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Original Article

Evaluation of Root Cause Analysis from Occupational Health and Safety Data in a Hospital: A Retrospective Study

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ABSTRACT

Introduction: Occupational accidents are increasing every year around the world. The fact that accidents will be repeated as a result of not learning the lessons is constantly forgotten. Occupational accidents should be examined based on the "Root Cause" approach. Within the scope of the information obtained as a result of the analysis studies on the causes of occupational accidents, the institutions need to make a plan to prevent the reoccurrence of the accidents. This study was carried out retrospectively to examine the root cause analysis process of occupational accidents that occurred in a state hospital and to examine how it was applied in the health facility.

Methods: The population of the research consists of occupational accident records that occurred in a state hospital between January 2018 and April 2021. (N=156). In the analysis of the data; Root cause analysis forms and number-percentage distributions were used to identify all factors that could cause a particular problem.

Results: Of those who had occupational accidents, 67.94% were women, 45% were nurses, 25 were cleaning staff and 3% were physicians. Fifty percent of the accidents occurred in inpatient services, 15% in emergency services, and 15% in intensive care units. Causes of accidents; needle-stick injuries (71.8%) are the most common occupational accidents. These injuries are followed by slipping and falling (14.7%).

Conclusion: By establishing a safety culture that monitors occupational accidents at the institutional level, evaluates their consequences, and develops precautions, the probability of occupational accidents will decrease. And the costs and compensations that will occur after the accident will decrease, and labor and service/production losses will be prevented.

Keywords: Accident, Health employee, Root-cause analysis, Safety

Introduction

Occupational health and safety is the systematic and scientific work carried out to determine the conditions that affect health and safety caused by various reasons during the performance of the work and to protect employees from the harmful effects of these conditions.[1] Negative states such as occupational accidents and occupational diseases are the situations that arise as a result of the ineffective implementation of occupational health and safety.

Post-accident investigations are as important as preventing work-related accidents. It is important to investigate occupational accidents, identify and eliminate hazards, reveal the deficiencies in the materials and equipment used, reduce the treatment and compensation costs that will occur after the accident, prevent labor losses, to prevent the events that may cause accidents in the future and to improve the morale of the employees.

Various methods such as five cause analysis, root cause analysis, fault tree analysis, event tree analysis, step (time-ordered stages of complex events),

barrier analysis, and bowtie analysis are used in accident and incident investigations.

Root cause analysis covers the determination of the main reason for the origin of the errors and the measures to be taken to prevent the errors from recurring.[2] It is a problem-solving process to investigate an incident, problem, error, accident, or noncompliance that has occurred. In all standards of quality management systems and problem-solving approaches related to the extent and depth of corrective and preventive measures, the realization of root cause analysis has been emphasized.[3]

The subject of root cause analysis is the event and its causes, not individuals. In this approach, the aim is not to find out who is negligent, but to make improvements in the system by reviewing all the events.[4] With the analysis studies to be carried out, it is aimed to find the root causes of the problems, learn the source of the problems, ensure the correct understanding of the problems and ensure positive behavior changes at the knowledge level, and prevent time loss due to corrective and preventive actions taken before reaching the source of the problems.

The root-cause analysis benefits the organization by identifying the underlying causes of a problem encountered. This approach offers a long-term perspective for improving management processes. If an effective root cause analysis and subsequent improvement studies are not carried out, the probability of recurrence of the error is high. Root cause analysis also prevents the same problem from repeating itself in the future. It should also be noted that a problem may often have more than one related or unrelated cause.[5] Root Cause Analysis is the most widely used analysis tool to investigate health care safety-related incidents, either as a technique or as part of continuous improvement efforts.[6]

Fishbone diagram (Ishikawa diagram), brainstorming, Pareto diagram, scatter diagram, flowcharts, histogram, tree diagram, control charts, etc. are some of the analysis tools used.[7] The fishbone diagram is the most widely used in health care.

Root cause analysis is used to identify possible causes of a particular problem or condition. It can visually present the causes of the problem by using statistical methods and based on the results of the analysis, in a way that can reach the causes of the event and reveal the cross-relationship between the resulting results and the causes that give rise to them.[8-10]

In this context, the research was conducted to examine the root cause analysis and process after an occupational accident in a state hospital and to examine how it was applied in the health facility and the causes of occupational accidents.

Methods

The hospital-based retrospective study was carried out by evaluating the occupational accident records that occurred in a state hospital and reported to the Provincial Directorate of Social Security. The population of the research consists of 156 health workers who had an occupational accident between January 2018 and April 2021.

Data were obtained by using the occupational accident notification forms and root cause analysis forms used in the institution. Occupational groups, the place where the injury occurred, the event that caused the injury, and the tool that caused the injury were included in the evaluation. The collected data were evaluated using percentage calculation.

In the study, the "fishbone" method, which is a root cause analysis method for detecting all factors that may cause a particular problem and confirming the factor that will affect the problem the most, was used.[11]

The problems were determined and the important reasons causing the problem were listed, and primary causes and sub-causes were studied.

To carry out the research, its ethical suitability was approved and evaluated by the Social and Human Sciences Ethics Committee of Tokat Gazi-osmanpaşa University, and written permissions were obtained from the Ministry of Health and the Tokat Provincial Health Directorate.

Results

The percentage distribution of occupational accidents by year is shown in Table 1. The reasons stated in the occupational accident and root-cause analysis form were examined, and the source of the problem was searched by giving priority to the findings. Of those who applied to the occupational health and safety unit due to a work accident; 67.94% were women, 45% were nurses, 25% were cleaning staff and 3% were physicians. Looking at the location of the accident, 50% occurred in inpatient services, 15% in emergency services, and 15% in intensive care units.

In the way, the accidents occur; needle stick injuries (71.8%) are the most common occupational accidents, followed by slipping and falling (14.7%). When the tools that cause sharps and stab wounds are examined; needle tip (45.5%) is in the first place, followed by branule (19.6%) and lancet (14.2%).

Considering the causes of needle stick injuries according to occupational groups; it was seen that the

nurses were trying to close the needle tip, the patient moved during the procedure, and the needles on/inside the sharps box were full during waste separation. The reason for the injury of the cleaning personnel is; that it was seen as throwing a sharp tool into a medical waste bag and forgetting a sharp tool in the environment during cleaning operations.

It was determined that the fall-collision accidents reported in the second rank occurred mainly in the cleaning personnel, caused the most loss of workforce, and the most common reason was due to the slippery floor. When the causes of work accidents are examined, it is seen that the main reason is inattention (37.18%). This is followed by non-compliance with the rules (27.56%).

Table I: Distribution of employees by socio-demographic characteristics and application periods

	Employees (n)	Percentage (%)
Gender		
Woman	106	67.94
Man	50	32.06
Marital status		
Married	102	65.38
Single	54	34.62
Title		
Doctor	5	3.21
Nurse	71	45.52
Midwife	12	7.69
Cleaning staff	40	25.64
Health officer	5	3.21
Security worker	3	1.92
Anesthesia Technician	3	1.92
Laboratory Technician	4	2.56
Other*	13	8.33
Educational Status		
Primary education	20	12.83
High school	31	19.87
Associate degree	18	11.53
Licence	87	55.77
Accident cause tool		
Needle tip	55	35.26
Branule	22	14.11
Lancet	16	10.27
Bistoury	2	1.28
Suture needle	2	1.28
Insulin shot	7	4.48
Other**	12	7.72
Work Place		
Inpatient Service	78	50
Intensive care	24	15.38
Emergency	24	15.38
Operating room	7	4.48
Policlinic	6	3.84
Hospital Garden	5	3.21
Laboratory	5	3.21
Other **	10	6.4
Causes of the accident		
Carelessness	58	37.18
disobeying the rules	43	27.56
Tiredness	8	5.12
Lack of maintenance	3	1.92
Irregularity	5	3.22

Inexperience	1	0.65
Other ****	38	24.35

* Computer operator, servant, clinical support staff, etc.)
** Microtome, spiral, scissors, glass etc.)
*** Corridor, machine shop, laundry
**** Insufficient lighting, visual impairment, slippery floor etc.

Discussion

Healthcare workers are a professional group that interacts a lot with patients and their relatives during the diagnosis and treatment processes. Unfortunately, they encounter many work accidents and occupational diseases while carrying out these procedures.

In our study, most of those who had occupational accidents were women. In this situation; it is thought that nurses form the main frame of the health care services process and the majority of nurses are women. In some studies, it was observed that the gender with the most occupational accidents was female.[12-15] Needle stick injuries were the most common occupational accident (71.8%). In another study, this rate was found to be 82.2%.[16]

The second most common occupational accident was slip-fall injuries. Contrary to our study, in the study of Wåhlin et al., threat and violence (18.6%) were the second most common injuries. Slip-fall (8.1%) occurred less frequently.[14] In the study conducted by İnci et al., 13% of occupational accidents were found to be falls and 36% to be sharp injuries. The rate of falls and injuries is similar to our study.[17]

According to the data obtained by the CDC, the number of the needle tip and percutaneous injuries increases every year in healthcare workers, and 385,000 injector injuries occur in hospital workers every year and an average of 1000 needle-stick injuries per day. In the USA, it is estimated that there are around 600-800 thousand applications for similar injuries per year, half of which are not reported.[18]

Our study determined that the most common type of injury was needle tip injuries (45.5%). Similarly, in the study of Kurttekin and Taçgın, it was found that the most common injury was caused by the needle tip.[19] Similarly, a study conducted in India revealed that the nurses' most common occupational injury is needle syringe injuries and it occurred commonly during needle recapping.[20]

In a study investigating the behaviors that cause needle-stick injuries in nurses, trying to close the caps of the injectors and the inability to remove the needles stand out as the most important problems. Similarly, in our study, it was observed that most of the needlestick injuries occurred while trying to close the needle tip.[21]

Insufficient questioning of the post-injury approach makes it challenging to reach healthy data. Therefore, this study aims to prevent or reduce accidents by determining which occupational accidents the employees are most exposed to and the leading causes of these accidents.

Conclusions

If an effective root cause analysis and subsequent improvement studies are not carried out, the probability of recurrence of the error is high. Incorrect determination of root cause will lead to incorrect determination of corrective actions and this will not be the definitive solution of corrective action. Thus, the probability of the problem reoccurring will continue. Performing root cause analysis also prevents repetition of the same determination by repeating it in case the same problem occurs. Instead of masking the problem, permanent solutions are produced to prevent the problem from becoming chronic.

More than one factor is likely to cause a single problem to occur. In this case, the reasons that may be the source of the problem should be listed. After the causes are determined, the subparts or branches of each cause, if any, should be named. For example, what could the reason for 'Personnel' also be listed? Problem-based data and information should be collected. Then, after all the sub-causes are sorted, all the data is analyzed by brainstorming and so on.

Meaningless reasons and ideas are eliminated and the cause or reasons that are the source of the problem are reached. While a 5-cause analysis may be sufficient to find the source of any problem, this method will not be sufficient in a complex and multi-factorial process. In this case, the fishbone diagram provides a useful framework for revealing the factors and causes that simultaneously affect a problem within the framework of the cause-effect relationship.

Today, although the rate of needle-stick injuries has decreased significantly with approaches such as the use of disposable medical equipment (injector, scalpel, lancet, etc.), blood collection with the vacuum tube, and the use of puncture-proof waste boxes for sharps, it is still at a very high rate of 50-70% in our country maintains its importance.[22]

Post-occupational accident investigation is important. According to the provisions of the Regulation on Occupational Health and Safety Committees, one of the principles of meeting Occupational Health and Safety Committees in workplaces is occupational accidents.[23] With this meeting, the cause of the work accident is investigated, and the cause of this accident is tried to be found and solutions specific to the cause are suggested. In this way, it is tried to prevent the recurrence of the accident. If the same errors/ınfolence ıs repeated;

1- Why the root found may be faulty.

2- Both the root cause and the action may be wrong.

It is thought that if the board meetings are carried out in parallel with the cause-precaution by removing the necessity of creating the documents and making them effective after the work accident, the probability of repetition of work accidents will decrease, and the costs and compensations that will occur after the accident decreases, and the loss of labor and service/production will be prevented.

Also, Occupational health and safety professionals investigating occupational accidents should be given in-service training to determine the root causes of the accidents and eliminate the root causes, select field-specific personnel or increase their knowledge and experience.

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