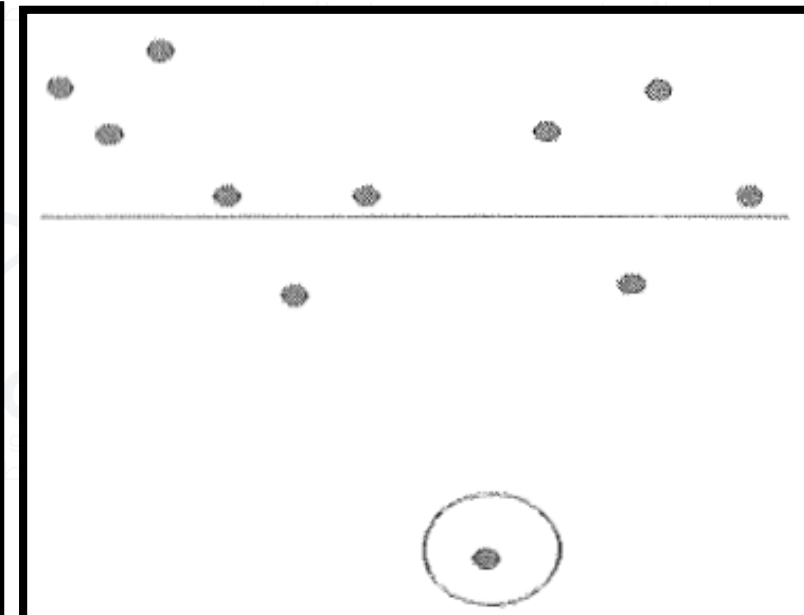
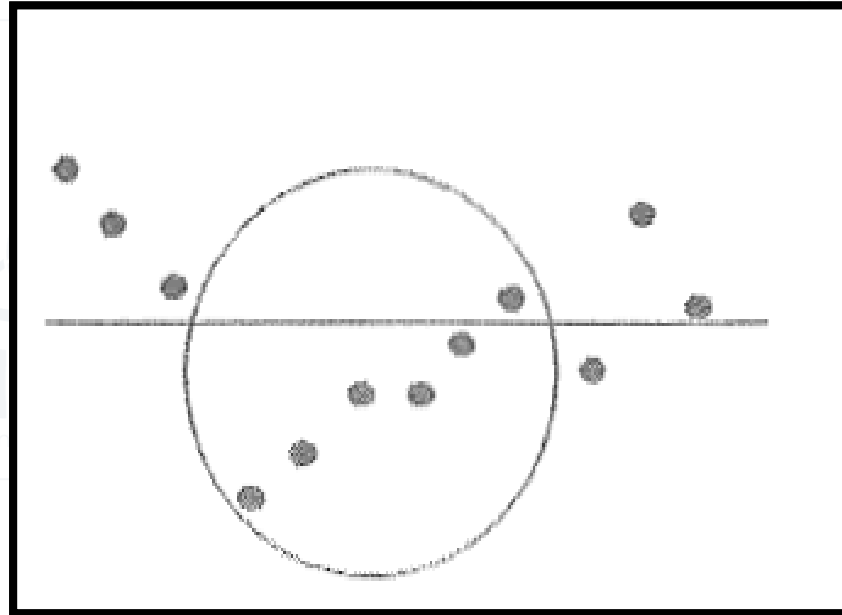
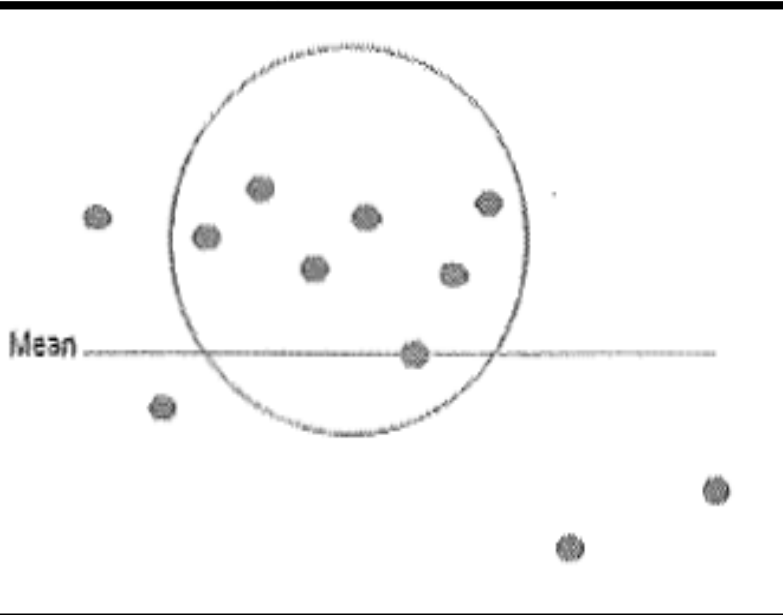
- six or more points consecutively appear above or below the mean or median.

Trend

- five or more consecutive data points going up or going down.

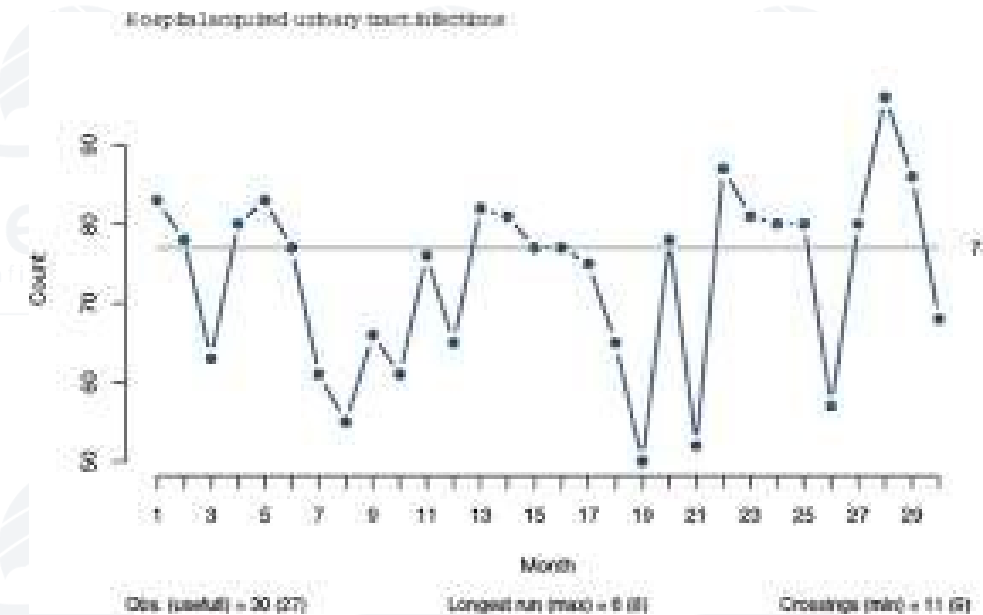
Astronomical Value

- one value which is greatly different from the other data values on the run chart.



How to build a Run Chart?

1. Draw a horizontal line (X axis) and label it with the unit of time.
2. Draw a vertical line (Y axis) for the data
3. Plot a minimum of 15 data points on the graph in time order.
4. Connect the points in the graph with a solid line.
5. Determine the median
6. Analyze the run chart.
 - The major draw back in using run charts is that they cannot detect all special causes.

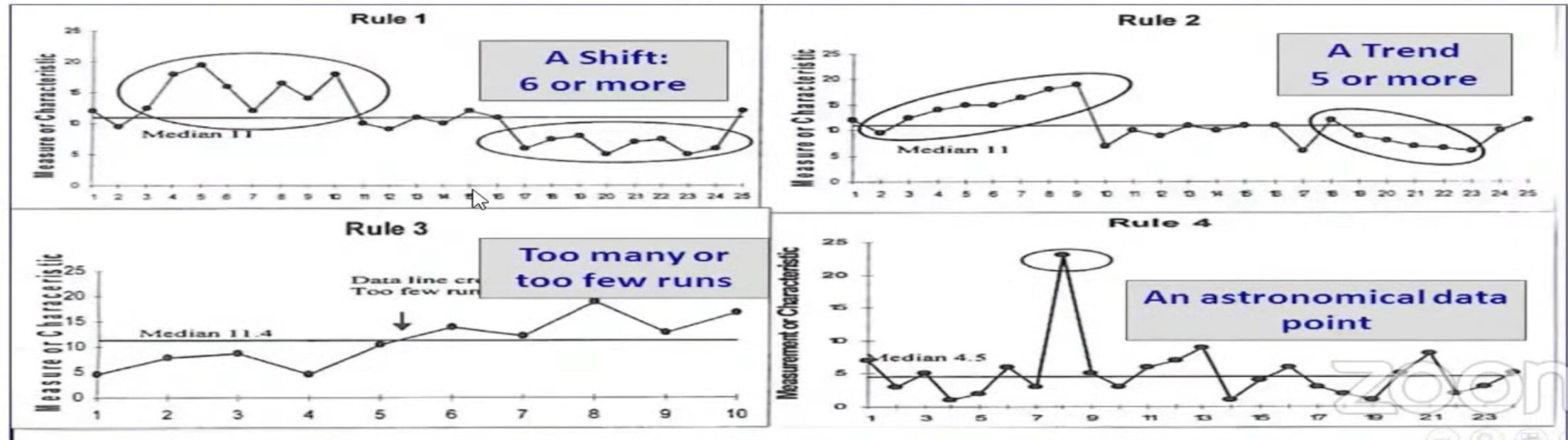


RUN CHART

Graphs which display time-series data are helpful tools for being able to understand and communicate variation in a process.

provides a running record of a process over time and can be used with any kind of data.

Non-Random Signals on Run Charts

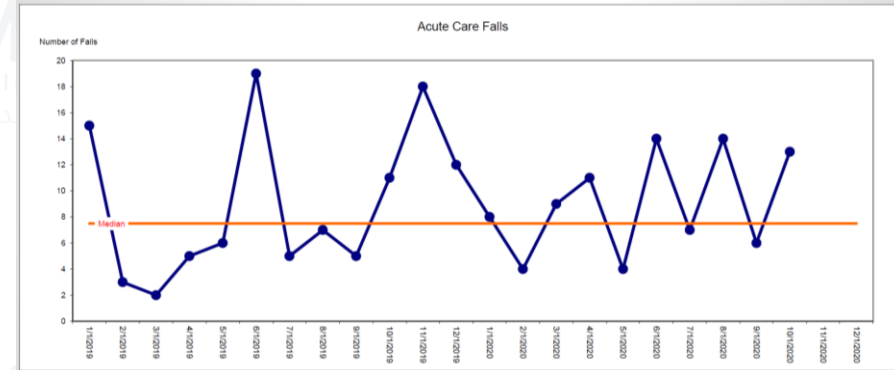


Run chart

Graphical display of data plotted in some type of order, generally over time

- Also known as a trend chart or time series chart
- Tool for understanding if the change you are making is an improvement
- Easy to construct
- Simple to interpret and versatile

Run Chart Example



When to use run chart

Use a run chart in improvement efforts

- Display data to make process performance **visible**
- Determine whether a change resulted in improvement
- Determine whether gains made through improvement effort are being **sustained**
- Determine how much **variation is present**

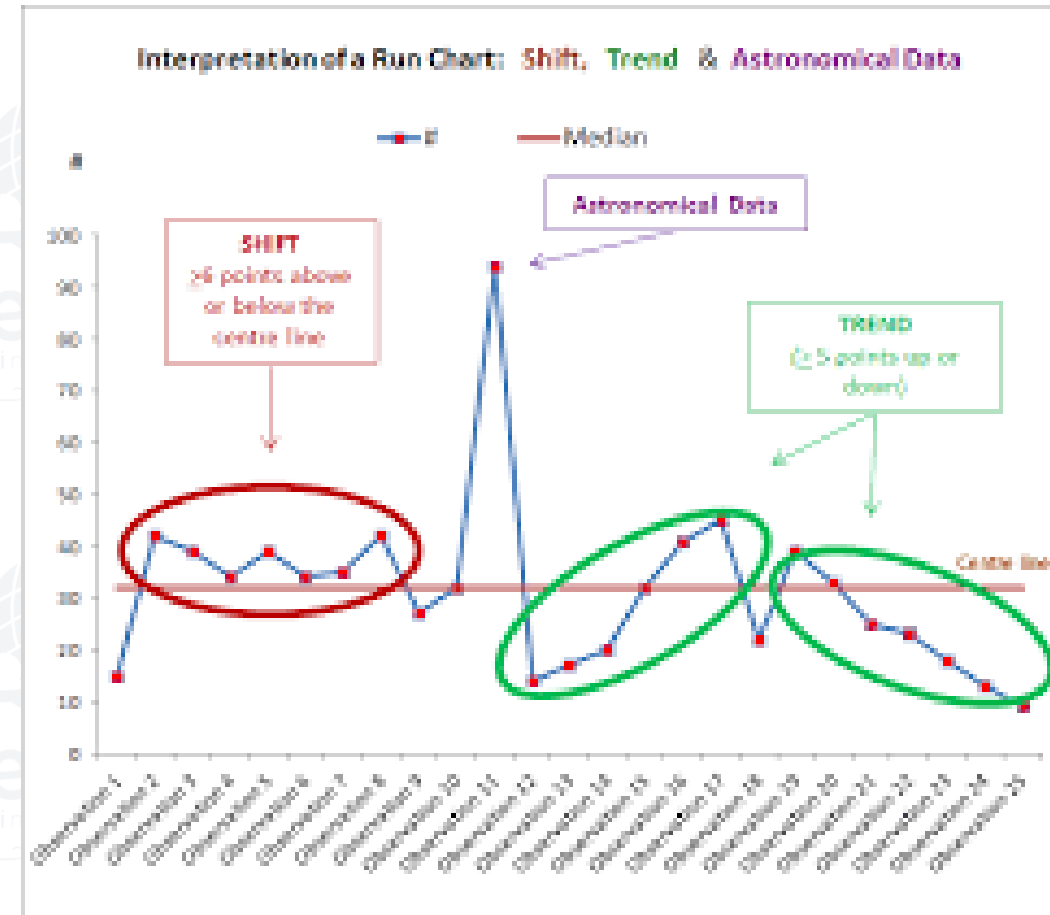
Use a run chart when you want to

- Use few data points
- Rapidly detect signals of improvement
- Use simple tool readily accepted
- Make amount of process variation visible
- Detect improvement
- Determine whether improvement has been maintained



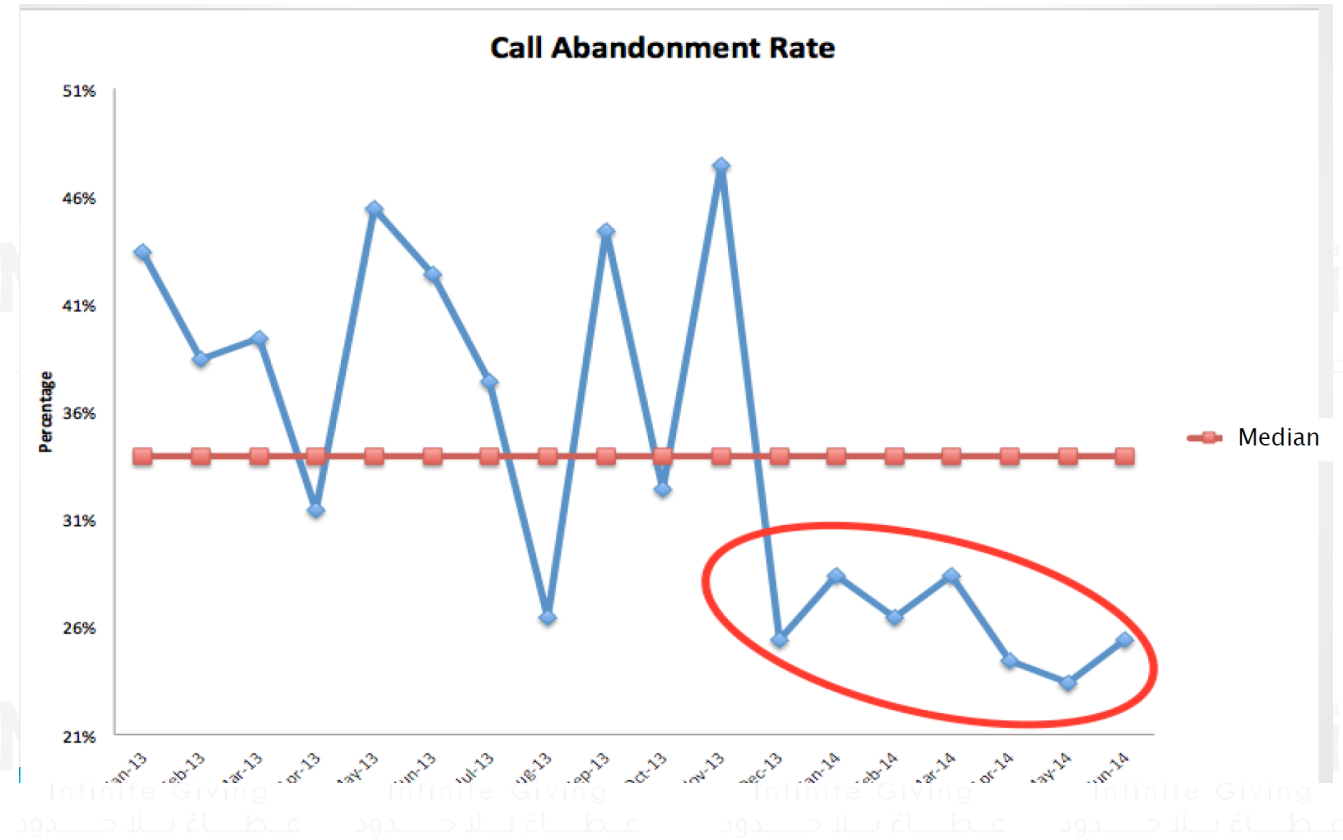


- Four rules can be used to identify nonrandom signals of change
- **Rule 1 –Shift**
- **Rule 2 –Trend**
- **Rule 3 –Too many or too few runs**
- **Rule 4 –Astronomical data point**
- Evidence of nonrandom signal of change in run chart if one or more rules is seen; can be evidence of improvement or degradation
- Learn from signal and take appropriate action



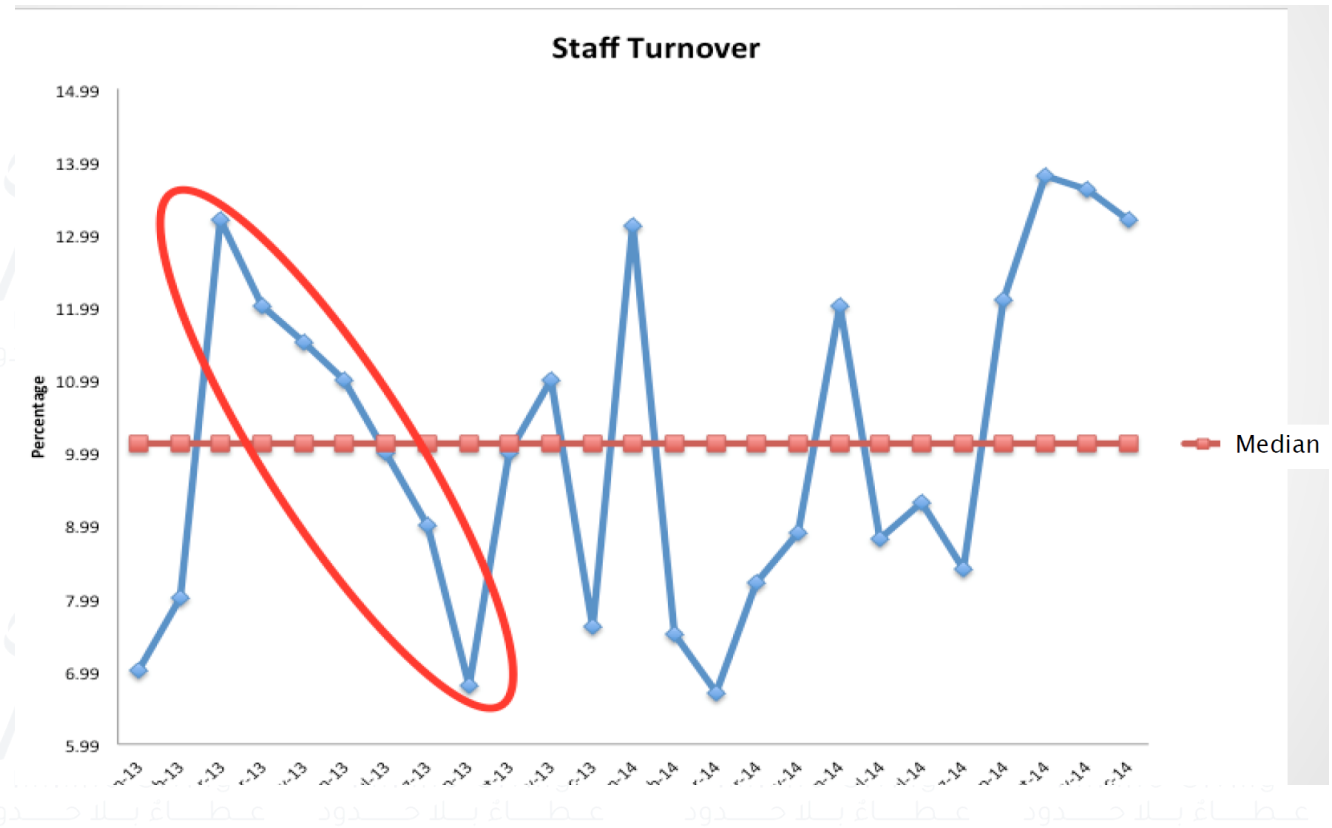
Rule 1-shift

- Six or more **consecutive** points either **all above** or **all below** the center line
- Values falling on the center line are not counted
- Values falling on the center line do not make a shift
- Values falling on the center line do not break a shift
- Skip values falling on the center line



Rule 2-Trend

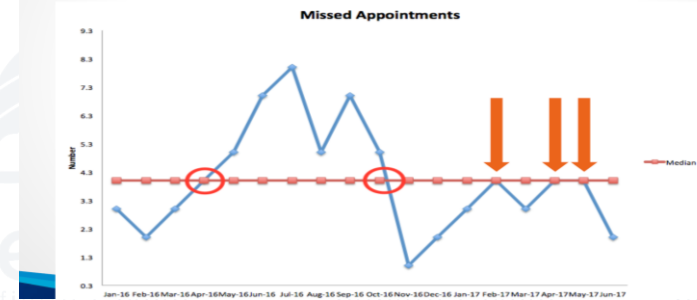
- **Five** or more consecutive points **all going up**
- Five or more consecutive point **all going down**
- If two or more points are the same, count only the first point
- Ignore points of the same value after counting the first one
- Like values do not make or break a trend
- Count the first point (trend inclusive rule)
- A trend can cross the center line. What matters is the number of points going up or down



Rule 3- Number of runs

- A run is defined as a series of points in a row on one side of the center line
- Too few or too many runs signals a nonrandom pattern of change (or crossing of the center line)
- Some points fall right on the median making it difficult to determine which run they are in
- Data must actually cross the center line in order to identify that a new run has started
- Count the number of data points that do not fall on the center line
- Count the number of times the line crosses the center line and add 1. This will always be the number of runs in your chart.
- NOTE: # times line crosses center line +1

14 data points not on the center line; minimum 4, maximum 12. In this example 2 crossings +1 = 3

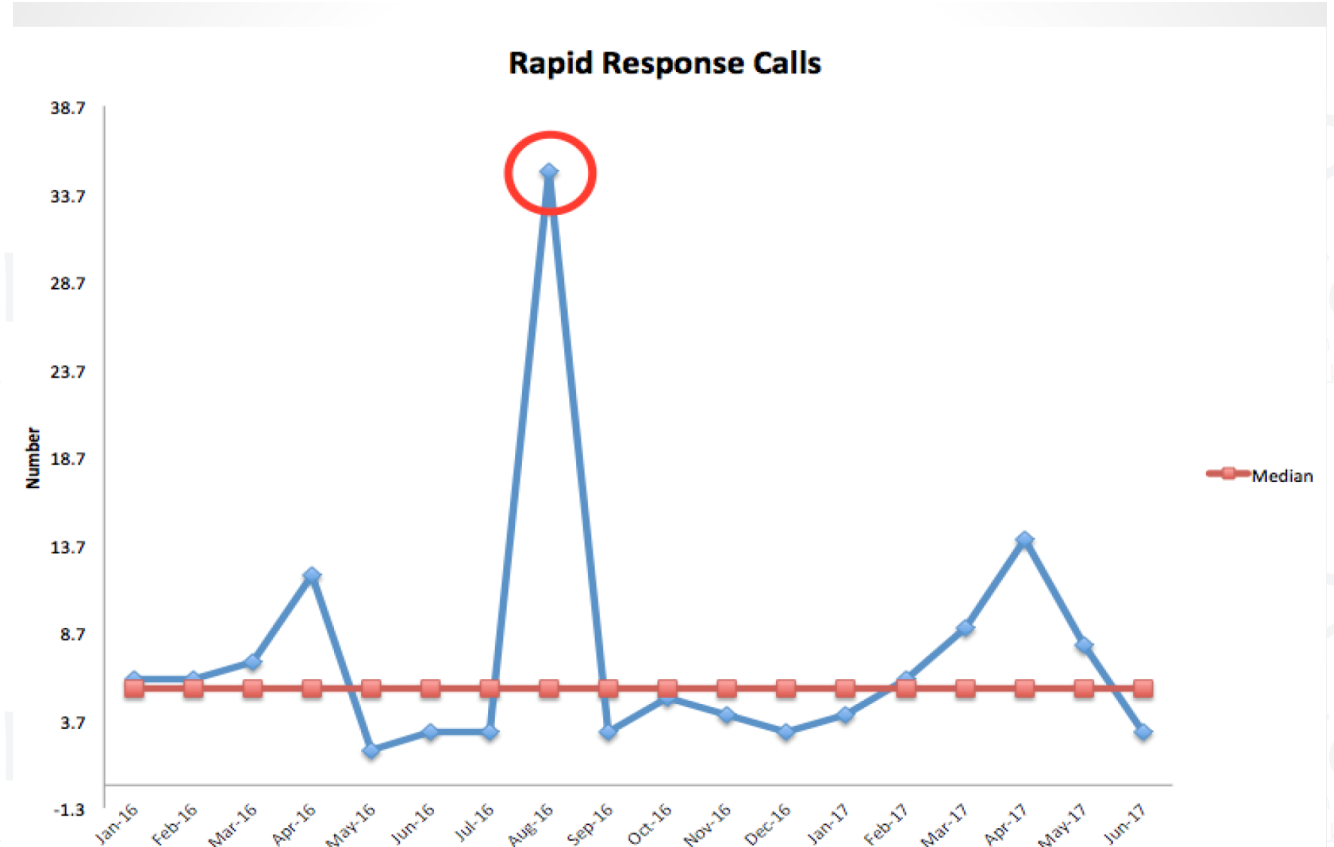


Total Number of Data Points (not on center line)	Lower limit for number of runs	Upper limit for number of runs
10	3	9
11	3	10
12	3	11
13	4	11
14	4	12
15 & 16	5	13
17	5	14
18	6	14
19	6	15
20	6	16
21	7	16
22 & 23	7	17
24	8	18
25	8	19

Table adapted from Provost, L. P., & Murray, S. K. (2011). The Health Care Data Guide. San Francisco: John Wiley & Sons.

Rule 4- Astronomical

- Astronomical point
- Obviously different from other points
- Universal agreement that it is unusual
- Every data set has a high and a low point; not all high and low points are astronomical



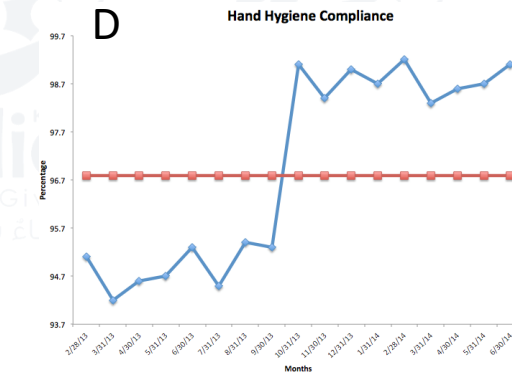
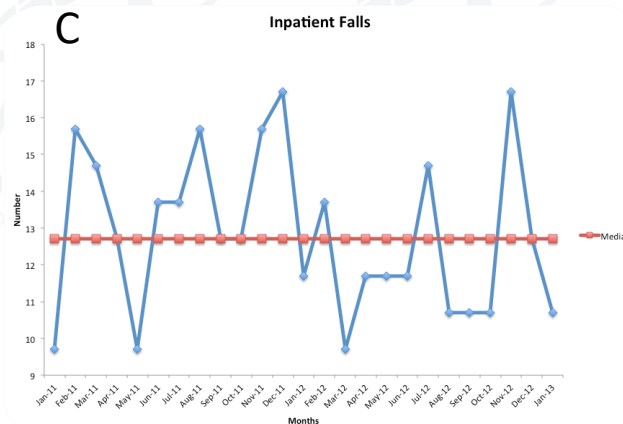
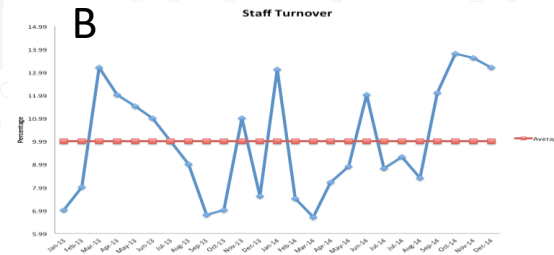
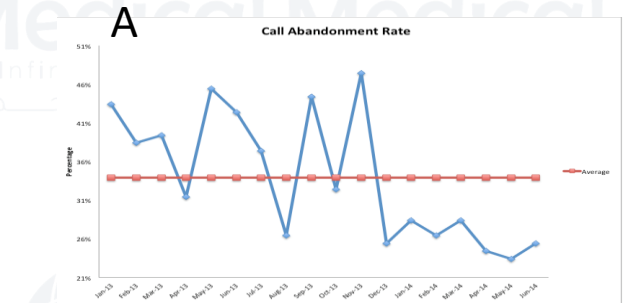


The next four slides contain run charts on various topics.

As we review each one together, determine what chart shows no signals of change. For ones that do, what rules apply? What actions would you take?

What chart shows no signals of change?

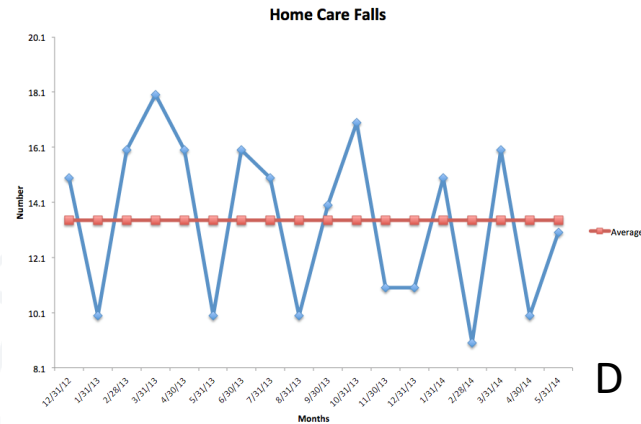
- A. Call Abandonment Rate
- B. Staff Turnover
- C. Inpatient Falls
- D. Hand Hygiene Compliance



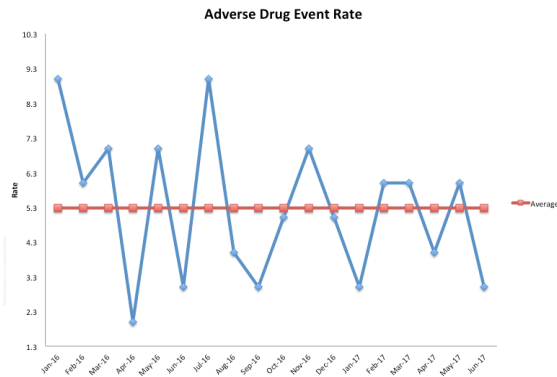
The next four slides contain run charts: which one shows a non-random signal for change?

- A. Adverse Drug Event Rate
- B. Medication Error Rate
- C. Primary Care Abandonment Rate
- D. Home Care Falls

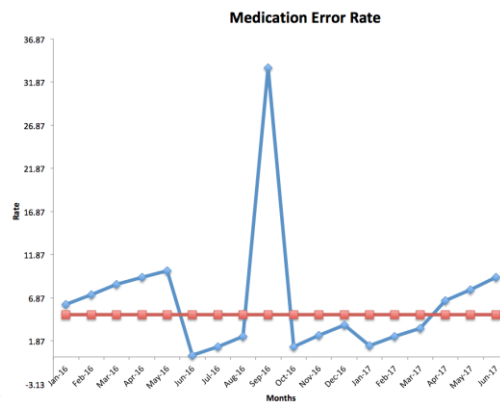
If there is a signal of change, which rule was activated and what actions would you take?



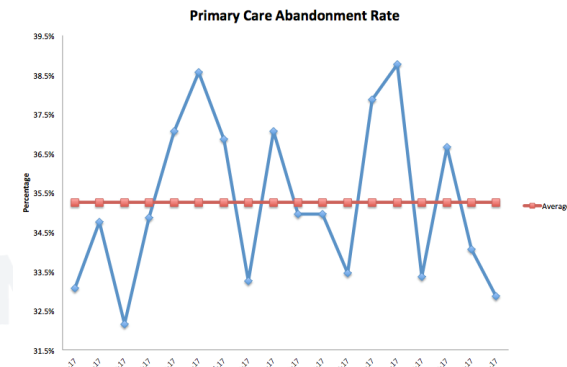
D



A



B



C

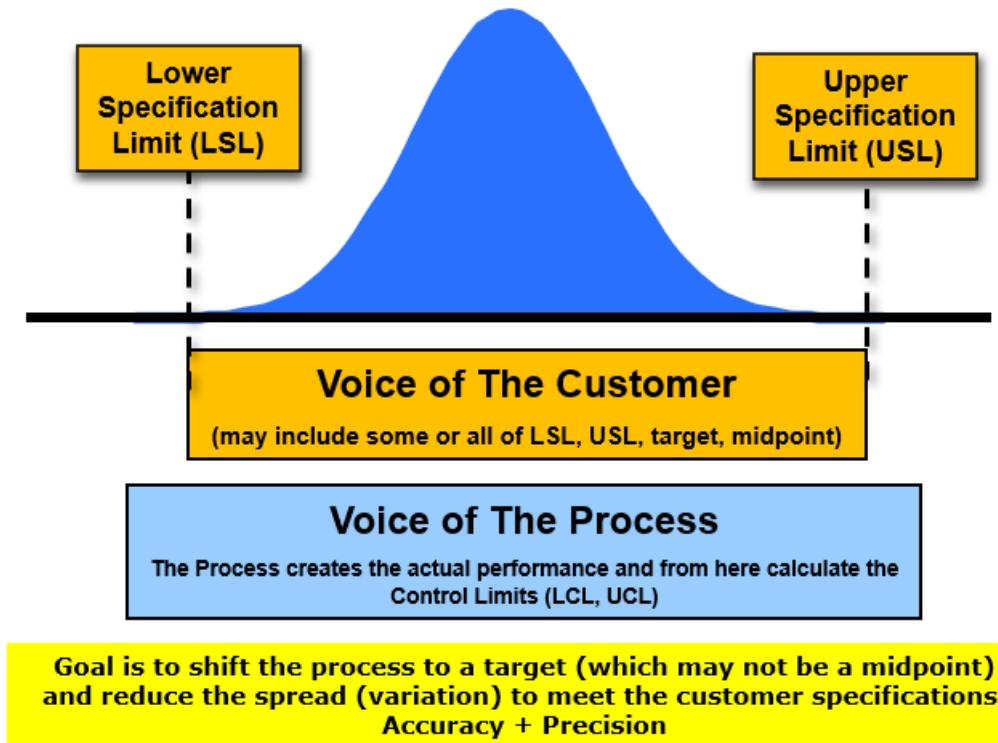
Statistical Thinking

Understands and views work as a process and **recognizes** that the processes and the **measurement data** they produce will exhibit **variation**

A process is in good statistical control when:

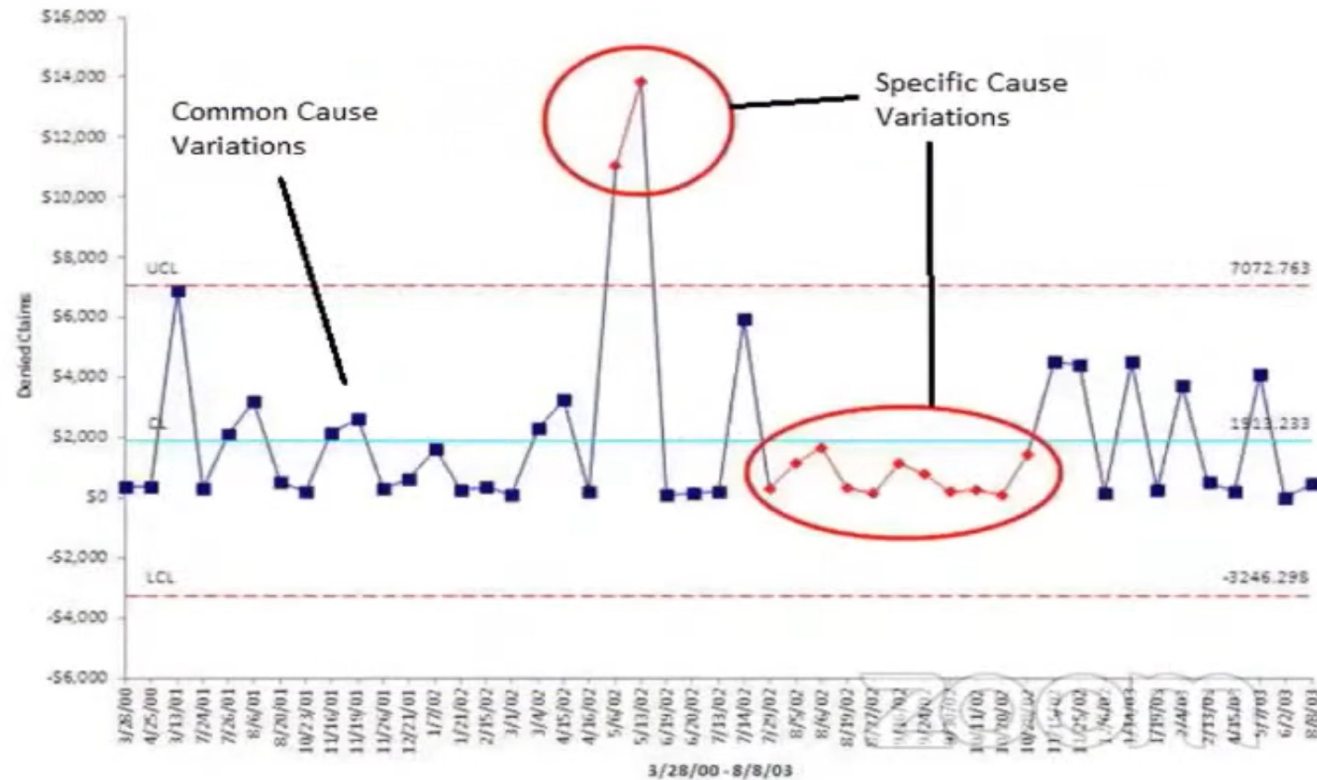
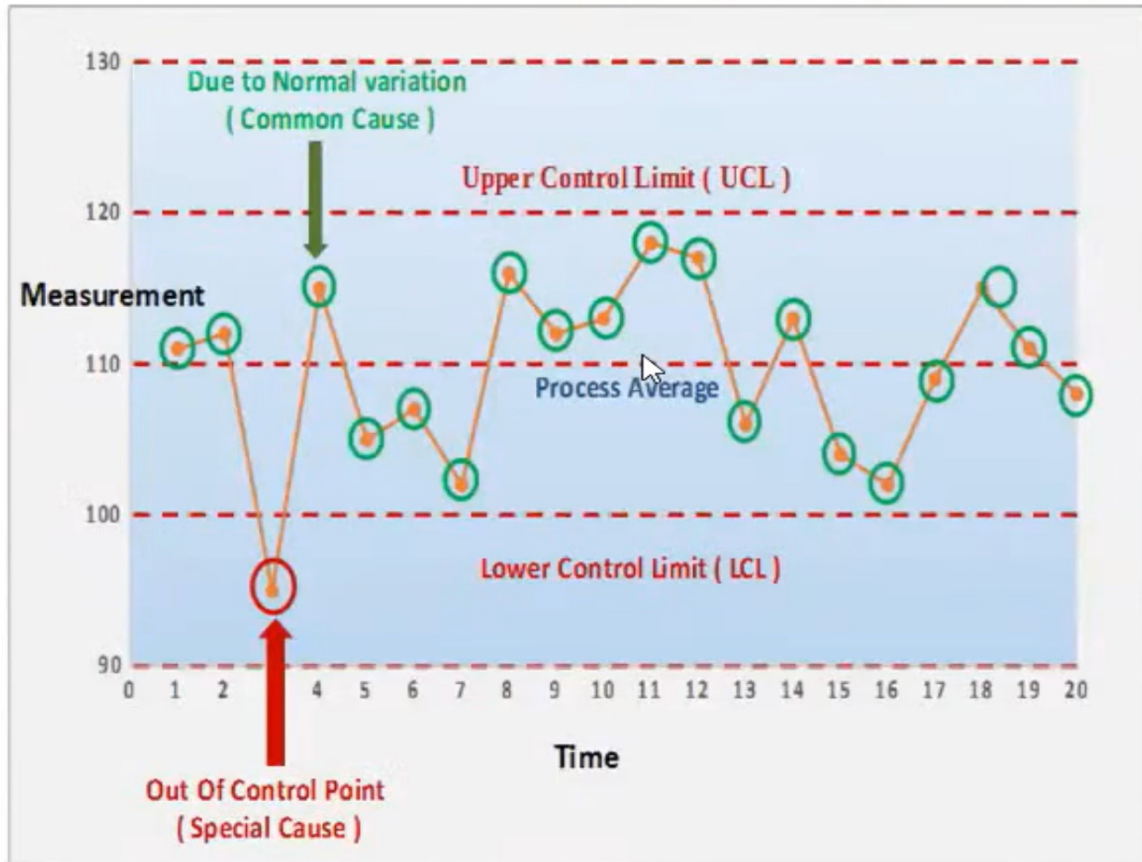
1. **stable over time** (demonstrated through measurement data)
2. operated in a stable, **consistent manner** with no **arbitrary changes (change without base or justification)** in process steps or conditions
3. the "process aim" is set and maintained at the **proper level**, based on quality control **specifications or target values**
4. the average or normal process variation (**control limits**) falls within the specification limits.

Process Capability Overview



CONTROL CHART

Shewhart chart



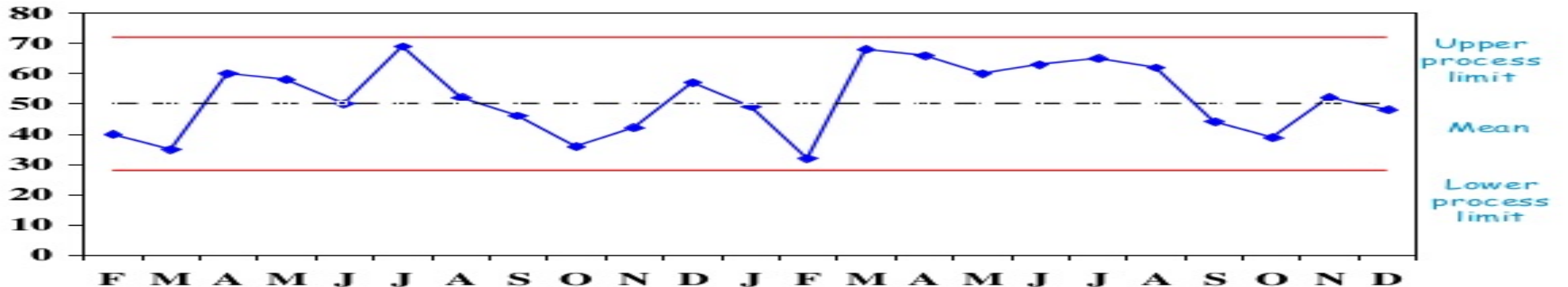
8. Control Chart:

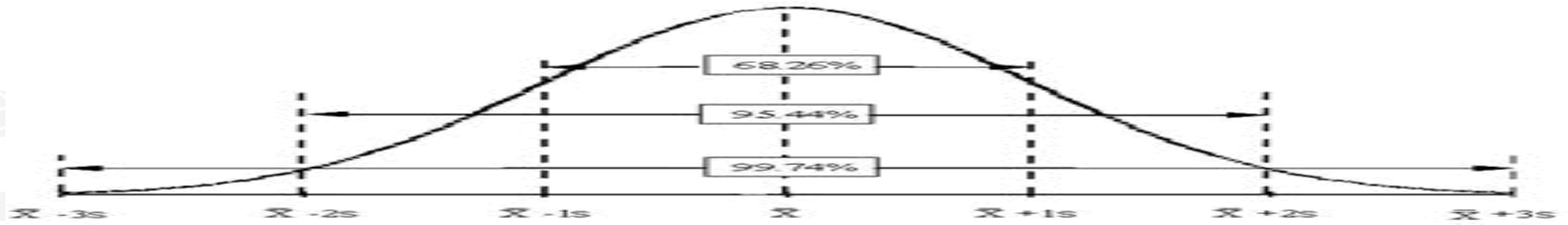
line graph/run chart that **compares actual performance or change over time to the mean** and includes both upper and lower control limits.

The **Control Limits** provide the basis for determining the **capability of the process** (the degree of control)

It is a display of **normal variations and special cause variations over time**.

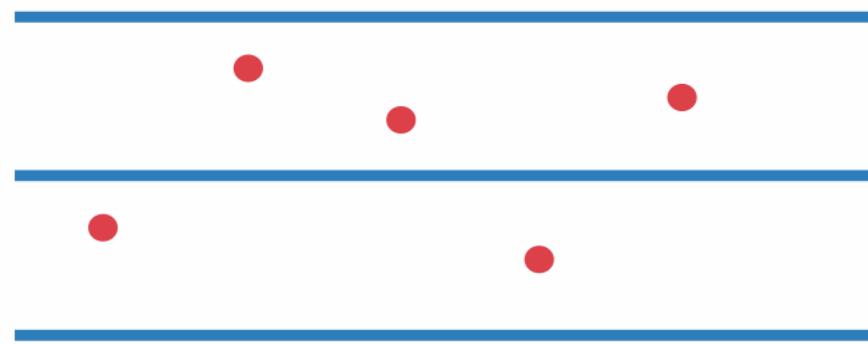
Natural (common cause) variation - a stable process in control



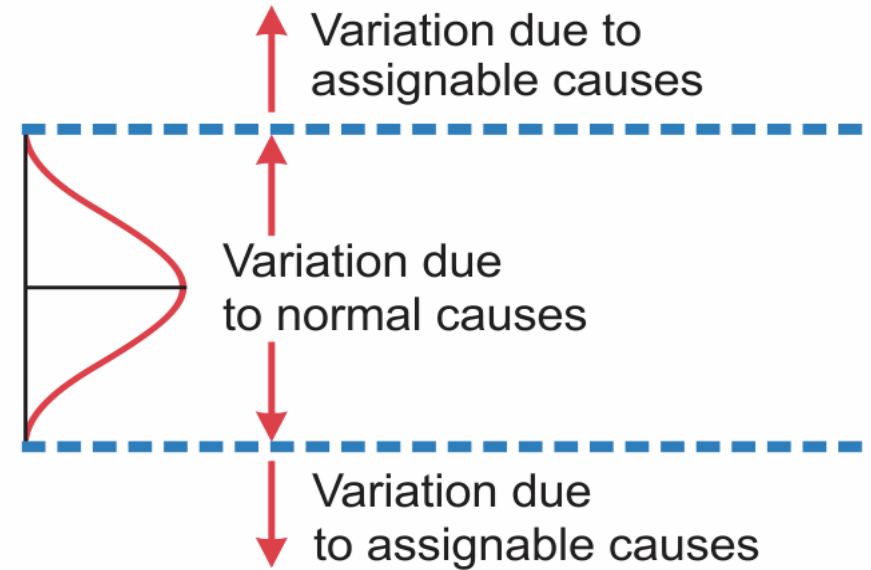


Observation out of control

Volume in ounces
UCL
CL
LCL



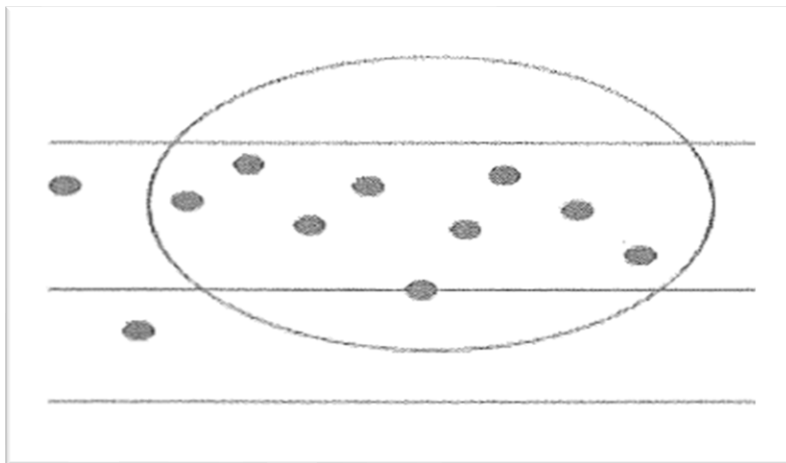
Sample Number





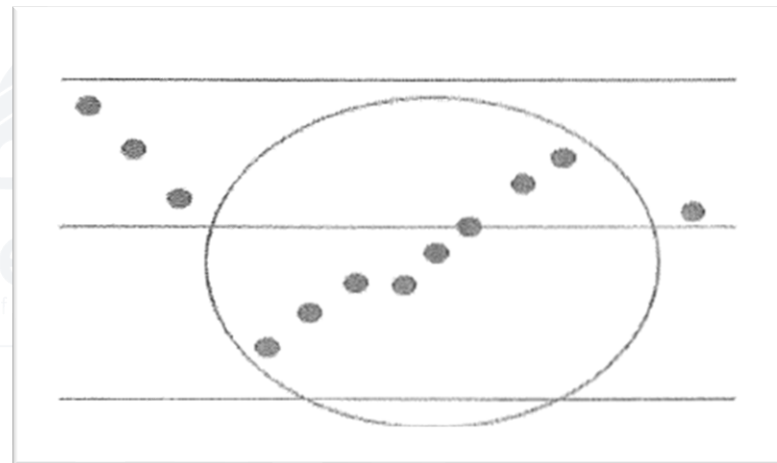
Shift

- Eight or more points consecutively appear above or below the mean or median.



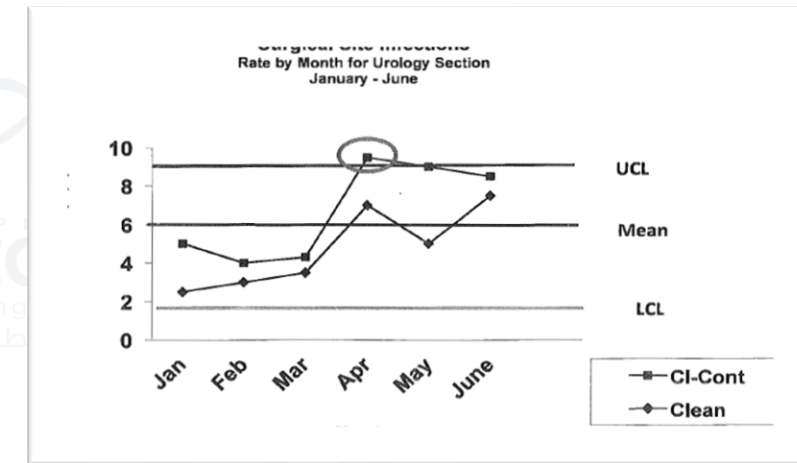
Trend

- Six or more consecutive data points going up or going down.



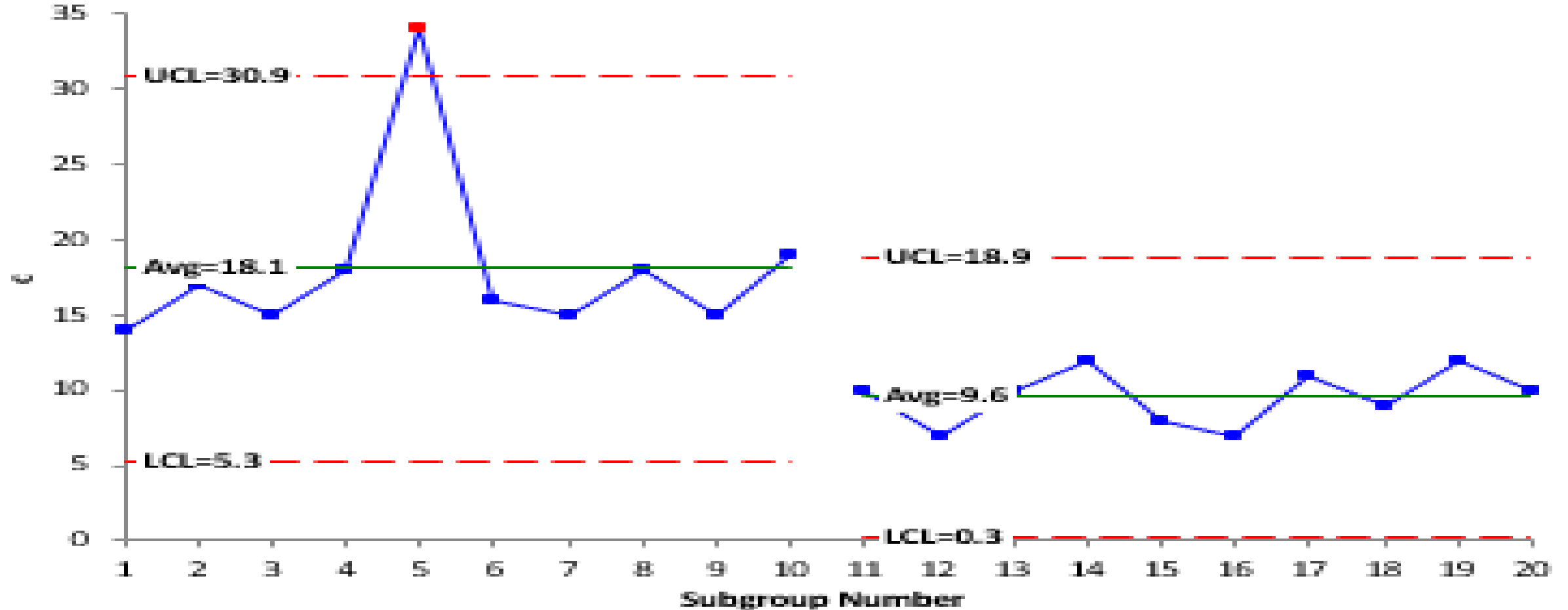
Value outside the limits

- One value outside the upper and lower limits (RCA)



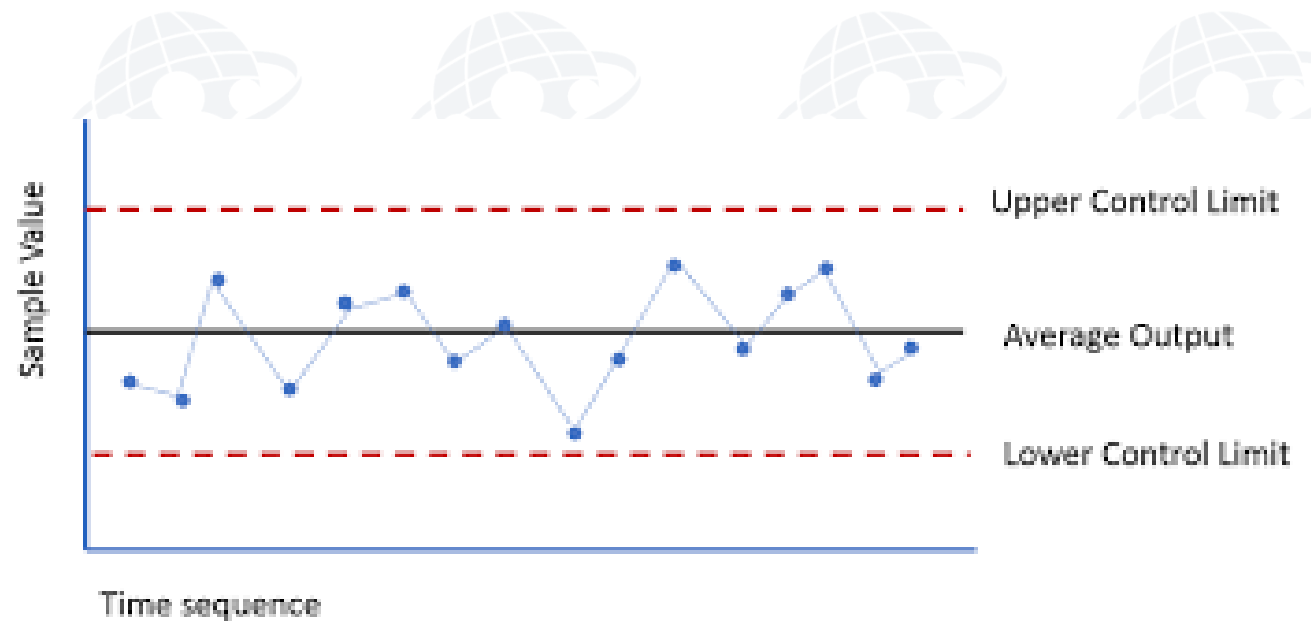


Control Chart Example



• How to build a Control Chart?

- A minimum of 20 data subgroups is required (best is 20-30).
- Calculate the mean.
- Calculate the upper and lower control limits (UCL,LCL) using the following formula:
 - $UCL(\text{for chart}) = \text{Mean} + 3SD$
 - $LCL(\text{for chart}) = \text{Mean} - 3SD$

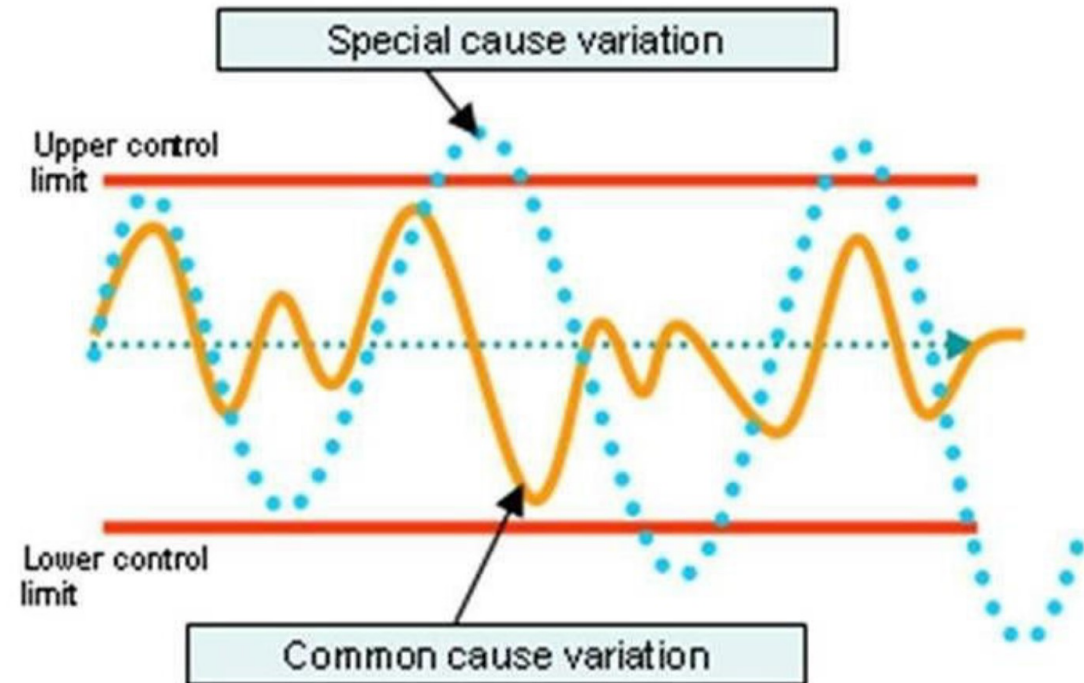




- Control chart (**Shewhart Chart**) is a statistical tool used to distinguish between variation due to

- **Common cause**
- **Special cause**

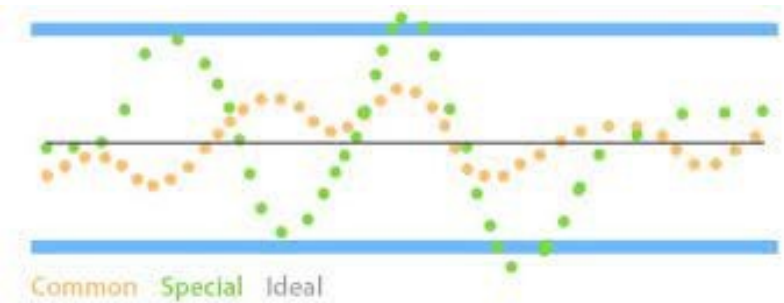
- Statistical tool to determine if a process is **stable** (and predictable)



Common cause variation

This random variation is inherent in the system (process or product) over time

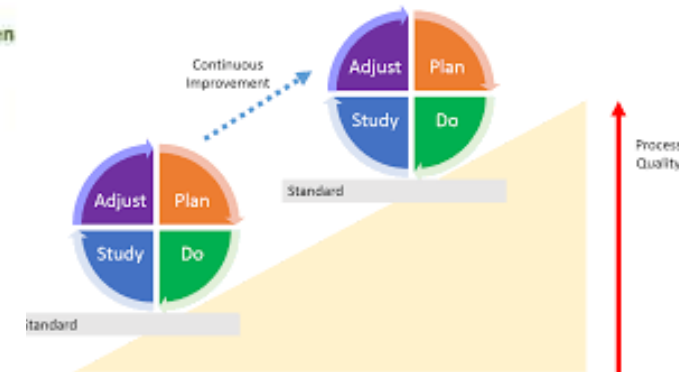
- Affects everyone working in the system
- Affects all outcomes of the system
- Process is **stable** and predictable when only common cause variation present
- Action(s) to be taken must relate to the **process** not to individual variation in measurement



Realize that process is performing as well as possible

- Making **it better** requires process redesign
- Identify all aspects of process to change
- Test changes using PDSA cycle
- Implement successful changes using PDSA cycle

The PDSA Cycle for Learning and Improvement



Special cause variation

Not part of the system (process or product) all the time or does not affect everyone

- Appears due to specific circumstances
- Not random; has specific cause
- Process is **not stable** or predictable
- Identify when special cause occurred
- Learn from the special cause

Action should be taken to learn about special causes of variation

Take action based on the special cause

- Can be favorable or unfavorable
- If distribution or pattern of points is not random, process is unstable (special cause)





Random or common cause variation	Assignable or special cause variation
Intrinsic - inlier	Extrinsic - outlier
Occurring noise in process	Variation from what normally expected, tails of bell shape curve
Situations usually within care systems and process	Practice pattern assigned to root cause
Chronic-persistent	Sentinel events, one time occurrence, unique out of the ordinary
Normal range of variation in process	More easily identified and resolved by QI teams
Goal: not to eliminate, but to reduce variation in process enough to produce & sustain stability	Goal : Needs case specific focused review & RCA
Refer to less desirable part of the process	If negative : Quickly changed or eliminated If positive : Analyzed for possible replication
Resolving more time consuming and difficult	As special cause variation exist, no accurate predictions about process performance or probable outcome

Process variation

- any change or **deviation** in form, condition, appearance, extent, etc., from the **usual state** or **assumed standard** either in the whole process or in a step of the process.

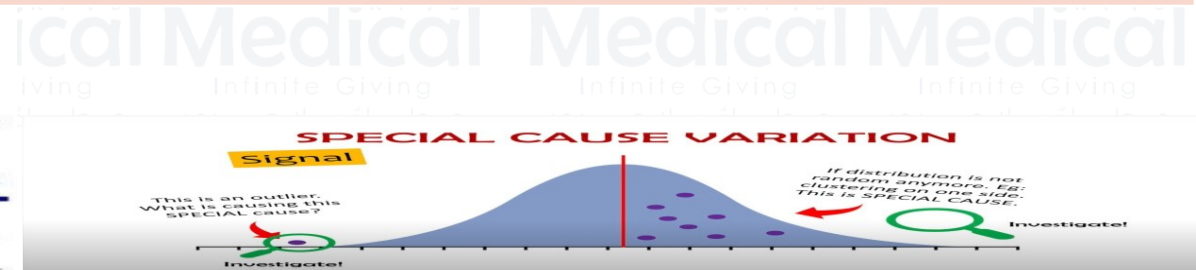
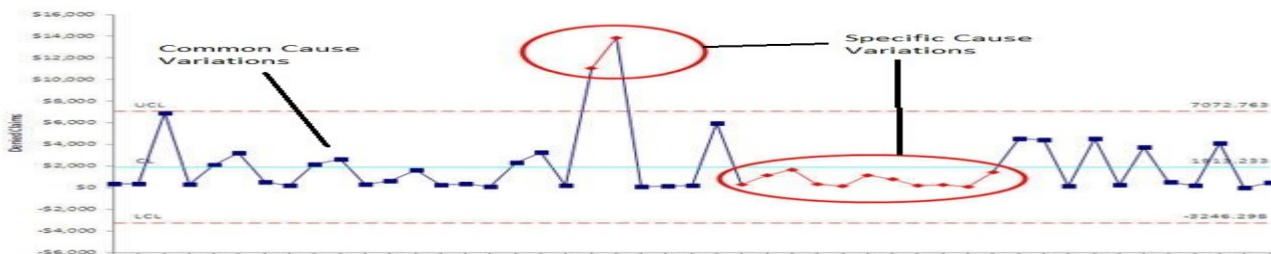
Types of Variation

Special (assignable & extrinsic) cause variation

- Extrinsic** of the usual process.
- Related to **Identifiable factors** can be tracked to **root cause**.
- Refer to **sentinel event**, unique, one time occurrences, out of the ordinary circumstances, outliers & tails.
- More **easy to identified** & resolved.
- may be positive or negative.
- Response**: root cause analysis (**RCA**).

Common (random & intrinsic) cause variation

- Intrinsic** to the process itself.
- Related to **situations within process**, chronic, noise & inliers.
- More **time consuming**, more difficult.
- Response**: no focus, monitoring, process redesign & improvement (aim to reduce variation).







Which of the following charts is used to institute quality improvement & monitor cost reduction on an ongoing basis?

- a) Pie chart
- b) Control chart
- c) Parto chart
- d) Fishbone diagram

Special cause variation is considered :

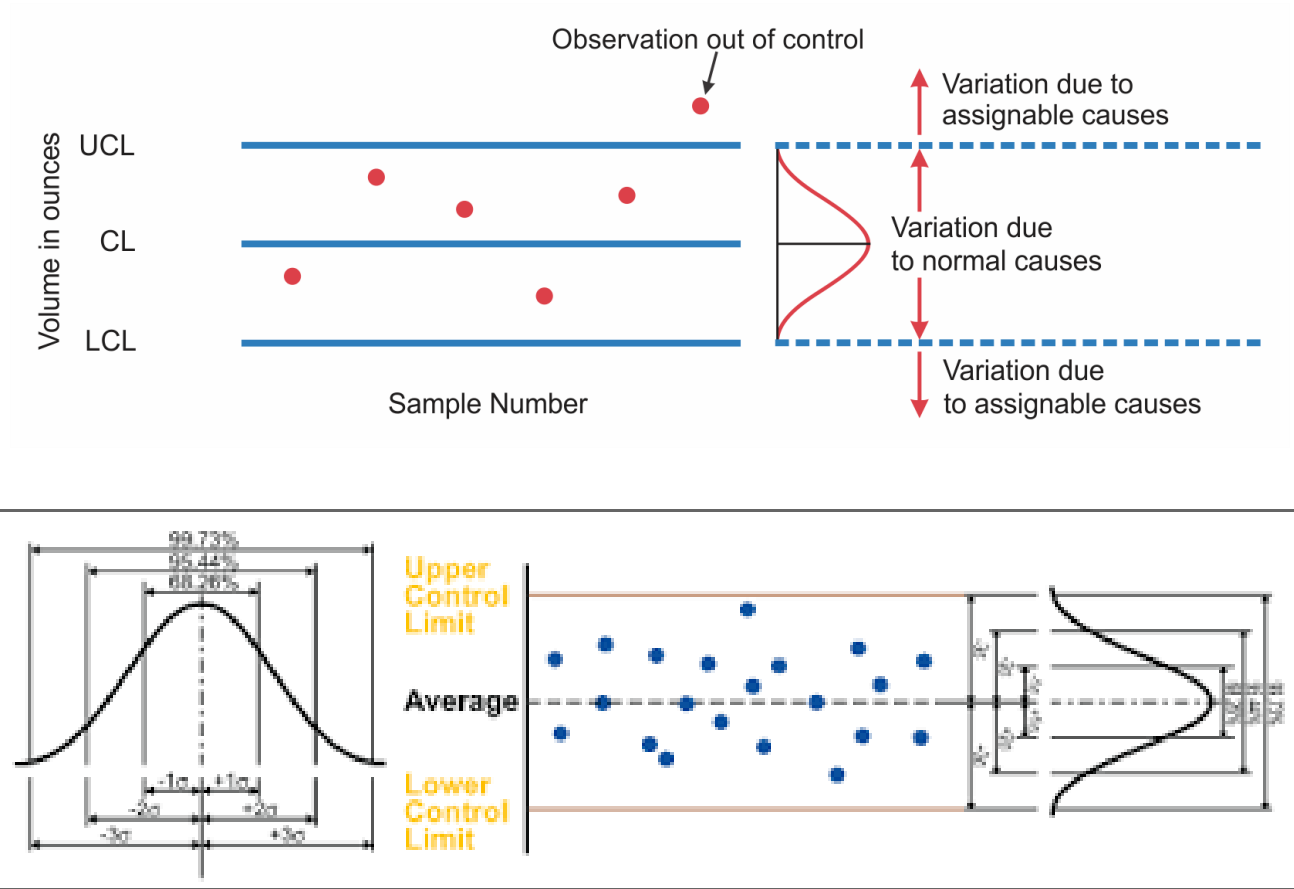
- a) A point over the control limit
- b) 3 standard deviation
- c) 1 standard deviation
- d) Sentinel event

Variance interpretation the most suitable tool

- a) Pie chart
- b) Control chart
- c) run chart
- d) Bar chart

What a control chart tells you

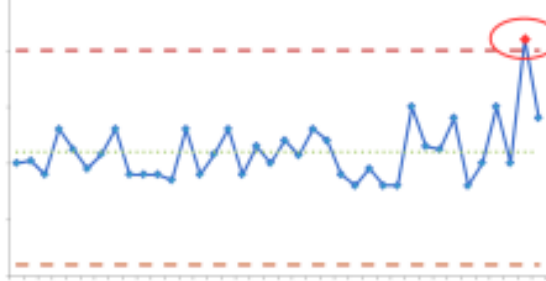
- How much variation exists in a process
- More sensitive than a run chart
- Type of variation (common or special cause)
- Which type of improvement strategy is needed (common or special cause)
- Whether a process is stable and predictable
- If changes yielded improvements
- If improvements are being sustained



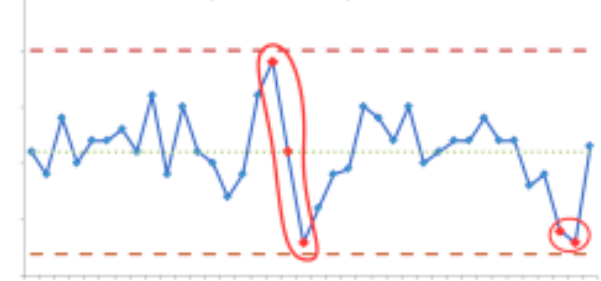
How to interpret a control chart

- Five rules can be used to identify special cause
 - **Rule 1** –Single point outside limits
 - **Rule 2** –Shift
 - **Rule 3** –Trend
 - **Rule 4** –2 of 3 Points in outer 1/3
 - **Rule 5** –15 or more points in inner 1/3

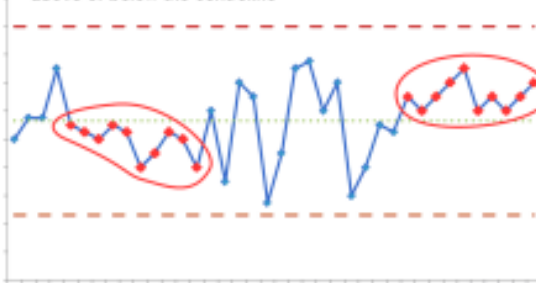
Rule 1: single point beyond the control limits



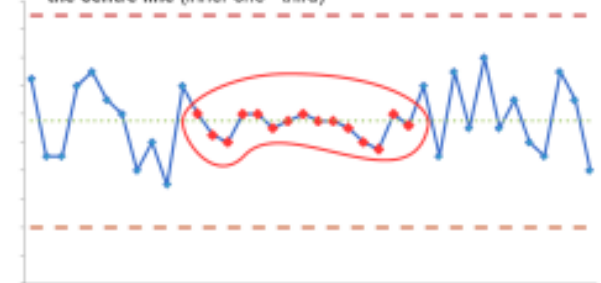
Rule 4: two out of three consecutive points near a control limit (outer one - third)



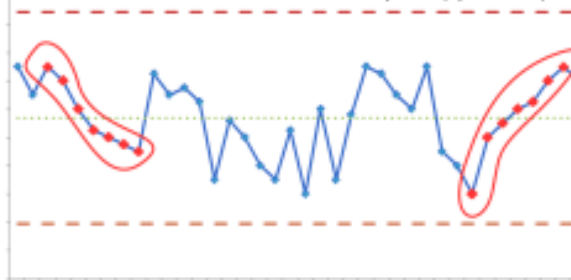
Rule 2: a shift of eight or more consecutive points above or below the centreline



Rule 5: at least fifteen consecutive points 'hugging' the centre line (inner one - third)



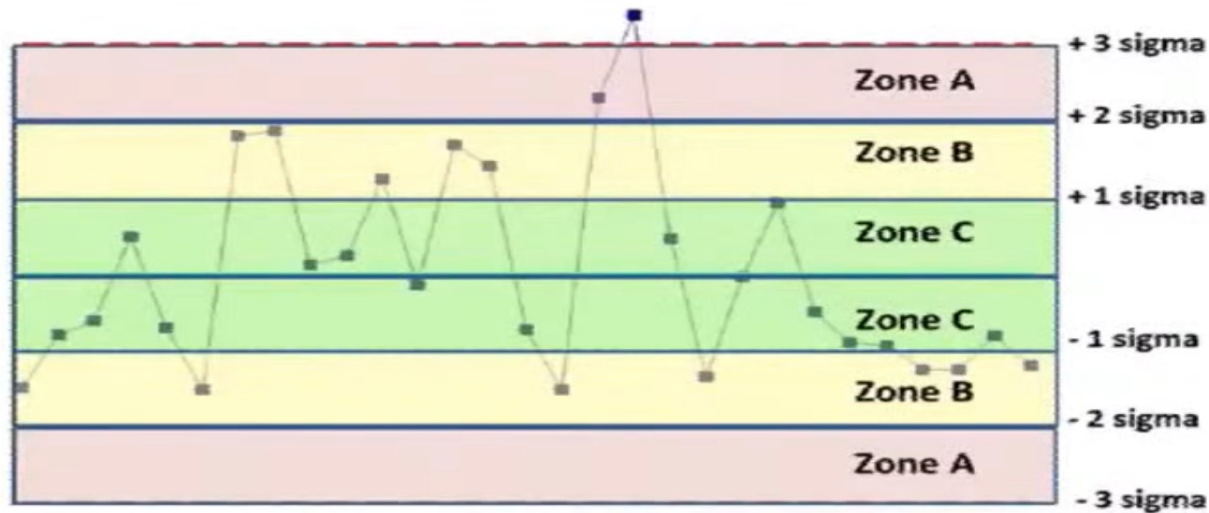
Rule 3: a trend of at least six consecutive points (up or down)



Standard control chart
rules for detecting
special causes

(Signs of presence of special cause variation)

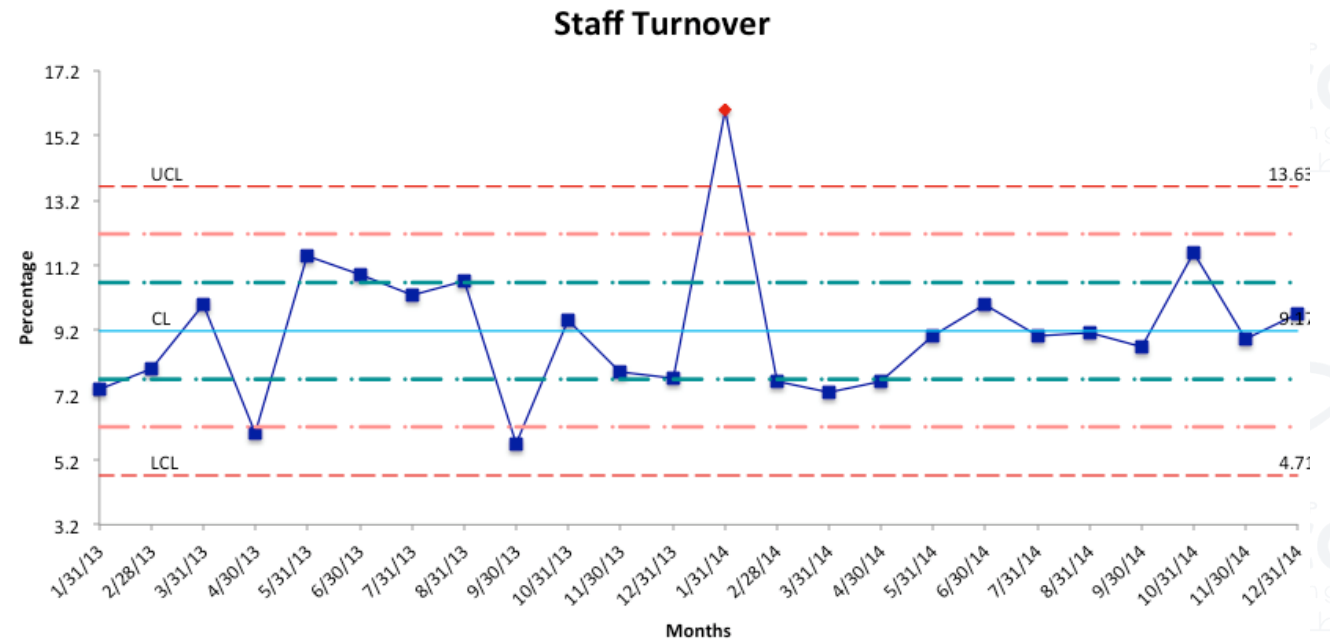
- Two points out of 3 consecutive points in Zone A.
- Four points out of consecutive in Zone B.
- 7 or more consecutive points on one side of the average in Zone C.



UCL	Zone A - 3 Sigma (+3 SD)
	Zone B - 2 Sigma (+2 SD)
M	Zone C - 1 Sigma (+1 SD)
	Zone C - 1 Sigma (-1 SD)
	Zone B - 2 Sigma (-2 SD)
LCL	Zone A - 3 Sigma (-3 SD)

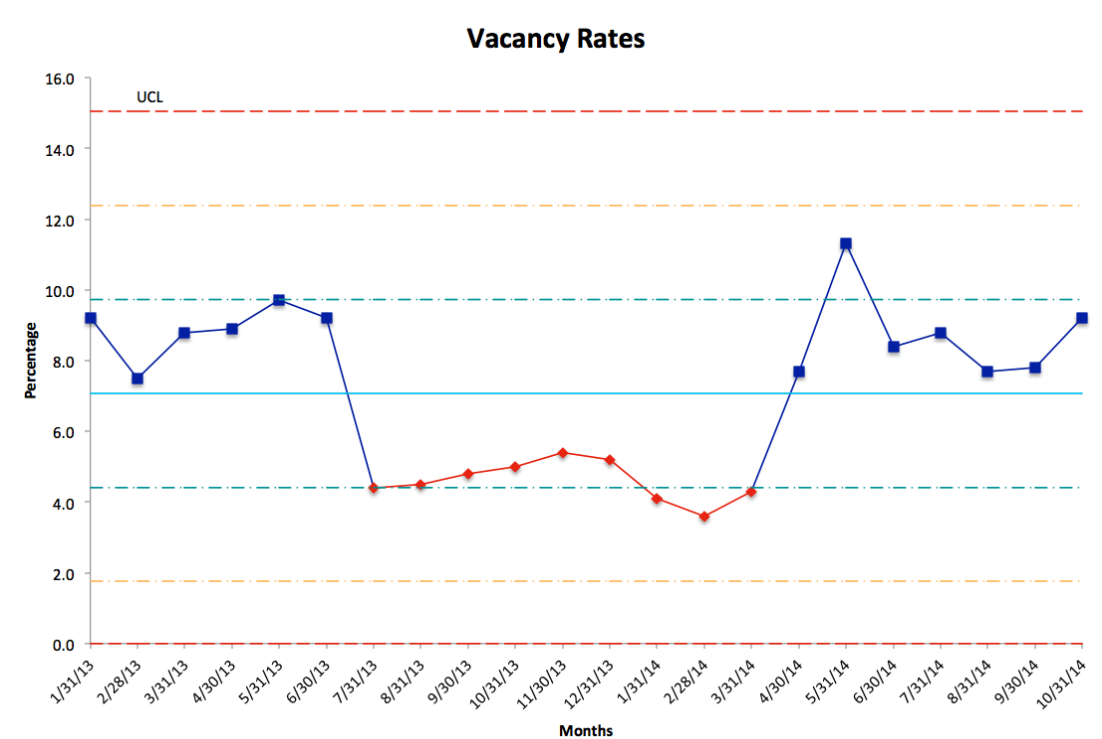
Rule 1 = Single point outside the control limits (UCL or LCL)

- A point exactly on the limit is not considered outside the limit
- When there is not a lower or upper limit on one side of the center line, Rule 1 does not apply Quickly identifies sudden changes



Rule 2 = Shift

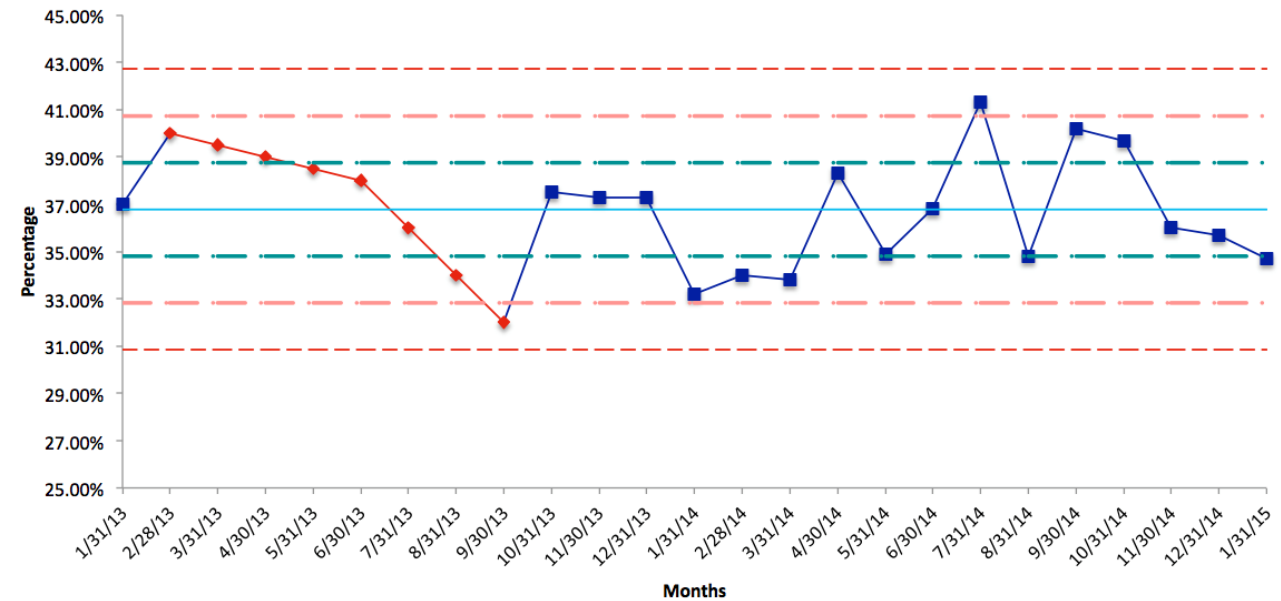
- Eight or more consecutive points in a row above or below the center line
- Known as a shift
- A point exactly on the center line does not cancel a shift or count toward a shift



Rule 3 = Trend

- Six or more consecutive points increasing (going up) or decreasing (going down)
- Known as a trend
- Ties between two or more consecutive points do not cancel a trend or add to a trend
- Does not matter if points cross the center line or not
- First point is included (trend inclusive rule)

Mental Health Call Abandonment Rates

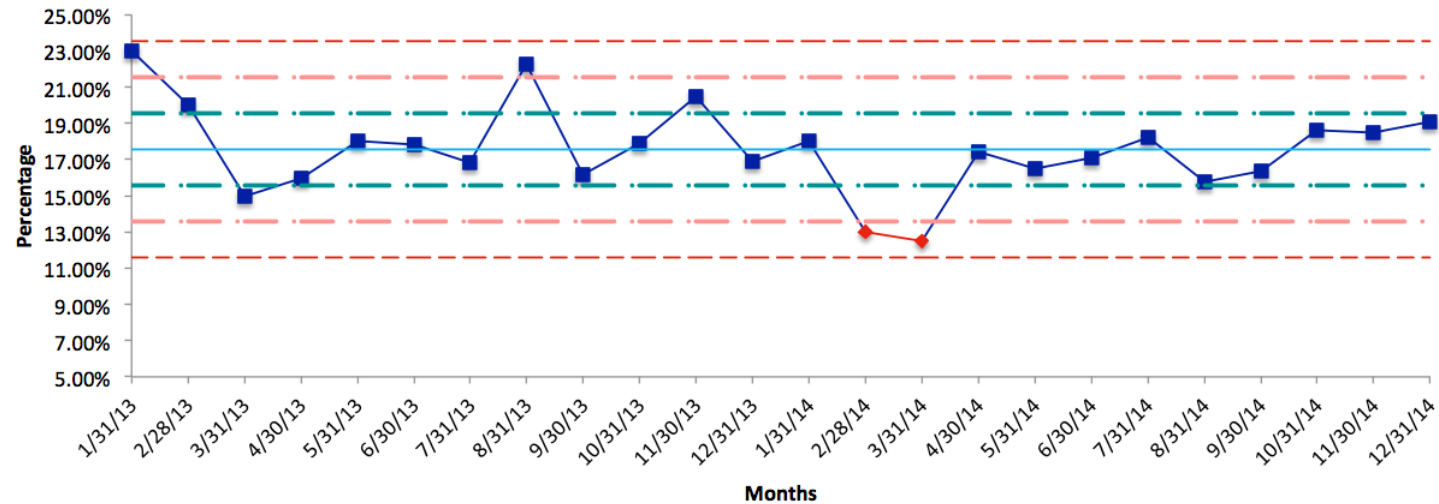




Rule 4 – 2 of 3 Points in outer 1/3

- Two out of three consecutive points in outer one-third (sigma) of a control limit
- Points do not have to be in the same third of an outer limit (one point can be in outer third near upper control limit and one point can be in outer third near lower control limit)
- When there is not an upper or lower limit on one side of the center line Rule 4 does not apply

Missed Appointment Rate Surgical Clinic

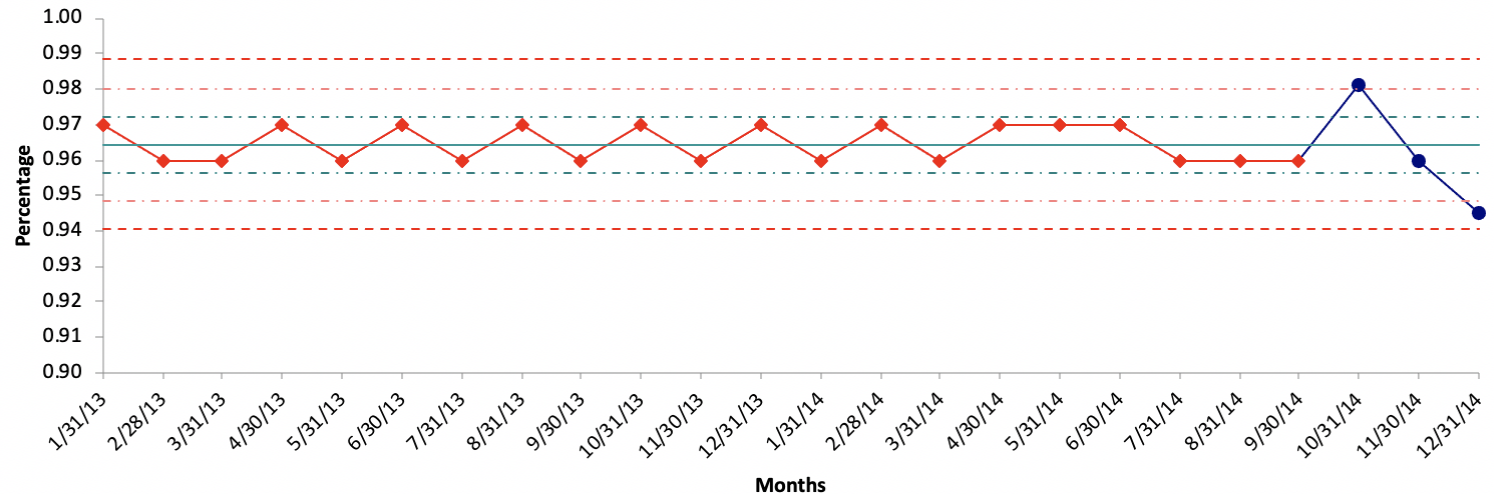




Rule 5 –15 or more points in inner 1/3

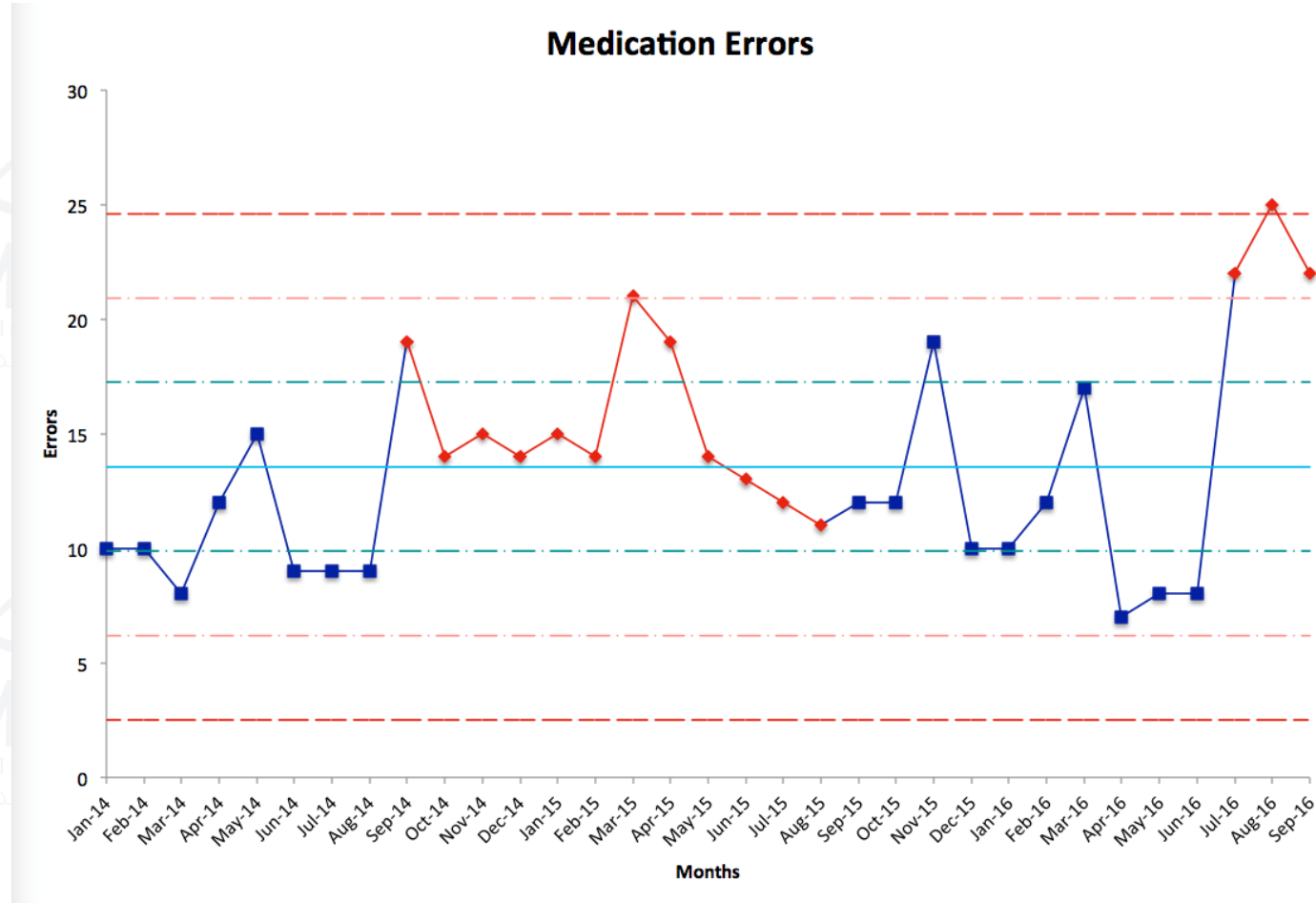
- Fifteen consecutive points close to the center line (in the inner one third or one sigma) of the chart

Personal Protective Equipment Compliance

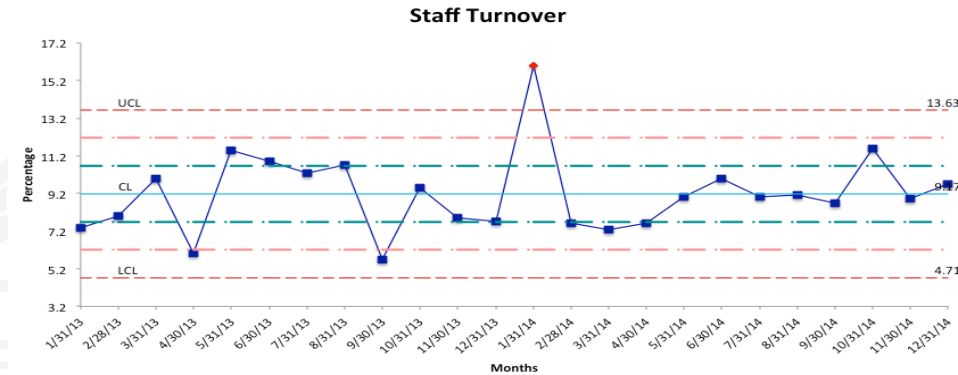




Control charet example : Medication errors



A large healthcare facility has a high amount of nurse turnover. Human Resources asked the Quality Department to work with nursing leaders to identify actions to decrease turnover among nursing staff. The quality department decides to make a control chart of turnover.



On the previous slide there is a control chart showing turnover. What do you notice?

- A.** There is no special cause in staff turnover
- B.** There is a trend (to the good) from 5/31/13 through 9/30/13
- C.** There is a shift from 5/31/14 through 12/31/14
- D.** There is a statistically significant percentage (to the bad) for nurse turnover 1/31/14

Quality Tools

Creating Ideas

Brainstorming	Nominal Group Technique
<ol style="list-style-type: none"> 1. Definition of the subject 2. establishment of a time limit for the entire session 3. time for individual thought 4. requesting ideas according to the predetermined (structure or unstructured) 5. all ideas are recorded (using a flip chart or overhead projector so all can see) 6. clarification of all ideas generated to assure accuracy and understanding 	<ol style="list-style-type: none"> 1. give everyone on the team/group an equal voice in brainstorming (in silence, written down, then shared one idea per person at a time, and recorded on a flip chart) 2. ideas are clarified, but not criticized. 3. Each idea is then rated by each participant by Voting within the team/group.

Rules of Brainstorming

- | | | | |
|---|------------------------------|---|----------------------------|
|  | Defer Judgment |  | One Conversation at a Time |
|  | Encourage Wild Ideas |  | Be Visual |
|  | Build on the Ideas of Others |  | Go for Quantity |
|  | Stay Focused on the Topic | | |



Lotus Diagram:

Is a tool to expand thinking around a single topic. The expansion may include types, categories, details, or questions around a theme. It is one simple, but effective way to organize output from Brainstorming.

	Orientation		X			New Teams	
		Orientation	X	New Teams			
W	W	EDUCATION	Y	Y			
		Leadership	Z	Physicians			
	Leadership		Z			Physicians	

Lotus Diagram

The Lotus Diagram is a brainstorming and organizational tool that is used to define key concepts or parts of a whole. It is based on the concept that the center of the diagram is the main idea or focus, and the eight surrounding boxes are representative of the petals of the lotus flower. Each of the eight ideas would be related to the central concept. Students can use this tool to brainstorm around a particular topic or break down a bigger idea.

round	bound	bound
around	ound	ground
found	ound	soft sound

Which Businesses Satisfy My Needs and Wants?

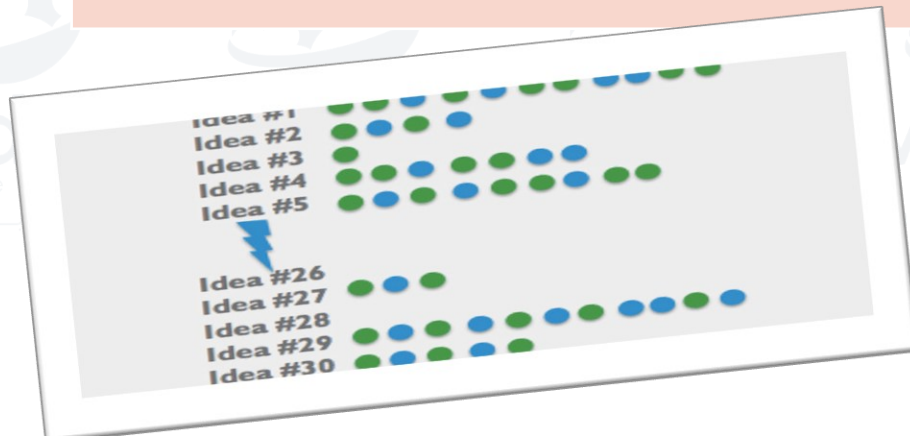
	Food		Education			Shelter	
What needs and wants does a baby have?	Food	Education	Shelter	Why are your parents' needs and wants different to yours?			
Businesses that satisfy my needs and wants.							
		Medical Care	Fun	Clothing			
	Medical Care		Fun			Clothing	

ink saving Eco



Ideas Prioritization / Consensus

Multi-voting	Delphi Technique
<ul style="list-style-type: none"> The goal is to end up with the "critical few" ideas. Each team member is asked for input to prevent wrongful tampering with an idea. Multiple ways for voting (fist five, ranking,...) 	<p>tool used to reach team consensus concerning a particular goal or task. The technique can be used whether or not the team is in session or if members are in different locations.</p> <p>A process used to arrive at a group opinion or decision by surveying a panel of experts. Experts respond to several rounds of questionnaires, and the responses are aggregated and shared with the group after each round</p>





Prioritization Matrix:

It promotes decision-making and consensus.

1. the matrix must be prepared with options, problems or solutions down the left side and criteria and total score columns across the top of the matrix.
2. List the items that need to be improved or decided upon down the left side of the matrix.
3. determine the criteria to be utilized to help make the decision
4. Determine the scoring system

PROJECT: IMPROVE PATIENT ACCESS TO CLINIC

Clinic Access Options	Quality Impact Criteria				Total Score
	Safety	Pt. Outcome	Pt. Satis-faction	Cost	
Toll-Free #	1	3	5	2	11
Longer Hours	3	5	4	4	16
Physician Numbers	5	5	1	2	13

Likert Scale 1 (lowest) 0 5 (highest)

prioterization

Root cause	Solution	Time	achievable	Cost	Value
No clear pathway for such cases	Intiate guideline and pathway for this diagnosis	3	5	5	75
The Anesthesia doctor was not have liscence yet	OR manager should make sure that all the physician participated in the procedure have liscence and priviledge to dothe procedure	5	5	5	125
Only one consultant has privilege to do this procedure	If the consultant not available in the organisation these cases will not be accepted in the hospital.	5	5	1	25
physician who did the procedure do not has privilege	All the visitor doctor must grant privilege from SGH-D as the priviledge is hospital specific	5	5	5	125
Patient history not assessed	consultant engaged/ direct contact with referral hospital for proper history	5	5	5	125
medication not holded in the proper time	Initiate specific departmental orientation for top five procedure and top five diagnosis	2	5	5	50



Cause & Effect

Cause & Effect Diagram (Ishikawa, Fishbone):

Display of the relationship between some "effect" (negative or positive) and all the possible "causes" impacting it.

Causes lines labeling:

- Industry** utilizes the **5 M's**: Manpower, Materials, Machines, Methods, and Management.
- In **healthcare**, there are the **5 P's**: People, Provisions (supplies), Policies, Procedures, and Place (environment).

Possible sub-causes of main causes can be identified by using the "**Five-Why**"

Cause & Effect

Cause = The reason for something happening.

Effect = What happened.

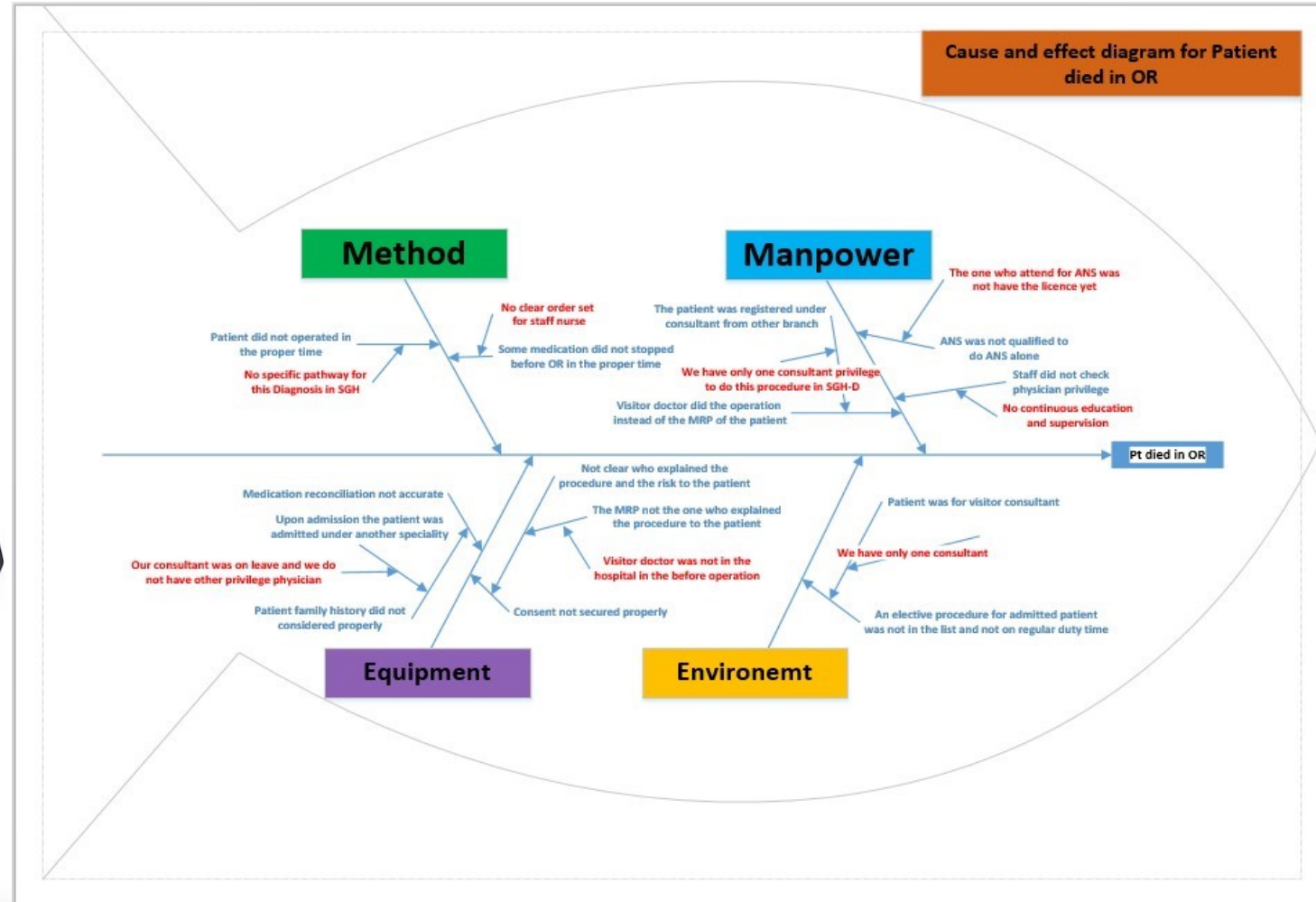
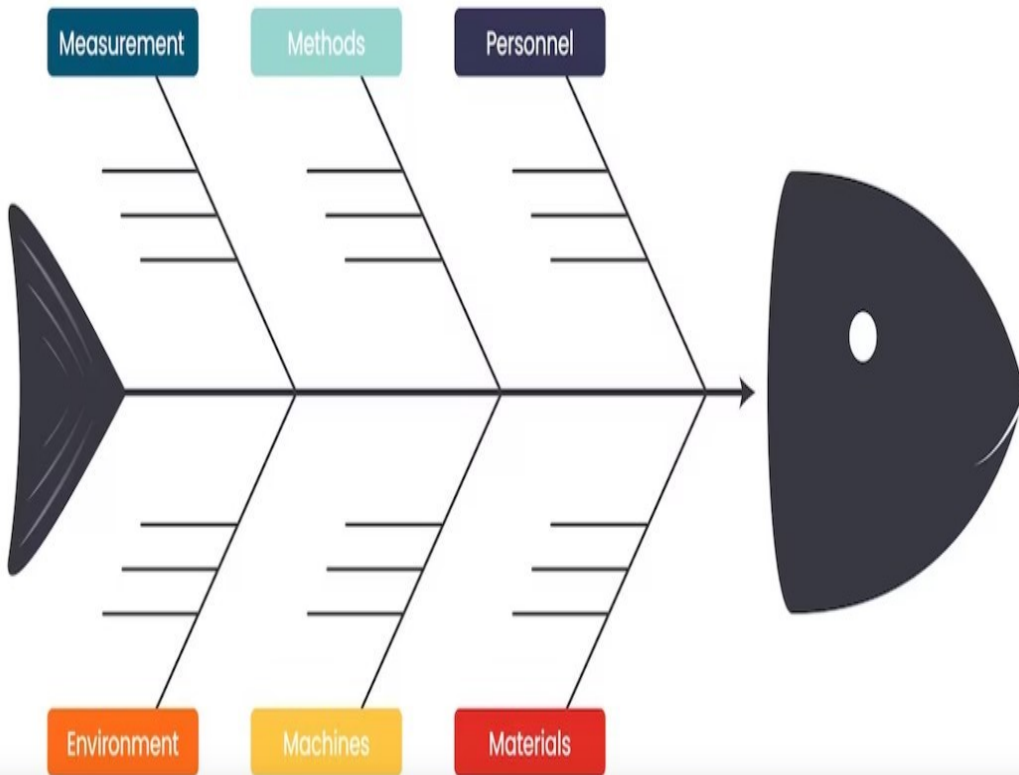
Cause + Effect = Explains why things happen.

Signal words that help identify Cause & Effect

so, because, therefore, since, if, then, so that,
without, cause, effect, how, explain.

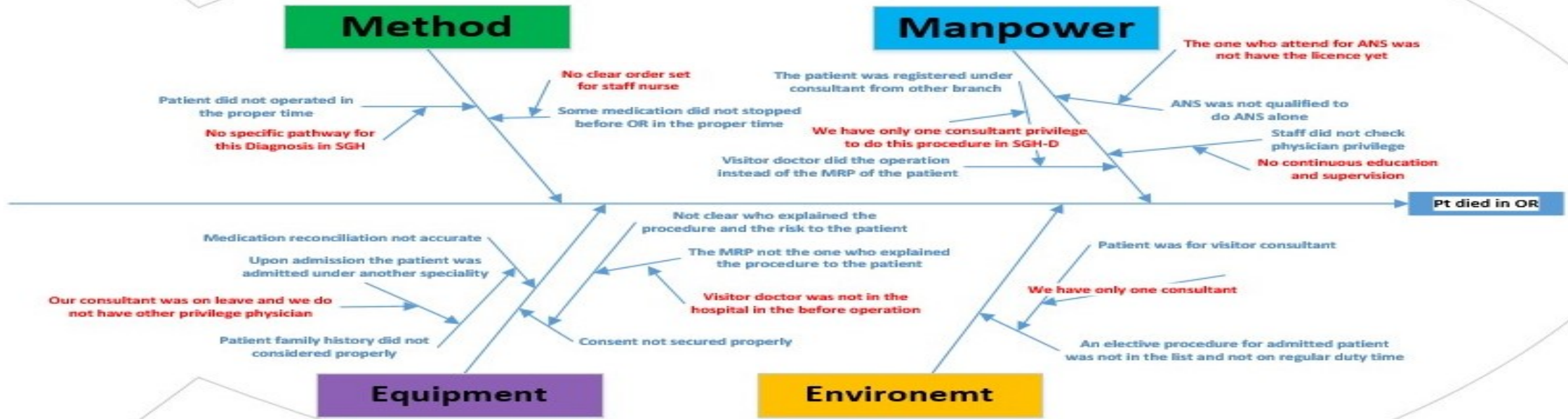


Cause & Effect Analysis





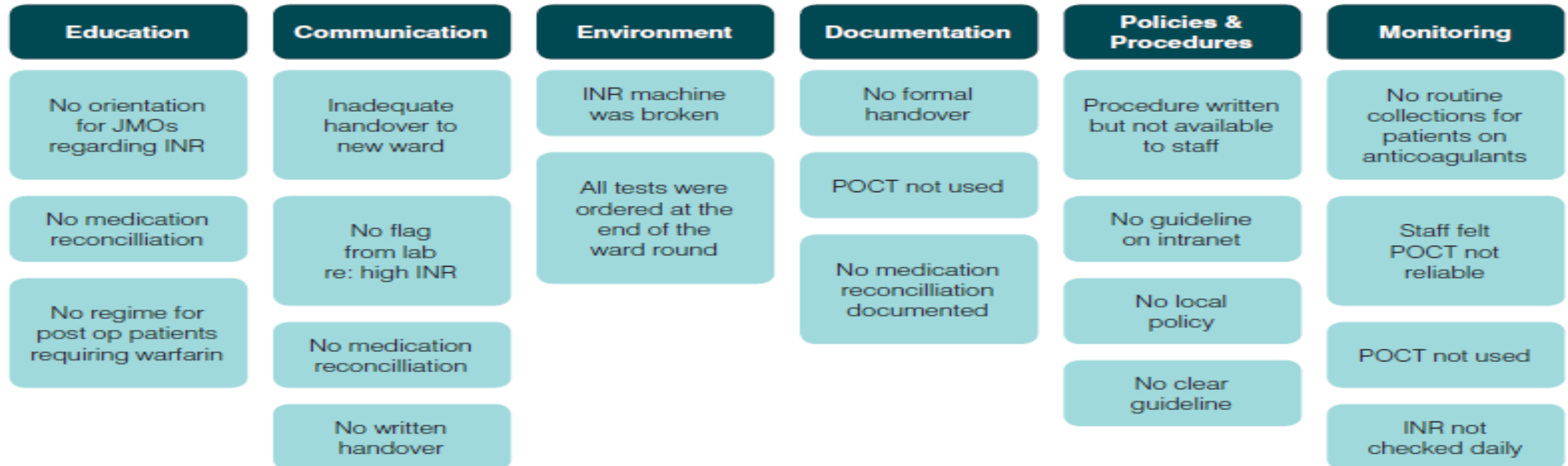
Cause and effect diagram for Patient died in OR





Organizing Idea (Affinity diagram)

Organizes a large number of ideas into their natural relationships. It is the organized output from a brainstorming session. Use it to generate, organize, and consolidate information related to a product, process, complex issue, or problem.



Process discription

Flowchart / Process Map:

It displays the actual sequence of steps and their inter-relationships in a specific process.

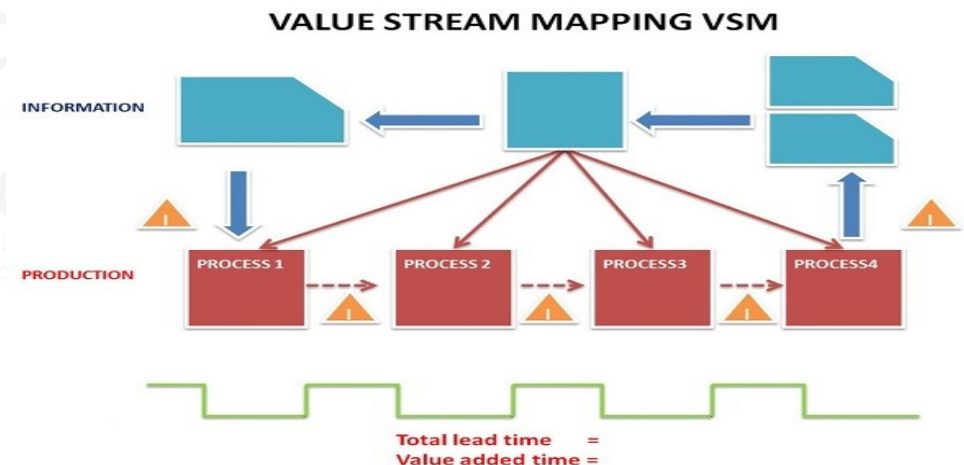
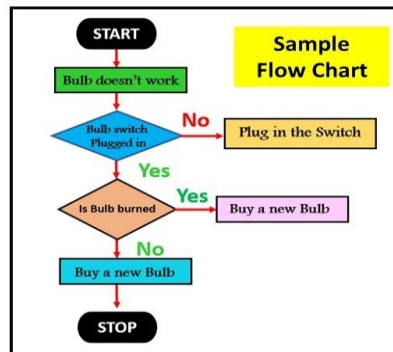
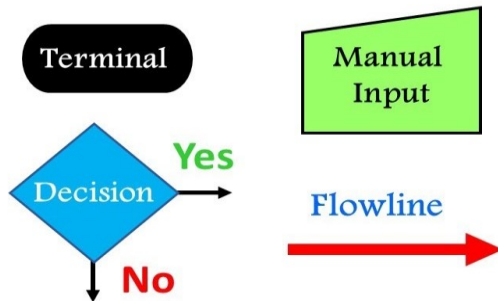
Used in FMEA, RCA OR in redesign the process.

Value Stream Map:

identify the value and non-value steps in a process from start to end of the process.

contains a SIPOC table, which stands for Supplier, Input, Process, Output, and Customer

Process ~ Flowchart



A3 Problem solving Approach

tool used to identify problems and propose solutions that are summarized on only one side of a sheet of paper. It is a dynamic way of thinking that organizes and synthesizes data in a clear and objective manner to achieve the established goal.



A3 METHOD

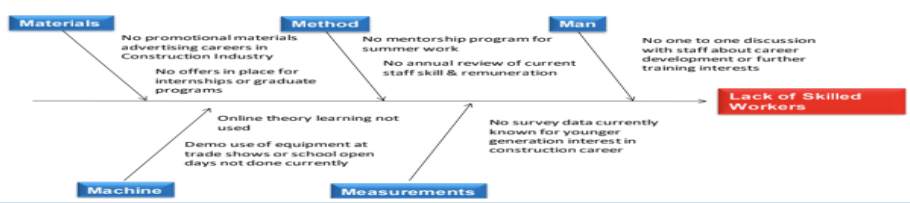
TITLE: LACK OF SKILLED WORKERS DATE: 20th November 2016 TEAM: B Healy, A Osman, J Orange

BACKGROUND
Lack of skilled workers currently in the pipeline for future construction works projects for the business. Demand is growing & the business will not be able to accept new contracts in the next 12 months.

CURRENT STATE
Seems to be an issue at a national level due to increased uptake of college education by the younger generation.

GOAL
Encourage retention & upskilling of current staff. Improve visibility, profile & attractiveness as an employer of choice for younger generation.

FISHBONE ANALYSIS



```


graph LR
    M1[No promotional materials advertising careers in Construction Industry] --> A[Lack of Skilled Workers]
    M2[No offers in place for internships or graduate programs] --> A
    M3[Online theory learning not used] --> A
    M4[Demo use of equipment at trade shows or school open days not done currently] --> A
    M5[No mentorship program for summer work] --> A
    M6[No annual review of current staff skill & remuneration] --> A
    M7[No one to one discussion with staff about career development or further training interests] --> A
    M8[No survey data currently known for younger generation interest in construction career] --> A
    
```

ACTION PLAN

Issue	Corrective Action	Owner	When	Status
No promotional materials in place for career advertisement	Hire agency for social media campaign for targeting younger generation for career in construction industry	BH	01/06/17	Planned
No offers in place for internships or graduate programs	Advertise graduate programs in school newsletters & internal business newsletter with rewards in place for current staff referrals	AO	20/12/16	Done
No mentoring program in place	Identify suitable mentors currently in the business & role out mentoring program for current staff skill development	BH	10/01/17	Checked
No annual review of skills & remuneration packages	Setup annual review process for all staff & align with HR & senior management team	BH	20/01/17	Planned
No one to one in place for current staff with line managers	Setup one to one process for all staff & implement with all line managers in the business	AO	01/01/17	Acted (closed)
Online training not used to further enhance learning of new skills	Engage HR department for establishing an online tool for learning theory & induction information for new skill development & implementation as project	BH	15/05/17	Planned
No tool demos currently happening	Setup tool & works demo at trade shows & school open / careers days to promote career & show business as employer of choice	JO	20/03/17	Planned
No survey or demographic data available	Engage marketing agency to perform survey with local & state schools & youth centres to establish current interest level in construction careers & provide key insights into demographics	BH	30/02/17	Planned

IMPROVEMENT ASSESSMENT

A staff survey was performed prior to communication about this improvement project. A repeat survey was performed two months after the total business communication of this project. The trend shows staff are engagement, satisfaction & retention have improved significantly.



Metric	Nov-16	Jan-17
ENGAGEMENT	65%	78%
SATISFACTION	65%	85%
RETENTION	68%	75%

Decreasing OR cancellation rate in SGH-D

Prepared / Hares Hassan

Project statement

At Feb 2022 we found increasing the OR cancellation rate which has financial effect for organisation also affect on patient satisfaction.

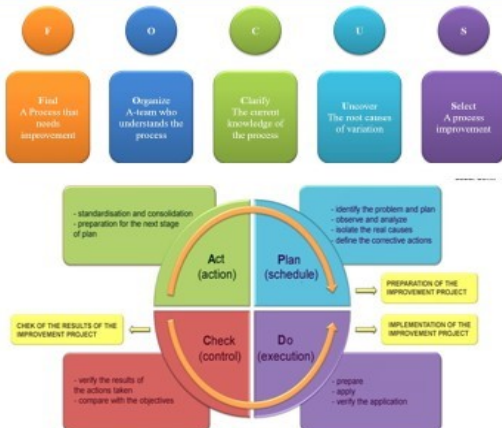
Team Members

Team Members	Sponsor
Dr. Mohamed Magdy	Sponsor
Dr. Elie Loutfi	Leader
MR. Ramadan Zoher	Member
Ms. Asmaa Almazawdah	Member
Ms. Latifa khalifah	Member
Ms. Eman Al aid	Member
Ms. Laila Alsheikh	Member
Ms. Sanaa Jomaa	Coordinator
Mr. Hares Hassan	Facilitator

OBJECTIVES

To decrease OR cancellation 10.26% rate to 2% in SGH-D with in 6 months

METHODOLOGY



Con. METHODOLOGY

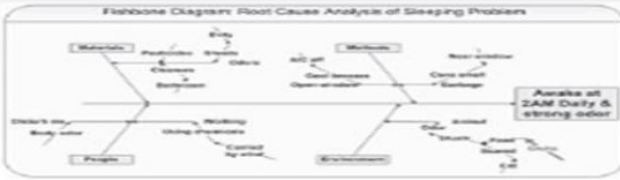
Definition of numerator: Number of all cancelled OR in SGH-D
Definition of dominator: Number of all Patient Booked for OR

TOOL OF DATA COLLECTION:

No	Procedure Date	Package Code	Report	Insurance Approval	Procedure Done	Cancel/No. Cancel
30023	04-08-2022	01002.00	CAR		Yes	
30024	04-08-2022	01002.00	CAR		Yes	
30024	04-08-2022	01002.00	CAR		Yes	
30027	04-08-2022	01002.00	CAR		Yes	
30029	04-08-2022	01002.00	CAR		Yes	
30031	04-08-2022	01002.00	CAR		Yes	
30032	04-08-2022	01002.00	CAR		Yes	
30033	04-08-2022	01002.00	CAR		Yes	
30034	04-08-2022	01002.00	CAR		Yes	
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30140	04-08-2022	01002.00	CAR		Yes	
30141	04-08-2022	01002.00	CAR		Yes	
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30147	04-08-2022	01002.00	CAR		Yes	
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30149	04-08-2022	01002.00	CAR		Yes	
30150	04-08-2022	01002.00	CAR		Yes	
30151	04-08-2022	01002.00	CAR		Yes	
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30153	04-08-2022	01002.00	CAR		Yes	
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30155	04-08-2022	01002.00	CAR		Yes	
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30157	04-08-2022	01002.00	CAR		Yes	
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30159	04-08-2022	01002.00	CAR		Yes	
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30167	04-08-2022	01002.00	CAR		Yes	
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30171	04-08-2022	01002.00	CAR		Yes	
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30173	04-08-2022	01002.00	CAR		Yes	
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30197	04-08-2022	01002.00	CAR		Yes	
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30200						

Seven tools of quality

Cause & Effect Diagram



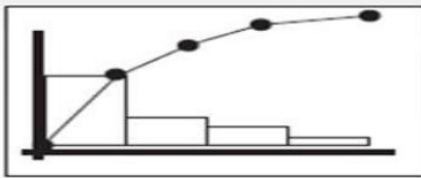
Flowcharts



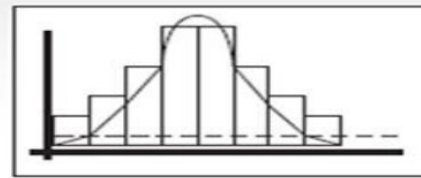
Checksheets

Category	Strokes	Frequency
Attribute 1		
Attribute 2		
Attribute ...		
Attribute n		

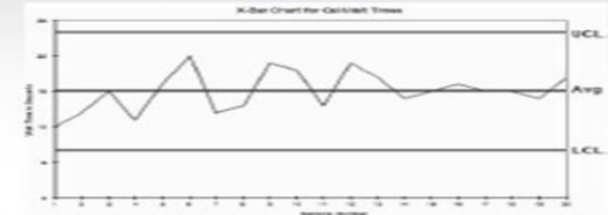
Pareto Diagrams



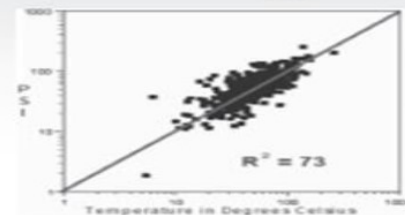
Histograms



Control Charts



Scatter Diagrams





Seven Basic Quality Tools

QualityGurus.com

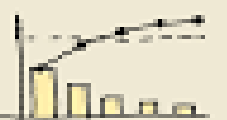
Cause and Effect Diagram



Check Sheet



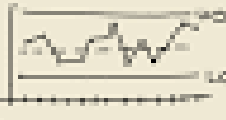
Pareto Chart



Histogram



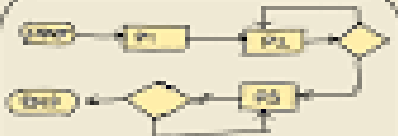
Control Chart



Scatter Diagram



Flow Chart





Cause and effect diagram / Ishikawa / Fish-bone diagram

