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Research Paper

Use Six Sigma Approach to Improve Healthcare Workers Safety

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Abstract: *Health care workers (HCWs) suffer between 600,000 and one million injuries from conventional needles and sharps annually. These exposures can lead to hepatitis B, hepatitis C and Human Immunodeficiency Virus (HIV), the virus that causes AIDS. At least 1,000 Health care workers are estimated to contract serious infections annually from needle stick and sharps injuries. The aim of this study was use of six sigma approach by utilizing the five-step DMAIC process to identify the causes, practice and conditions related needle stick injuries and proposing the appropriate policies and procedures to decrease the incidence of needle stick injuries to improve safety of healthcare workers. This study could serve as valuable serve as valuable models for other safety concerns in the health care workplace.*

Keywords: Six Sigma approach, DAMIC Process, Needle Stick Injuries.

1. Introduction:

Six sigma is an important advance in quality management and process improvement in the last two decades. Six sigma has gained wide popularity in various types of organizations since the 1990s. Most Fortune 500 companies have adopted Six Sigma [1]. Rich anecdotal evidences showed that Six Sigma can help firms achieve significant performance improvement. For example, Motorola reported $16 billion benefits from Six Sigma for the period of 1986-2001 [2-4]. The benefits of Six Sigma include but are not limited to cost reduction, customer satisfaction improvement, and sales revenue growth [5]. A more common definition of Six Sigma is that it is a set of tools and techniques for problem solving or process improvement [6]. Some define Six Sigma as an improvement method that holds the set of tools and techniques together. This definition reflects the evolution of Six Sigma over time. While viewing Six Sigma as a defect rate metric is free of dispute, Six Sigma today means much more

than a metric. Over time, many tools and techniques have been developed to help firms improve their processes to achieve Six Sigma level quality. The use of these tools and techniques is guided by an overarching structured improvement method known as DMAIC (Define, Measure, Analyze, Improve, and Control). In fact, DMAIC is so well known that many consider it a synonym to Six Sigma. DMAIC is a structured problem solving method. A more comprehensive definition of Six Sigma is that it is an improvement approach or an improvement program. A good definition of Six Sigma is an organized, parallel-meso structure to reduce variation in organizational processes by using improvement specialists, a structured method, and performance metrics with the aim of achieving strategic objectives [7]. This definition captures several distinctive characteristic of Six Sigma: an organizational approach, statistical tools and techniques for variation reduction, a structured method, and metrics orientation, although it leaves out the aspects of customer orientation and project-based implementation [8]. In health care, six sigma methodologies seek to provide near-perfect services and to reduce costs incurred by organizations. DMAIC—defining, measuring, analyzing, improving, and controlling—is a method used to allow the team to define and implement appropriate goals. Health care sectors are facing major challenges in the form of Hospital Acquired Infections (HAI). Using six sigma we can analyze the problem, come to practical solutions and implement and sustainable improvements.

The aim of this study was using six sigma approach to identify the causes, practice and conditions related needle stick injuries and proposing the appropriate policies and procedures to decrease the incidence of needle stick injuries to improve safety of healthcare workers.

2. Materials and Methods:

This study was conducted at a general governmental hospital. The number of beds is 106 beds, number of physicians is 59 physicians and number of nurses is 92 nurses. We introduced six sigma in our health care setup for implementation of safety and occupational health practices. Six Sigma's approach of problem identification, measurement, statistical analysis, improvement, and controls plans was covered by our study. The six sigma quality improvement team utilizes the five-step DMAIC process for every project [9]. Table (1) defines each phase of the DMAIC process utilized in six sigma.

Table (1): Definitions for the DMAIC Process

Phase	Definition	Components
Define	Identify the problem, create objectives for the project, and initiate the project.	Identify the project & The problem. Objective. Team selection & Project Plan.
Measure	Understand the current process in need of improvement	Analyze Symptoms Operational definition Measure the Symptoms & Define boundaries
Analyze	Use statistical analysis to understand causes and effects in relation to the current process.	Formulate Theories & Cause-Effect Diagrams Test Theories & Data Collection Identify Root Cause(s)
Improve	Develop a plan that can be validated by statistical data to improve the process	Evaluate alternatives. Design remedy & Design for culture. Prove effectiveness & Implement.
Control	Establish a monitoring tool or mechanisms to ensure that the process will be sustained	Control and Continuous monitoring Indicators & Audit the controls

3. Results and Discussion:

Health care workers suffer between 600,000 and one million injuries from conventional needles and sharps annually. These exposures can lead to hepatitis B, hepatitis C and Human Immunodeficiency Virus (HIV), the virus that causes AIDS. At least 1,000 Health care workers are estimated to contract serious infections annually from needle stick and sharps injuries. Needle stick injuries are preventable. Over 80% of needle stick injuries could be prevented with the use of safer needle devices. According to the American Hospital Association, one case of serious infection by blood borne pathogens can soon add up to $1 million or more in expenditures for testing follow-up, lost time and disability payments. The cost of follow-up for a high-risk exposure is almost $3,000 per needle stick injury even when no infection occurs [10-15].

3-1. Define Phase:

The Problem: Needle stick injuries transmit infectious diseases, especially blood-borne viruses. In recent years, concern about AIDS (Acquired Immune Deficiency Syndrome), hepatitis B, and hepatitis C has prompted research to find out why these injuries occur and to develop measures to prevent them. Despite published guidelines and training programs, needle stick injuries remain an ongoing problem [16, 17].

Objective: To identify the causes, practice and conditions related needle stick injuries and proposing the appropriate policies and procedures to decrease the incidence of needle stick injuries.

3-2. Measure Phase:

Operational Definition: Needle stick injuries are wounds caused by needles that accidentally puncture the skin. Needle stick injuries are a hazard for people who work with hypodermic syringes and other needle equipment. These injuries can occur at any time when people use, disassemble, or dispose of needles. When not disposed of properly, needles can become concealed in linen or garbage and injure other workers who encounter them unexpectedly [16-18]. Table (2) identifies the customers of the process and table (3) defines critical customer requirements, while figure (1) shows the bounder of the process.

Table (2): The customers of the process

Registered nurse resident specialist Phlebotomist Patient' s family	Nursing assistant Clinical laboratory technician Sterilization attendant Housekeeper	general practitioner Nursing student Medical student Inhalation therapist Community	Radiology technician Patient attendant Laundry worker Dentist Dental hygienist

Table (3): Critical customer requirements

Shortage in the number of container Inadequate place of container Lack of adequate containers shortage in containers Shortage in syringes Unavailability of clean water facilities Unavailability of hand hygiene facilities Unavailability of gloves Unavailability of hepatitis B vaccine Unavailability of appropriate equipments improper disposal of needles improper restraint of patient Inadequate training for new staff Unavailability of proper disposal facilities Unavailability of hepatitis B immunoglobulin Lack of reporting system for needle sticks injuries notification	Unavailability of responsible team for management of needle sticks injuries Incompliance staff with reporting of needle sticks injuries Unavailability of laboratory investigation for patient and worker status Unavailability of drug for treat HIV exposed worker Unavailability of assessment strategies for risk of needle sticks injuries Unavailability of counseling for workers with needle sticks injuries Unavailability of follow up for workers with needle sticks injuries Unavailability of Kits for laboratory testing to specify patient and health care worker status Overfilled containers

3-3. Analyze Phase:

Formulate Theories: Brainstorming was used to consider the full range of possible causes, table (4) shows formulate theories through brainstorming and figure (2) shows cause-effect diagrams.

Figure (1): Shows the bounder of the process

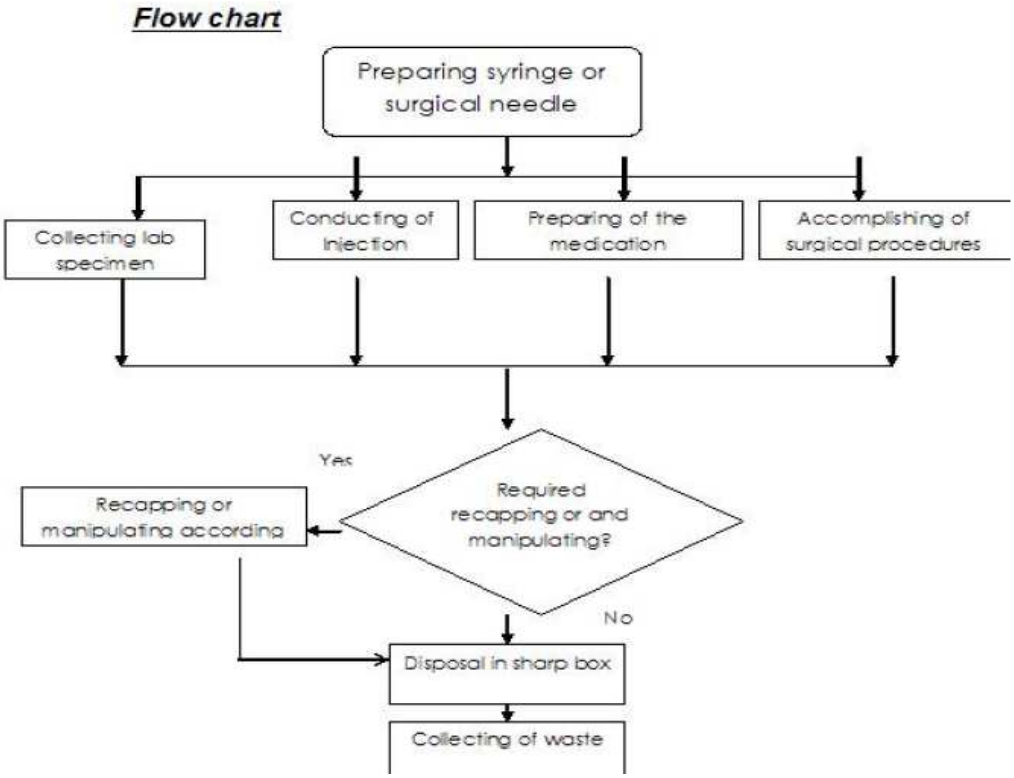
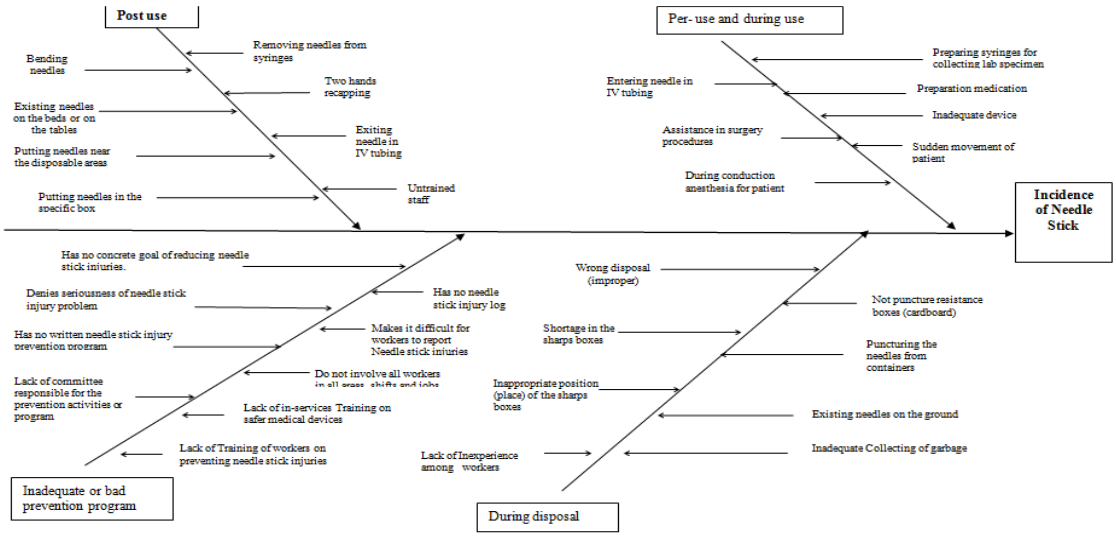


Table (4): Formulate Theories through Brainstorming

1. Overuse of injections and unnecessary sharps 2. Lack of supplies: disposable syringes, safer needle devices, and sharps-disposal containers 3. Lack of access to and failure to use sharps containers immediately after injection 4. Inadequate or short staffing 5. Recapping of needles after use 6. Lack of engineering controls such as safer needle devices 7. Passing instruments from hand to hand in the operating suite 8. Lack of awareness of hazard and lack of training 9. Exiting needle in IV tubing 10. Existing needles on the beds or on the tables 11. Putting needles near the disposable areas 12. Putting needles in the specific box 13. Puncturing the needles from containers 14. Collecting of garbage 15. Existing needles on the ground 16. Preparing syringes for collecting lab specimen 17. During conduction surgical procedures 18. Sudden movement of patient 19. Shortage in the sharps boxes 20. Inappropriate position (place) of the sharps boxes 21. Using of not puncture resistance boxes (cardboard) 22. Having the device jarred by a patient. 23. Pulling a needle out of the rubber stopper of a vacuum tube which can jab the hand in a rebound reflex. 24. Injuries commonly occur when workers try to do several things at the same time, especially while disassembling or disposing of needles.	25. Staff reductions where nurses, laboratory personnel and students assume additional duties. 26. 27. Difficult patient care situations. 28. Working at night with reduced lighting. 29. New staff or students tend to have more needle stick injuries than experienced staff 30. It is extremely dangerous to hold a needle in one hand and attempt to cover it with a small cap held in the other hand. Injuries occur three different ways. 31. Workers gave the following reasons for recapping despite knowing about the potential hazards: 32. Needle stick injuries of nursing and laboratory staff occur when workers attempt to dispose of needles using sharps containers. Accidents occur at every step. 33. Lack of appropriate program for prevention of needle stick injuries 34. Withdrawing a needle from a patient, especially if staff attend to bleeding patients while disposing of the needle. - Denies seriousness of needle stick injury problem. 35. Has no written program. 36. Designates no authority at all. 37. Has no health and safety contract language. 38. Has no needle stick injury log. 39. Has no needle stick injury log. 40. Makes it difficult for workers to report Needle stick injuries. 41. Involves no front-line workers. 42. Conducts no training on needle stick injury prevention.

Figure (2): Shows cause-effect diagrams



Theories Test: Strategy for testing theories is testing of all theories at the same time.

Data Collection: The data was obtained from questionnaires related to national infection control program about health care workers experience with needle stick injuries. So we selected all previous questionnaires for workers who exposed to needle stick incidences, and abstract needed data based on a constructed abstracting sheet.The abstracting sheet covered the following items:

- Department
- Position
- Needle stick incidence Condition
- Attitude toward notification about needle stick incidences
- Manipulation of needles before disposal Practice
- Disposal of needles Practice
- Training Status

Data-Analysis: Data-analysis tool is Pareto diagram, to concentrate on the vital few; The goal of the Pareto is to separate the causes of problems into the vital few and the useful many. Pareto diagram was used to present the results (tables 5-11& figures 3-9) reveal the contributors, magnitude and cumulative percent.

Table (5): Pareto Table of Departments:

Department	No	%	Cumulative Percent of total
H. Other	5	3.0	3.0
F. Dental care	10	5.9	8.9
G. Medicine	11	6.5	15.4
C. ICU	17	10.1	25.4
A. Emergency	30	17.8	43.2
E. Laboratory	30	17.8	60.9
D. Surgery	31	18.3	79.3
B. Dialysis	35	20.7	100.0
Total	169	100.0	

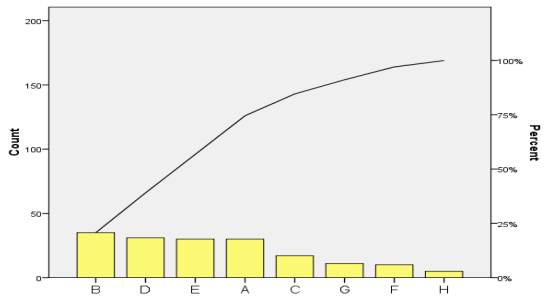


Figure (3): Pareto diagram of Departments

Table (6): Pareto Table of Positions

Position	No	%	Cumulative Percent of total
B. Dentist	9	5.3	5.3
E. Worker	18	10.7	16.0
A. Physician	22	13.0	29.0
D. Laboratory Technician	22	13.0	42.0
C. Nurse	98	58.0	100.0
Total	169	100.0	

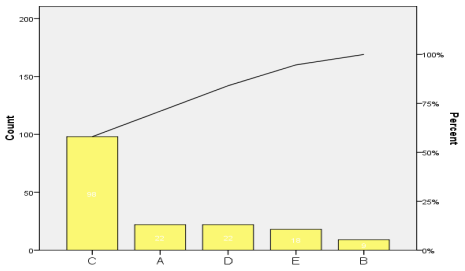


Figure (4): Pareto diagram of Positions

Table (7): Pareto Table of Condition Related needle stick incidence

Position	No	%	Cumulative Percent of total
M	2	1.2	1.2
P	2	1.2	2.4
Q	2	1.2	3.6
D	3	1.8	5.3
F	3	1.8	7.1
J	3	1.8	8.9
R	3	1.8	10.7
G	4	2.4	13.0
C	5	3.0	16.0
L	6	3.6	19.5
K	7	4.1	23.7
H	8	4.7	28.4
N	13	7.7	36.1
B	15	8.9	45.0
O	17	10.1	55.0
I	18	10.7	65.7
A	20	11.8	77.5
E	38	22.5	100.0
Total	169	100.0	

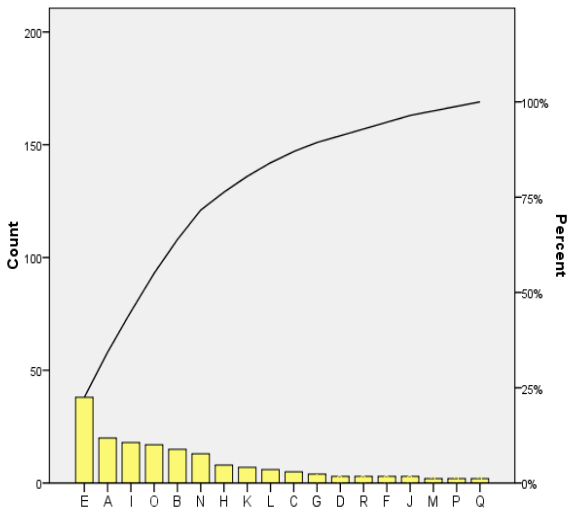


Figure (5): Pareto diagram of Condition Related needle stick incidence

Codes of Condition related needle stick incidence

- **J.** Puncturing the needles from containers
- **K.** Collecting of garbage
- **L.** Existing needles on the ground
- **M.** preparing syringes for collecting lab specimen
- **N.** during conduction surgical procedures
- **O.** sudden movement of patient
- **P.** shortage in the sharps boxes
- **Q.** inappropriate position (place) of the sharps boxes
- **R.** not puncture resistance boxes (cardboard)

- **A.** Preparation medication
- **B.** Entering needle in IV tubing
- **C.** Removing needles from syringes
- **D.** Bending needles
- **E.** Two hands recapping
- **F.** Exiting needle in IV tubing
- **G.** Existing needles on the beds or on the tables
- **H.** Putting needles near the disposable areas
- **I.** Putting needles in the specific box

Table (8): Pareto table of attitude toward notification about needle stick incidences

Attitude	No	%	Cumulative Percent of total
A. Reporting	8	4.7	4.7
C. Not Reporting BUT aware	16	9.5	14.2
B. Not Reporting NOT aware	145	85.8	100.0
Total	169	100.0	

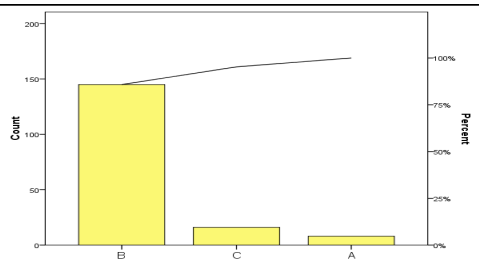


Figure (6): Pareto diagram of Attitude toward Notification about Needle Stick

Table (9): Pareto Table of Practices Related manipulation of needles before disposal

Practice	No	%	Cumulative Percent of total
B. Banding	2	1.2	1.2
D. one hand recapping	2	1.2	2.4
C. breaking	5	3.0	5.3
E. two hands recapping	52	30.8	36.1
A. do not manipulating	108	63.9	100.0
Total	169	100.0	

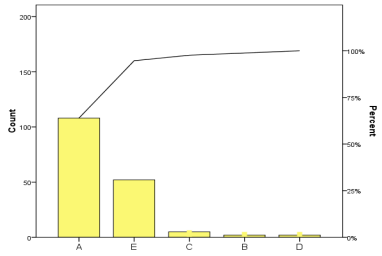


Figure (7): Pareto diagram of Practices Related manipulation of needles before disposal

Table (10): Pareto Table of Practice Related disposal of needles

Practice	No	%	Cumulative Percent of total
B. cardboard boxes	5	3.0	3.0
C. Hazardous waste containers	8	4.7	7.7
D. Normal waste containers	12	7.1	14.8
A. Puncture resistant boxes	144	85.2	100.0
Total	169	100.0	

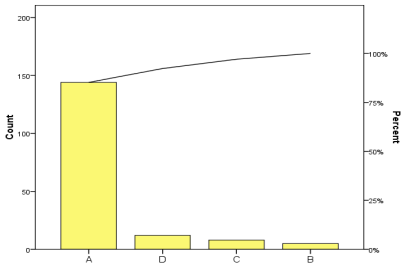


Figure (8): Pareto diagram of Practice Related disposal of needles

Table (11): Pareto Table of Training Status

Training Status	No	%	Cumulative Percent of total
C. Attending infection control training but **did not cover** aspects of needle stick	5 28	3.0 16.9	3.0 19.5
A. Attending infection control training	136	80.5	100.0
B. Not attending			
Total	169	100.0	

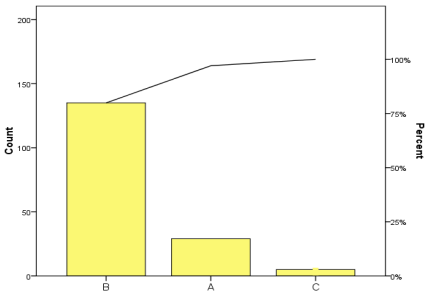


Figure (9): Pareto diagram of Training Status

Identify Root Causes: Root Causes of needle stick injuries are causes resulted from lack of adherence to the recommended safe practices resulted of inadequate training about these practices.

3-4. Improve Phase:

Evaluate alternatives: formulate remedies through brainstorming; table (12) summarizes all remedies which articulate throw brainstorming, then for evolution purpose we organize the remedies at four main strategies which include the following:

Strategy (I): Proper training of workers. To reduce needle stick injuries, an effective program must include employee training. Workers need to know how to properly use, assemble, disassemble, and dispose of needles. Workers need to understand the risks associated with needle stick injuries and know the proper means to prevent them. Specifically, the training programs should address: promote safety awareness in the work environment, health care procedures for reporting injuries, establish procedures for and recommended precautions for use and disposal of needles.

Strategy (II): Adoption and dissemination of Recommended Guidelines. The infection control committee reviews, publishes, and updates guidelines to protect staff from exposure to all blood-borne disease-causing agents. The following guidelines deal specifically with needle safety: Needles, scalpel blades and other sharp instruments--workers should consider these as potentially infectious and handle them with care to prevent accidental injuries and disposable needles and syringes, scalpel blades, and other sharp items--workers should place these in puncture-resistant containers located near the area of use. They should avoid overfilling the containers because accidental needle stick injuries may occur. Workers should not recap needles by hand or purposely bend, break, or remove them from disposable syringes or otherwise manipulate them by hand.

Strategy (III): Establishing a post-injury protocol that protects the interest of workers. This activity may require extensive research and investigation on the part of members. The team will have to consider issues of confidentiality, counseling for affected employees undergoing HIV testing, tracking down source patients, etc.

Strategy (IV): Provision of Devices with Safety Features. Improved engineering controls are often among the most effective approaches to reducing occupational hazards and therefore are an important element of a needle stick prevention program. Such controls include eliminating the unnecessary use of needles and implementing devices with safety features.

Evaluation Criteria: the previous four strategies were evaluated according to the following criteria:

- Total Cost
- Impact on the Problem
- Benefit/Cost Relationship
- Cultural Impact/ Resistance to Change
- Implementation Time
- Uncertainty about Effectiveness
- Health & Safety
- Environment

Each strategy was given score from H to L through M where (H= High Desirability and M= Medium Desirability, while L= Low Desirability). Table (13) shows remedy selection matrix and according to this matrix that Selected strategies were training program about the recommendation and establishing post-exposure protocol. The planning matrix, figure(10), shows the process that will be conducted to implement the selected remedial strategies.

Design Remedy: The required resources:

- Trained staff for post –injuries procedures (responsible team for management of needle sticks injuries)
- Team consists of one nurse, assistant and one clerk
- Fires aid kits & Essential Drugs & equipments
- Recodes (needle stick injury log)
- Hepatitis B vaccine
- Hepatitis B immunoglobulin (HBIG)
- drug for treat HIV exposed worker
- Kits for laboratory testing to specify patient and health care worker status
- Costs of development and dissemination of the guidelines
- Costs of training

Figure (11) shows the implementation work plan including the activities and time limits and responsible persons (Gant Chart).

Table (12): All remedies which articulate from brainstorming

1. A written exposure control plan designed to eliminate or minimize worker exposure to blood borne pathogens 2. Compliance with universal precautions (an infection control principle that treats all human blood and other potentially infectious materials as infectious) 3. Engineering controls and work practices to eliminate or minimize worker exposure 4. Personal protective equipment (if engineering controls and work practices do not eliminate occupational exposures) 5. Prohibition of bending, recapping, or removing contaminated needles and other sharps unless such an act is required by a specific procedure or has no feasible alternative 6. Prohibition of shearing or breaking contaminated needles 7. Free hepatitis B vaccinations offered to workers with occupational exposure to blood borne pathogens 8. Worker training in appropriate	✓ Needle stick injuries can best be reduced when the use of improved engineering controls is incorporated into a comprehensive program involving workers. Employers should implement the following program elements: 19.Analyze needle stick and other sharps-related injuries in workplace to identify hazards and injury trends. 20.Set priorities and strategies for prevention by examining local and national information about risk factors for needle stick injuries and successful intervention efforts. 21.Ensure that health care workers are properly trained in the safe use and disposal of needles. 22.Modify work practices that pose a needle stick injury hazard to make them safer. 23.Promote safety awareness in the work environment. 24.Establish procedures for and encourage the reporting and timely follow up of all needle stick and other sharps-related injuries. 25.Evaluate the effectiveness of prevention efforts and provide feedback on performance. ✓ Health care workers should take the following steps to protect themselves and their fellow workers

engineering controls and work practices 9. Post-exposure evaluation and follow up, including post-exposure prophylaxis when appropriate ✓ Employers of health care workers should implement the use of improved engineering controls to reduce needle stick injuries: 10.Eliminate the use of needles where safe and effective alternatives are available. 11.Use devices with safety features provided by your employer. 12.Avoid recapping needles. 13.Solicits input from workers in all areas, shifts, and jobs. 14.Trains workers frequently on preventing needle stick injuries. 15.Provision of in-services on safer medical devices. 16.Organizes injury data to show injured workers' classifications, shifts, departments, as well as medical devices and tasks involved. 17.Evaluates and makes changes in work practices and medical devices based on injury data. Buys and implements safer medical devices for all workers. 18.Implement the use of devices with safety features and evaluate their use to determine which are most effective and acceptable.	from needle stick injuries: 26.Avoid the use of needles where safe and effective alternatives are available. 27.Help employer select and evaluate devices with safety features. 28.Plan for safe handling and disposal before beginning any procedure using needles. 29.Dispose of used needles promptly in appropriate sharps disposal containers. 30.Report all needle stick and other sharps-related injuries promptly to ensure that you receive appropriate follow up care. 31.Tell employer about hazards from needles that observe in work environment. 32.Participate in blood borne pathogen training and follow recommended infection prevention practices, including hepatitis B vaccination. ✓ Creating a GOOD needle stick injury prevention program that: 33.Sets a concrete goal of reducing needle stick injuries. 34.Has a written needle stick injury prevention program that emphasizes aggressive prevention of needle stick injuries. 35.Has one Labor/ management needle stick prevention committee responsible for the program, with a timeline and accountability. 36.Is backed by specific contract language and is accountable to a joint Labor /management committee. 37.Produces and circulates the needle stick injury log to the full committee on a regular basis. 38.

Table (13): Remedy selection matrix

Criterion	**Strategy (I)**	**Strategy (II)**	**Strategy (III)**	**Strategy (IV)**
Strategy Name	Proper training of workers	adoption of Recommended Guidelines	Establishing a post-injury protocol	Provision of Safety Devices
Total Cost	H	H	M	L
Impact on the Problem	H	H	M	H
Benefit/Cost Relationship	M	H	H	L
Cultural Impact/ Resistance to Change	M	L	M	M
Implementation Time	L	L	M	L
Uncertainty about Effectiveness	M	H	L	L
Health & Safety	H	H	H	H
Environment	H	H	M	L
Summery (Rate 1 for best, 2 for next, and so on.)	1.6	1.5	1.9	2.4

Figure (10): Planning Matrix

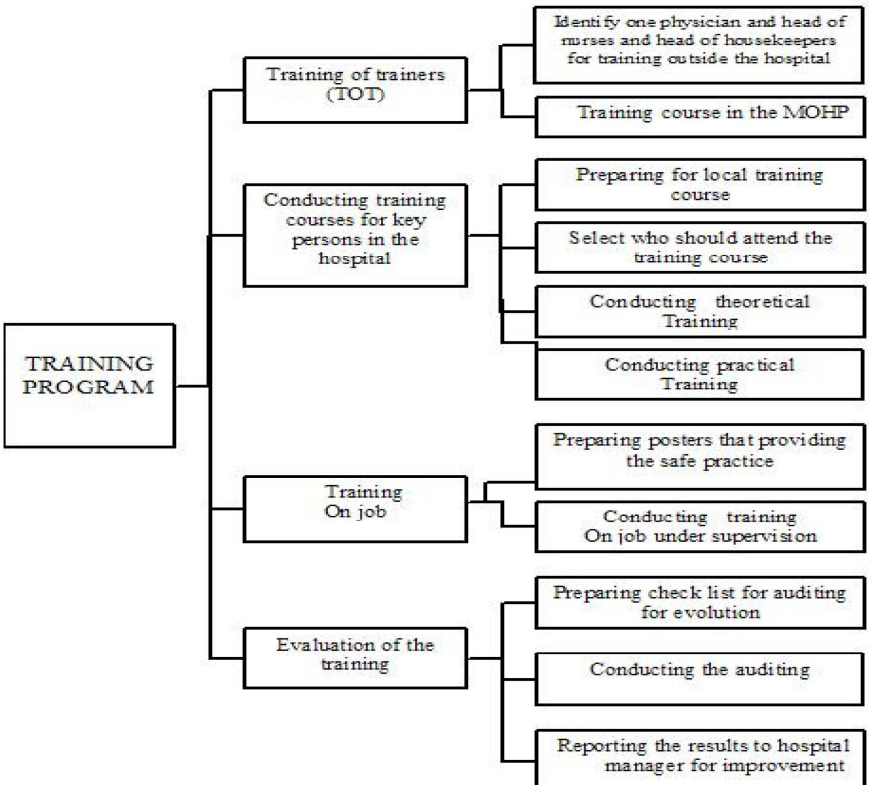


Figure (11): Gant Chart

Activity	Training Program												Person Responsible
Weeks	1	2	3	4	5	6	7	8	9	10	11	12	
Identify One Physician And Head Of Nurses And Head Of Housekeepers For Training Outside The Hospital	■												Hospital Manager And Head Of Infection Control Office
Training Course In The Ministry Of Health		■	■										Ministry Of Health
Preparing For Local Training Course				■	■								Trainers & Head Of Infection Control Office
Select Who Should Attend The Training Course						■	■						Hospital Manager And Head Of Infection Control Office
Conduct Theoretical Training						■	■						Trainers & Head Of Infection Control Office
Conduct Practical Training								■					Trainers & Head Of Infection Control Office
Conduct Training On Job									■	■	■		Courses Attendants Under Supervision Of Trainers & Head Of Infection Control Office
Conduct Assessment												■	External Evaluators From Ministry Of Health

Design for Culture

Sources of resistance (barriers) and support (aids) and countermeasures needed to overcome barriers have identified and discussed as following:

Barriers:

- Resistance of change by physician, nurse and workers
- Shortage in the adequate boxes
- Not reporting of needle stick incidences
- High Cost of safe equipments

Aids:

- Management support
- Starting of National infection control program
- interest high Politician level (ministry of health and population) on the infection control program,

Counter Measures:

- involvement of all physician and clinical leaders
- participative of all nursing supervisors
- education of all workers
- Benefit /cost relation ship
- Availability of adequate boxes (quality. number, location)
- Continuous monitoring for adherence with appropriate practices

Notes: Barriers to reporting needle stick injuries. Under-reporting is a problem that may be difficult to eliminate. Several studies indicate that physicians and nurses chronically fail to report incidents. Through surveys and interviews, a team could attempt to establish the causes for underreporting in its facility. This activity would be invaluable in planning a campaign to encourage more reporting [15, 17].

Prove Effectiveness by Pilot Test: The strategy was implemented in dialysis for nursing staff on a limited scale.

3-5. Control Phase:

Control and Continuous Monitoring: Evaluate the effectiveness of prevention efforts and provide feedback on performance. Team should ensure that health care workers are adopting the recommended prevention strategies and that the changes they make have the desired effect. Thus they should provide a forum to assess worker perceptions, evaluate compliance, and identify problems.
Control and continuous monitoring activities provide in-depth analysis of needle stick accidents to:

- Determining the rate of needle stick injuries.
- Investigating the factors that cause the injuries.
- Ensuring that injured workers receive proper treatment.
- Identifying areas in which the prevention program needs improvement.
- Eventually providing practical strategies for dealing with the problem.
- Identifying the types and designs of needle instruments that are potentially capable of causing needle stick injuries.
- Understanding better how needle devices are normally handled in the workplace and how they cause injuries.

- Finding methods that eliminate the need to move hands towards the tips of contaminated needles, or to manually disassemble contaminated needle equipment.

Indicators:

- Rates of sharps injuries,
- Survey of occupational health departments on reported rates
- Overall reported rate
- Reporting rate estimated by questionnaire of sample of the HCW population clinical HCW, and medical students
- rate of the HCW population clinical HCW, and medical students who were vaccinated with Hepatitis B vaccine
- proportion of HCW population clinical HCW, and medical students who attended training course about safe handling and safe disposal of sharps

4. Conclusions:

There are several benefits to working on the problem of needle sticks. First and foremost, employees from several job classifications and with different perspectives on the problem are given an opportunity to examine the problem in a comprehensive manner. Communication is heightened in this atmosphere, and wider arrays of concerns are taken into consideration. This type of cooperative effort might also translate to greater cooperation and interest on the part of other workers as activities are implemented. Employees may be more willing to participate in surveys or less resistant to changes in hospital policy. This study could serve as valuable serve as valuable models for other safety and occupational health concerns in the health care workplace.

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