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RESEARCH PROJECT AND ONLINE COURSE

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PART A

WORK FROM HOME REPORT UNDER MENTOR GUIDANCE

TOPIC- A REVIEW ON HOSPITAL ACQUIRED INFECTIONS AND ITS CONTROL IN
INDIA

ABBREVIATIONS

1. HAI – Hospital Acquired Infections
2. CLABSI – Central Line Associated Blood Stream Infections
3. CAUTI – Catheter Associated Urinary Tract Infections
4. HAP – Hospital Acquired Pneumonia
5. VAP – Ventilator Acquired Pneumonia
6. SSI – Surgical Site Infections
7. BSI – Blood Stream Infections
8. WHO – World Health Organisation
9. CDC – Centers for Diseases Control and Prevention
10. UTI – Urinary Tract Infections
11. SUTI – Symptomatic Urinary Tract Infections
12. ABUTI- Asymptomatic Bacteraemic Urinary Tract Infections
13. IDSA – Infectious Disease Societies of America
14. OR – Odd Ratio
15. ABHR – Alcohol Based Hand Rub
16. ICU – Intensive Care Unit
17. VDs – Ventilator Days

INTRODUCTION

Hospital infections are also called hospital-acquired infections caused by bacterial, viral, and fungal infections. The most common types are blood stream infections (BSI), pneumonia (VAP), UTI, SSI, etc. At least one out of 25 hospital patients have and HAI at any random day, according to CDC. The CDC estimated that there are approximately 1.7 million cases of HAI every year, affecting as many as 10 per cent of hospital patients.

“Hospital-acquired infections (HAIs), also known as health-associated infections (HCAs), are infections that occur in a hospital patient or other health-care facility in which the infection was not present or incubating at the time of admission”. “HAI is a major patient safety issue, and has a high morbidity and mortality impact”. HAI is a very common cause of adverse patient outcome. Affects 5-15% of all hospital patients and 40% patients in ICU. WHO estimates mortality from health care associated infections ranges anywhere from 12-80%

In 2011, study says HAI is a significant safety issue for healthcare providers and patients with an estimated 15.5/100 patient incidence in developing countries. The study of Dec 3, 2018 found incidence rate of HAI as 19.6% and incidence density as 26.35 per 1000 patient days. SSI was commonest type (57.2%) followed by UTI (23.8%) and BSI (19.0%) respectively.

For a HAI, it is not necessary to have the infection before someone is under medical care. One of the most common wards in which HAIs occur is the intensive care unit (ICU), where doctors treat severe illnesses. As medical attention becomes more complex and antibiotic resistance increases, HAI cases will grow.

HAI, the infection must occur:

- Up to 48 hours after admission into hospital
- Up to 3 days after discharge
- Up to 30 days post surgery
- When someone was admitted for reasons other than infection, in a health care facility.

India has no national surveillance system for monitoring HAI and there are no universally accepted guidelines on the use of antibiotics for common infections. In India HAI and SSI were reported to be high.

RESEARCH QUESTION

Research Analysis on Hospital Acquired Infections and its Control in India During Last 5 Years (2015-2020)

OBJECTIVES

1. To ascertain the prevalence of hospital acquired infection in India
2. To assess the practices related to prevention of hospital acquired infection in India

METHODOLOGY

The data taken for the study is from the secondary sources. The literature were collected from PubMed, Google Scholar and CDC. Inclusion criteria was of all those Indian research paper which was published in the period of last 5 years (2015-2020). Exclusion criteria was not relevant topic, duplicate articles, data of countries other than India, some articles were rejected on the basis of abstract review.

Keywords- Hospital Acquired Infection, Cross Infection, SSI, Surgical Wound Infection, Catheter- UTI, Central line blood stream infection, VAP, Hospitals, India

Searching on the PubMed were followed searching strategy which are:

“Catheter Related Infection” [MeSH], AND “India” shows 18 results, after selecting 5 years and free full text 2 results were shown. Removed from the study in view of title and abstract were not relevant for the current study.

“Surgical wound infection” [MeSH], AND “India” which shows 95 results then selection of free full text and 5 years found 14 research papers found. 11 papers were removed on the basis of reviewing title and abstract. 3 results were selected for final full paper review.

“Healthcare- Associated Pneumonia” [MeSH], AND “Pneumonia, Ventilator- Associated” [MeSH], AND “India” which shows 32 results, selecting 5 years and free full text come up with the result of 7 research papers. Three papers were selected for final full review others removed because not relevant for the study.

“Infection Control” [MeSH], AND “Cross-infection” [MeSH], AND “Hospitals” [MeSH], “India” shows 29 results, after selecting 5 years and free full text it shows 5 results. Three were selected for final study.

LITERATURE SURVEY

Published Year	Title	Author	Study Design	Findings
CLABSI				
2016	"Risk Factors for Central line – associated Bloodstream Infections"	Shilpa Tomar <i>et al.</i>	Prospective Study	The most common type of line used was triple lumen central line and the most common site of central line insertion was femoral vein. There was no relationship between those variables and CLABSI in the study. Important risk factors associated with CLABSI were the frequency of central line access / day and the one-time or more change of triple lumen central line. Important risk factors included change of the central line, particularly triple lumen, and frequent access to the central line
2017	Central-line associated bloodstream infections at a tertiary care hospital	CK Chudasama <i>et al.</i>	Prospective Observational Study	There was 3.69 per 1000 central line days of CLABSI. More CLABSI was seen with underlying medical co morbid conditions.

CAUTI				
2017	"Catheter-associated urinary tract infection in a Tertiary Care Hospital"	Areena Hoda Siddiqui <i>et al.</i>	1874 Cases of foleys catheter followed for 3 months	"The most common isolate was <i>E.coli</i> (28.57%) followed by <i>Klebsiella pneumoniae</i> (19.05%)."
2018	"Care Bundle Approach to reduce Catheter associated Urinary Tract Infection at a Teaching Hospital, Kanpur (UP) India"	Nashra A. <i>et al.</i>	CAUTI rates was analysed for 6 months	The CAUTI rate 4.20 per 1000 device days before implementation and the rate after implementation was reduced to 3.22 per 1000 device days. The personnel's checklist performance improves from a rate of 57.77 percent to 83 percent after the CAUTI has been implemented through care bundle approach.
2019	"Prevalence of Catheter-Associated Urinary Tract Infections in Neurosurgical Intensive Care Patients – The Overdiagnosis of Urinary Tract Infections"	Stacey Podkovik <i>et al.</i>	Reterospective Analysis	"Evidence to support the newest IDSA guidelines that patients with elevated temperatures should have a clinical workup of all alternative etiologies prior to testing for a urinary source unless the clinical suspicion is high."

SSI				
2015	"Surgical site infections, occurrence, and risk factors, before and after an alcohol-based handrub intervention in a general surgical department in a rural hospital in Ujjain, India"	Cecilia Lindsjo <i>et al.</i>	Included in the Department of Surgery were "patients who underwent surgery between October 2010 and August 2011 (prevention period) or September 2011 and August 2013 (intervention period)."	"The risk factor common for SSI in both periods was the duration of surgery (OR = 2.6 vs OR = 1.96, pre- and intervention periods, respectively). Risk factors in the intervention period were being a woman (OR = 2.18), renal disease (OR = 3.61), diabetes (OR = 4.43), smoking (OR = 2.14), preoperative hospitalization (<3 vs >15 days; OR = 3.22), and previous hospitalization (OR = 3.5)."
2018	"Clinical prediction score for superficial surgical site infection after appendectomy in adults with complicated appendicitis"	Pinit Noorit <i>et al.</i>	Randomised Control Trial	"Four predictors were significantly associated with SSI, i.e., presence of diabetes, incisional length > 7 cm, fecal contamination, and operative time > 75 min with the odds ratio of 2.6 (95% CI 1.2, 5.9), 2.8 (1.5, 5.4), 3.6 (1.9, 6.8), and 3.4 (1.8, 6.5), respectively." The clinical prediction score ranged from 0 to

				4.5 with its 0.74 (95 per cent CI 0.66, 0.81) concordance of discrimination (C).
2018	"A review of prevention of surgical site infections in Indian hospitals based on global guidelines for the prevention of surgical site infection, 2016"	A Arora <i>et al.</i>	Review Article	Preoperative bathing with Chlorhexidine gluconate Preoperative surgical Antibiotic prophylaxis Surgical Site Preparation Antibacterial coated sutures (triclosan-coated) Incisional wound irrigation Optimal timing for wound drain removal
VAP				
2016	"Ventilator-associated pneumonia: A persistent healthcare problem in Indian Intensive Care Units"	Ashu Sara Mathai <i>et al.</i>	Tertiary level, prospective observational study	"A total of 95 (38 per cent) patients developed VAP infections, an incidence of 40.1 episodes of infection/1000 mechanical ventilation (MV) days." "These were caused mainly by Gram-negative bacteria, especially the Acinetobacter genus (58

				isolates, 53.2 per cent)."
2018	"Bacteriological profile of ventilator-associated pneumonia in a tertiary care hospital"	Somi Patro <i>et al.</i>	Observational cross sectional study	VAP was 35 per cent prevalent. "Enterobacteriaceae (66.66 per cent) and Staphylococcus aureus (20 per cent) were prevalent in early onset VAP, While non fermenters (50%) and Enterobacteriaceae (40.61%) predominated in late-onset VAP." "Prior antibiotic therapy ($P = 0.001$) and hospitalization of 5 days or more ($P = 0.001$) were independent risk factors for VAP by MDR pathogens. polymyxin B, tigecycline, and vancomycin were the most sensitive drugs for Gram-negative and positive isolates respectively from VAP."
2018	Ventilator Associated Pneumonia in Pediatric Intensive Care Unit: Incidence, Risk Factors and Etiological	Gnanaguru Vijay <i>et al.</i>	Prospective Cohort Study	Ventilator-associated pneumonia in children undergoing mechanical ventilation in PICU and Gram negative bacilli (Acinetobacter and Pseudomonas) is a common complication in

	Agents			the main causative agents.
HAI & INFECTION CONTROL				
2017	“Point prevalence & risk factor assessment for hospital-acquired infections in a tertiary care hospital in Pune, India”	Velu Nair et al.	Four intersectional point prevalence surveys	The prevalence of HAI should be 3.76 per cent. Study showed that HAI has the highest prevalence in surgical ICU (25 per cent), followed by medical ICU (20 per cent) and burn wards (20 per cent) Study revealed that HAI prevalence in the first round was 5.6% and in the fourth round it decreased to 1.6%.
2018	<i>“How Can the Patients Remain Safe, If We Are Not Safe and Protected from the Infections”? A Qualitative Exploration among Health-Care Workers about Challenges of Maintaining Hospital</i>	Sudhir Chanra Joshi et al.	Qualitative study carried out using 10 focused discussions in groups.	The study identified “prevailing practices, problems and suggested environmental hygiene measures” in hospitals, in particular hospital cleanliness and HAI prevention and control processes.

	Cleanliness in a Resource Limited Tertiary Setting in Rural India			
2018	"Hand hygiene in hospitals: an observational study in hospitals from two southern states of India"	Mukta Tyagi <i>et al.</i>	Cross sectional assessment	Overall compliance with hand hygiene to be 23 per cent in neonatal care units, 44% in private care unit and 12% in public facilities. Secondary care facilities were studies less (12%) in comparison to tertiary care facilities (33 per cent). "In labour wards compliance are better in private (100 per cent) than public (27 per cent)." Study suggests compliance to hand hygiene is much better private than public

TYPES OF HOSPITAL ACQUIRED INFECTION

In the study there are four main types of HAI that have been reviewed.

1. “Central Line Associated Bloodstream Infection (CLABSI)”
2. “Catheter Associated Urinary Tract Infections (CAUTI)”
3. “Surgical Site Infection (SSI)”
4. “Ventilator Associated Pneumonia (VAP)”

COMMON CAUSATIVE PATHOGENS

CLABSI – Most common pathogen is Coagulative negative staphylococci, Other Causative Pathogens are Enterococcus spp., Klebsiella pneumoniae, E.coli.

CAUTI – Most common pathogen is E. coli, Other Causative Pathogens are Klebsiella, Enterococcus, P. mirabilis, P. aeruginosa.

SSI – Most common pathogen is S. aureus, Other causative Pathogens are S. epidermis, Enterococcus, E. Coli, P. aeruginosa.

VAP – Most common pathogen is S. aureus and P. aeruginosa. Other Causative Pathogens are Enterobacteriaceae, H. influenzae, S. Pneumonia, MRSA, Extended spectrum beta-lactamase (ESBL)- producing Enterobacteriaceae, A. baumannii.

INFECTION CONTROL FOR HAI

CLABSI

To help prevent CLABSI, health care provider may take the following steps:

1. Practice hand hygiene.
2. Apply aseptic to appropriate skin.
3. Make sure the skin prep agent has dried thoroughly before inserting the central line.
4. Use precaution on all five maximum sterile barriers (Sterile Gloves, Sterile Gown, Cap, Mask, Large Sterile Drape).

5. "Once the central line is in place: follow the recommended central line maintenance practices and wash your hands before and after touching the line with soap and water, or an alcohol-based hand rub."
6. Remove a central lines as soon as it is no longer needed. The earlier a catheter is removed the less likely it will get infected.

CAUTI

About 17% -69% of CAUTIs can be prevented by taking the appropriate infection control measures.

1. Avoid using Urinary Catheters.
2. Use aseptic techniques, sterile equipment and hand washing properly.
3. Use sterile barrier.
4. Maintain closed drainage and un obstruct urine flow.
5. Insertion by properly trained person and acute hospital care setting.
6. Routine hygiene.
7. Not cleaning the periurethral area with antiseptics while the catheter is in place to prevent CAUTI.

SSI

1. Wash the whole body with Chlorhexidine before surgery.
2. Use of preoperative surgical antimicrobial prophylaxis for instance Cephalosporin, Cefazoline, etc.
3. Use antimicrobial coated sutures.
4. Glycemic Control specially during surgery.
5. Maintain perioperative normothermia.

VAP

1. Infection Control like hand hygiene gloves, gown and masks.
2. Elevation of the head (30-45 Degree) of the bed in ventilated patients and other measures to reduce the risk of aspiration.
3. "ABCDE bundle (Awakening, Breathing, Coordination, Delirium and Early Mobility)" can be effective in shortening ventilation times.
4. Care of oral hygiene for ventilated patients.

5. Regular Suction.

Conclusion

This is secondary data descriptive study done with the help of Research Articles and Published papers on PubMed and Google Scholar for last 5 years (2015-2020). The relevant articles and papers were selected on the basis of keywords. There are four major HAIs as CLABSI, CAUTI, SSI and VAP. Infection control practices for them are following standard precaution as gloves, gown, masks and maintain proper hand hygiene. Other than these remove central line as early as possible. Avoid UTI until required, Use sterile equipment, and once foleys catheter inserted do not change it frequently. Use chlorohexidine before surgery, maintain glycaemic and normothermia to prevent SSI. Use ABCDE bundle for shortening VDs, elevation of 30-45 degree of head side of the bed. Regular Suction and Oral hygiene.

PART B

ONLINE COURSE REPORT

COURSE NAME- LEADING HEALTHCARE QUALITY AND SAFETY

WEBSITE – www.coursera.org

ABBREVIATIONS

1. WHO - World Health Organization
2. AHRQ - Agency for Healthcare Research and Quality
3. NCQA - National Committee for Quality Assurance
4. HEDIS - Healthcare Effectiveness Data and Information Set
5. IOM - Institute of Medicine
6. HACCP - Hazard Analysis Critical Control Point
7. STEEEP - Safety, Effectiveness, Efficiency, Equity, Patient-Centered
8. PDSA - Plan Do Study Act
9. TQI- Total Quality Improvement
10. HFACS - Human Factor Analysis Classification System

COURSE DESCRIPTION

I have taken a course from Coursera 'Leading Healthcare Quality and Safety'. "The course takes a world view of patient safety and quality, linking participants to research and resources from the World Health Organization (WHO), the United States Agency for Research and Quality in Healthcare (AHRQ), the Joint Commission, and other international organizations. Highlights of the course include personal stories, lessons learned from other industries and interviews with the President of the National Committee for Quality Assurance (NCQA) and other leaders in the movement for quality".

Course offered by 'The George Washington University, Washington, DC'.

There are two main instructors

1. Jean Johnson, Professor, GW School of Nursing and Executive Coach.
2. Gregory Pawlson, Clinical Professor of Medicine and Adjunct Professor, GW School of Nursing Executive Coach.

OBJECTIVES

1. To study "the essential features and expected results of safe, high quality healthcare".
2. To "examine the criticality of patient safety in healthcare and the science that underlies patient safety".
3. To study the key attributes of healthcare measures and measuring process characteristics in order to provide useful reflection of the quality of care.
4. To identify opportunities for quality improvement and its significance and benefits of team-based approaches to QI.
5. To obtain "the value of Health Information Technologies and other innovations" to improve the quality of health care.
6. To exploring "the importance of leadership in promoting and improving quality and safety".
7. To discuss the strategies contributing to a quality health care culture.
8. The study to examine the different models of organizational change that's leads to quality and safety initiates.

COURSE CONTENTS

1. Module 1 Establishing a framework for quality and safety
2. Module 2 Safety as a first principle of quality
3. Module 3 Measures and Measurement
4. Module 4 Quality and Safety Improvement
5. Module 5 Leadership for Quality and Safety

LEARNINGS METHODOLOGY USED IN THE COURSE

Video Lectures, Interviews, Presentation, Reading & Resources, Discussion and Practice Quizzes

KEY LEARNINGS OF THE COURSE

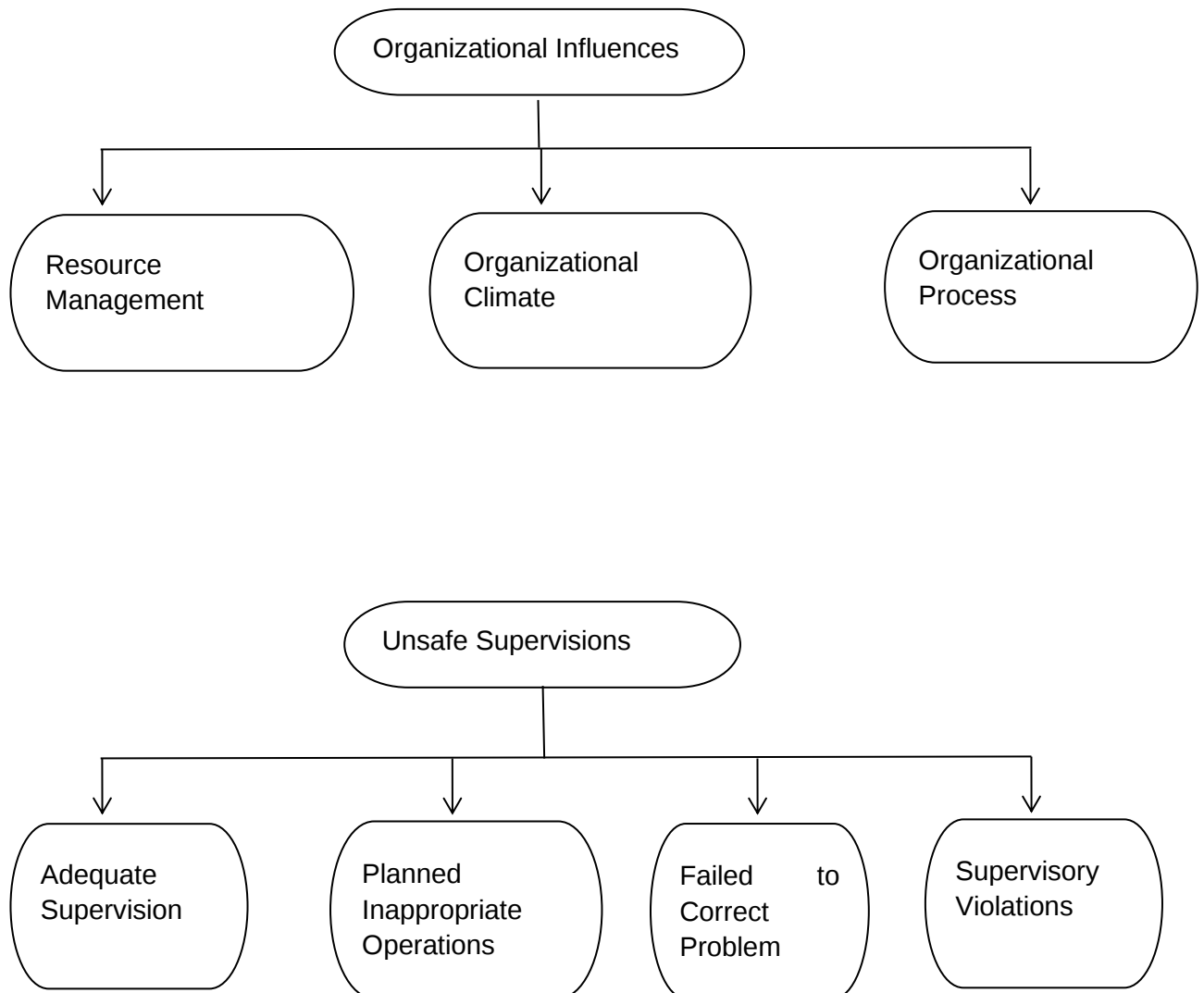
1. Measuring the quality of care provided is a key to knowing the level of care actually delivered and how it varies between providers, which provides at least a starting point for identifying where the gaps in quality and safety are the greatest, and to guide more focused studies to determine the reasons for variation in quality and safety.
2. The desirable characteristics of high quality healthcare systems using the acronym STEEP (Safe, Timely, Effective, Efficient, Equitable and Patient Centered)
3. The Lewis Blackman Story: "A 15-year-old Lewis Blackman was admitted to a hospital in South Carolina for routine surgery to correct congenital deformity in the chest. After receiving a powerful post surgery painkiller, Lewis began to complain about ever more severe stomach pain. Lewis story illustrates how most tragic events like his result from multiple and frequently repeated lapses and mistakes".
4. The Science of Patient Safety Substantial "elements of safety science include research into systems engineering, psychology and human factors. The pioneering work of Dr. Peter Pronovost was the development, testing and now widespread use of the checklist for the insertion and maintenance of central venous lines, which alone had a significant positive infection of the rates of infection with these devices".
5. Typology of harms other than sentinel events: An adverse event: an event in patient safety that causes a patient to suffer harm. A no harm event: a patient

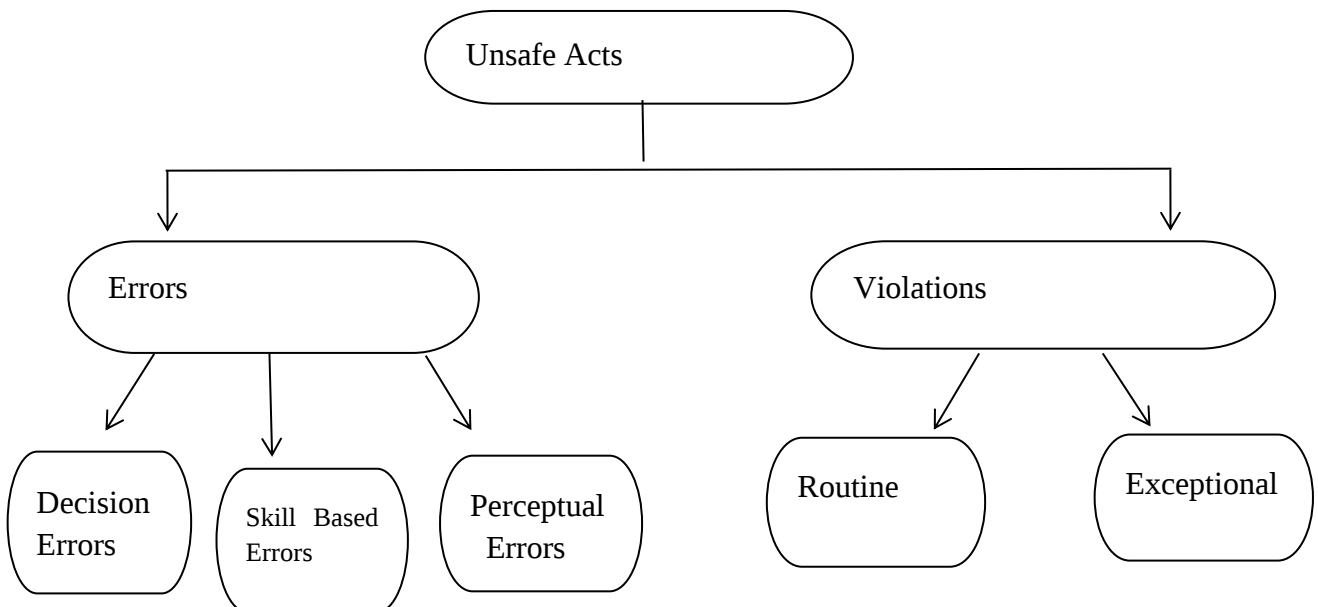
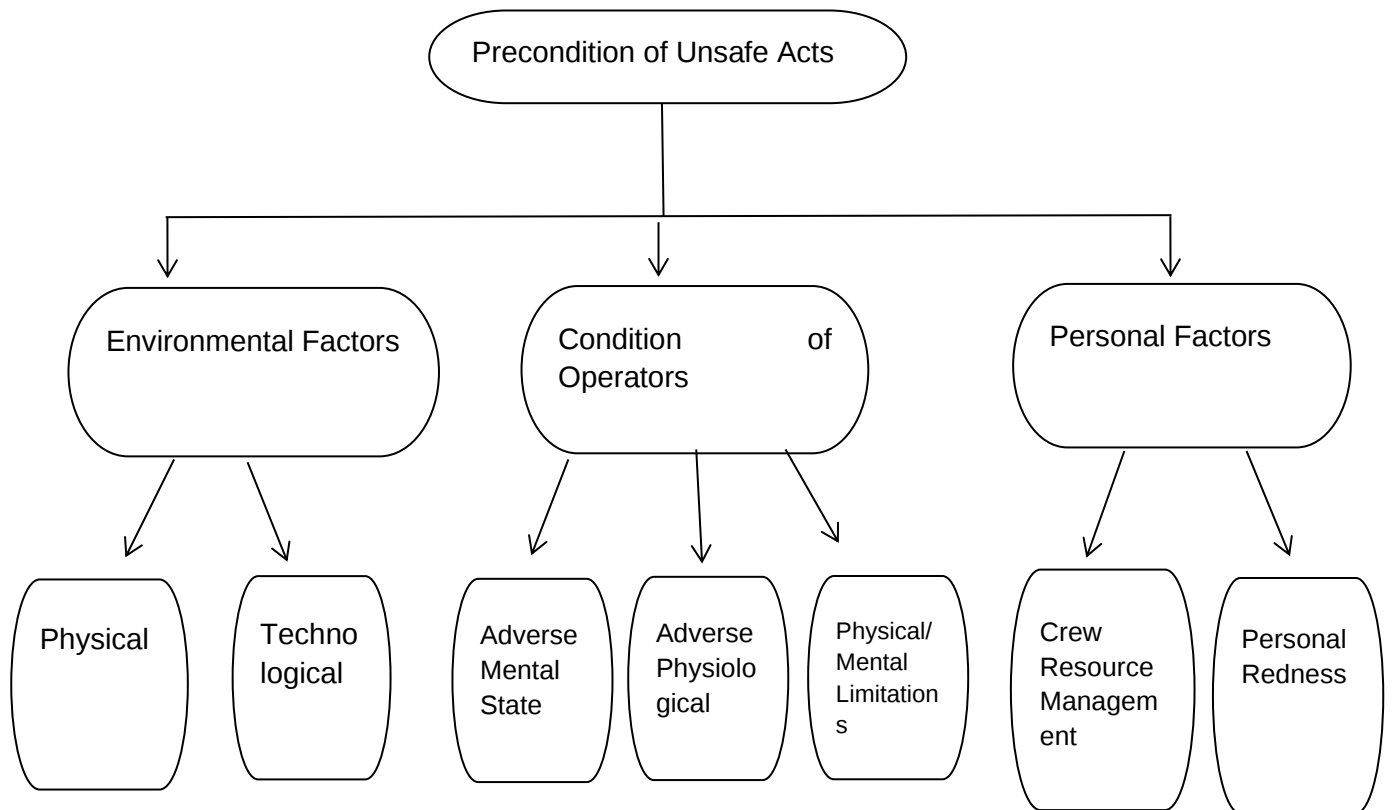
safety that reaches but does not cause harm to the patient. A close call or near miss: an event of patient safety which failed to reach the patient. A dangerous condition: a circumstance other than the process or condition of the patient's own disease which increases the likelihood of an adverse event.

6. The Swiss Cheese Model Reason identifies four major categories that give rise to the potential failures including:

- Organizational influences
- Supervision
- Preconditions
- Specific Actions

7. HFACS (Human Factor Analysis Classification System)

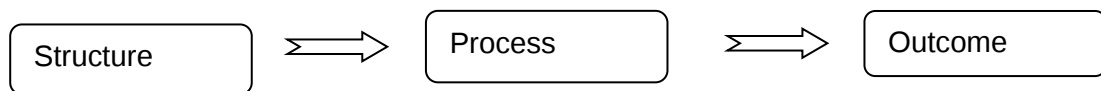




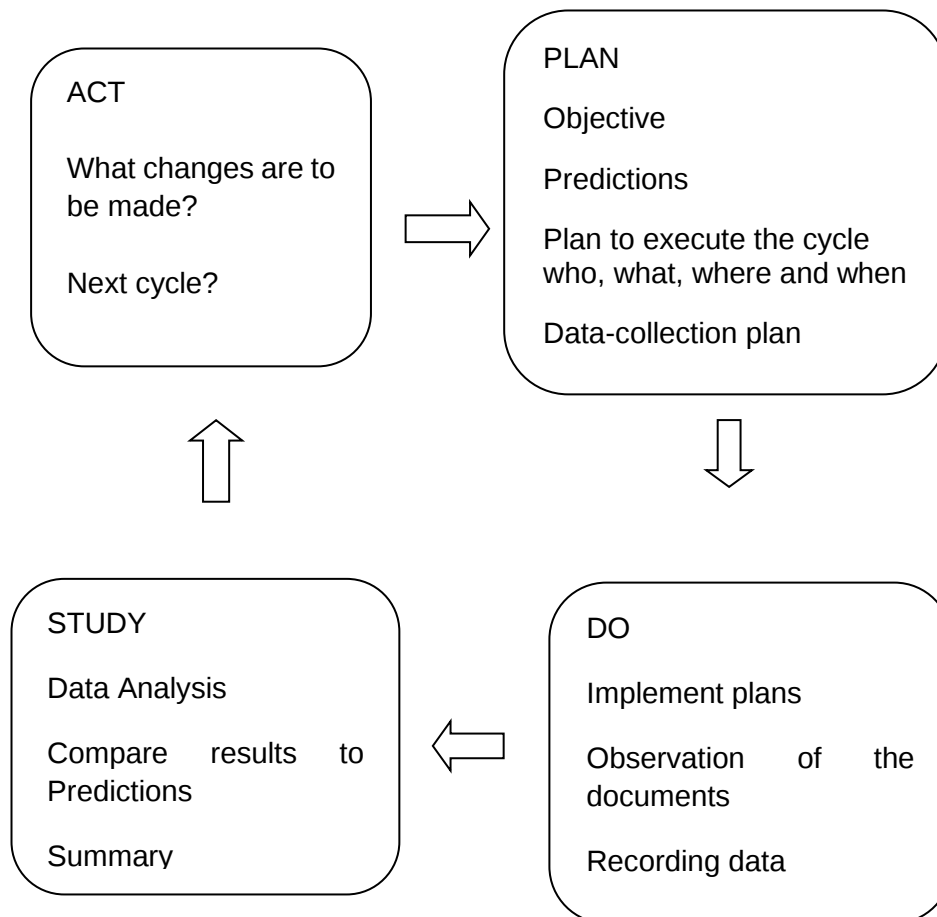
8. A measure in healthcare is simply a defined tool used to quantify healthcare processes, outcomes, patient perceptions and the healthcare delivery system. While measurement or more precisely good measurement, is the process of applying:

- The right measure
- To the right situation
- In the right way

9. Avedis Donabedian identifies the three important construct to characterize quality



10. PDSA Process is a Iterative process.



11. Lean Approach which is based on Toyota production system introduced in 1930 enhance the process constantly, and reduce any output defects.

Approach is focusing on eliminating waste

- Transportation waste
- Inventory waste
- Motion waste
- Wasting time waste
- Overproduction
- Over processing
- Defects

12. Six Sigma Approach roots at Motorola, 1900's. Statistical monitoring of process capability.

$1\sigma = 67\%$

$2\sigma = 31\%$

$3\sigma = 6.7\%$

$4\sigma = 3.4\%$

13. QI as a Team Sport. Team STEEP is a teamwork system.

Team members

- Honesty
- Curiosity
- Creativity
- Discipline
- Humility
- Trust

14. Overarching concept: The direct outgrowth of effective leadership in this area, namely creating and maintaining a culture of quality.

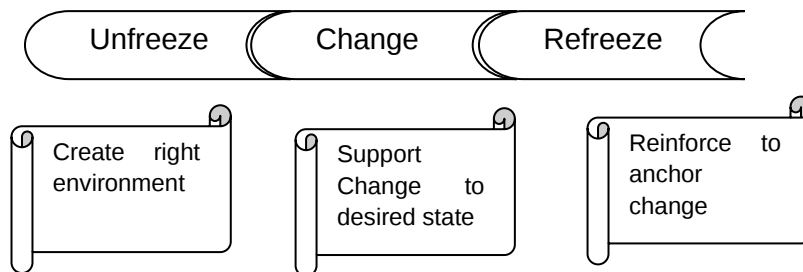
15. Principles

- Recognition of "the high risk nature of an organization's activities and the determination to consistently achieve safe operations".
 - A blame free environment.
 - Encouraging "collaboration across ranks and disciplines to look for solutions to the problem of patient safety".
 - "Organizational commitment of resources to tackle patient safety".

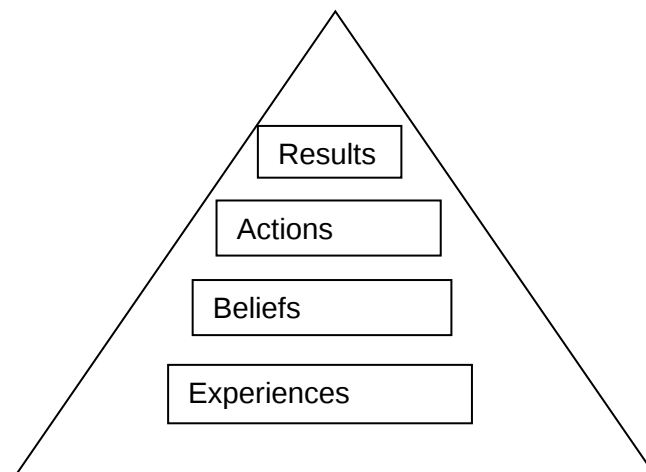
16. Five discipline from the Peter Senge book 'The Fifth Discipline' are:

- a) "Personal Mastery
- b) Mental Models
- c) Building Shared Vision
- d) Team Learning
- e) Systems Thinking"

17. Kurt Lewin Change Model (1950s)



18. Roger Connors And Tom Smith results Pyramid



19. John's Kotter 8 Step-Model (Step by Step Approach)

Implementing and Sustaining for Change	8. Make it Stick
	7. Build on the Change
Engaging and enabling the organization	6. Create quick wins
	5. Empower action
	4. Communicate the vision
Creating the Climate for Change	3. Create a vision for change
	2. Form a powerful coalition
	1. Create Urgency

80% correlation between collaboration and innovation.

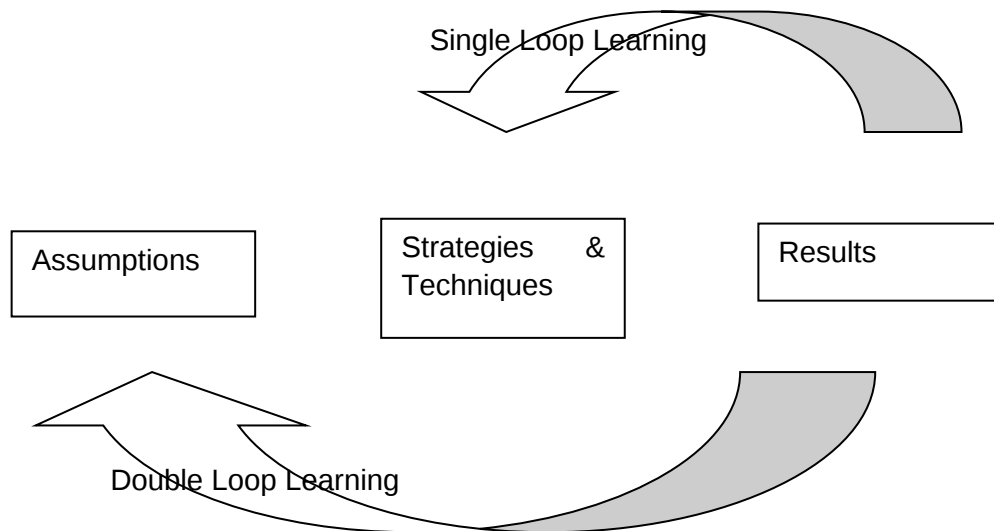
20. Attributes of leadership

- Have a vision
- Sharing the vision
- Caring for people
- Honesty
- Delegating effectively
- Having confidence
- Commitment
- A positive attitude

21. Kegan & Lahey identified three plateaus for adult mental complexity

1. Socialized Mind
2. Self Authoring Mind
3. Self Transforming Mind

22. Argyris and Schon propose :



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