

Original article:

Analysis of the Root Causes of an Undesirable Incident in a Hospital in Mashhad, 2013

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Abstract

Background and Objective: Medical errors are equivalent to costly failures. In other words, it is the behavior and/or decision which do not comply with healthcare standards. Thus, this study aimed to analyze the root causes of an undesirable incident which lead to the death of a 24-year-old intern who had been in contact with a patient with Crimean-Congo Hemorrhagic Fever (CCHF). She was referred to the infectious section with symptoms of a cold and fever which was accompanied by hemorrhage and respiratory distress. Unfortunately, she passed away four days later in one of the hospitals in Mashhad in 2013. **Case Report:** The current research is a descriptive study which was conducted through the qualitative method in 5 steps. The steps were as follows: defining the incident, data collection, outlining the identification of the issues, data analysis and identification of the root causes and working out solutions and implementation concerning the same incident in May 2013. Analysis of the root causes dated from May 2013 to June 2013. In the process, such tools as diagramming Cause and effect and storming thoughts were applied. **Findings:** A number of reasons were identified to have given rise to the incident. The lack of quarantine areas in the emergency section of the hospital, the negligence of the senior resident of the infectious diseases ward as to consider the need to isolate the patients, the negligence of the responsible intern as to take into account the similar cases which had been recorded in the morning report of the hospital on the same day, inadequate surgical consultations given by the senior resident according to the hospital policy and last but not least, inefficient education in universal precautions of the disease for the staff and students. **Conclusions:** The analysis of such fatal errors in the field of patient safety is of paramount importance. Thus, these techniques should be used in healthcare centers in order to evaluate critical situations systematically.

Keywords: Analysis of the root causes; patient; undesirable incident; hospital

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Introduction

Medical errors are a threat to the health and well-being of patients and the repetition of such cases deteriorate the quality of the care provided¹. Error is defined as the failure to completely perform a planned activity in accordance with the program (administrative error), and the use of a wrong program to achieve an aim (planning error).

Assessment of the factors threatening the patients' safety has shown that multiple factors are involved in error occurrence, and the events occur when there is a combination of active and latent errors. Active errors are usually associated with human factors. Such errors are the severest threat to the patients' safety. Latent errors are associated with health and medical systems, management decisions and organization

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conditions².

There are two main approaches so as to deal with errors in Health Medical systems including individualized approach and systemic approach. In the individualized approach, the focus is on the individuals and the suggested solution is also dealing with individual behaviors³.

Research has proven that in Health Medical organizations the potentiality of error is directly influenced by undesirable conditions of the work environment. Such conditions account for inadequate number of staff, lack of time, work pressure, hostile, inadequate supervision, poor and/or inappropriate communication system, conflict between employees, improper maintenance of equipment, incompatible goals and stressful environment^{4,5}.

Currently, the main approach to patient safety has changed from an individual approach to a systemic approach⁶ which states that the factors leading to incidents related to patient safety cannot simply be caused by the healthcare workers, but are more likely to be in relation with the systems in which the employees are working⁷.

Individual approach to errors, for one, leads to the loss of trust and confidence; another disadvantage to this approach is that with acknowledging these errors as individual, the systems are deemed innocent of any wrong. Thus, the errors might reoccur under similar circumstances. One of the most effective methods for analyzing the system's problems and finding the possible solutions is the analysis of the root causes⁸.

Analysis of the root causes is a systematic analysis of the cause and effect which seeks to determine how the issues related to patients, staff, policies, environment and processes are involved in medical error occurrences⁹. Early data indicates that analysis of the root causes of errors not only takes the analysis of undesirable events toward systemic errors, but also improves the patient safety⁸.

Normally, in the analysis of the root error, an incident is reported which requires immediate evaluation. A team of stakeholders is composed, data is collected and the team analyzes it to determine the root causes and contributing factors⁹. Given the importance of analyzing the root causes of errors to find the main factors involved in causing an error and corrective

measurement caused by it in order to prevent the recurrence of errors, the present study was performed aiming to analyze the root cause of an undesirable incident at a hospital in the city of Mashhad.

Case Report:

A 24-year-old medical student with a history of G6PDD had been in contact with the blood of a Crimean-Congo Hemorrhagic (CCHF) patient the night before his referral, and the evening of the next day, he referred to the clinic and was admitted and hospitalized by the order of a specialist on 2012/5/3 at 19:22 pm with the symptoms of fever, headache and sore eye.

On 2012/5/4, the patient was discharged without fever, with normal CBC by his own consent and in good condition after obtaining permission from the physician. It was advised that he refer again if the general condition starts worsening. On 2012/5/7, he was hospitalized again by the order of the ward's specialist with flu-like symptoms. Decreased platelet begins from this point. Ribavirin and platelet transfusion started for the patient on 2012/5/8 at 17:10 pm.

On 2012/5/9, due to an increase in the International Normalised Ratio (INR), Fresh Frozen Plasma (FFP) begins at 01:45 pm and IVIg begins at 3 pm on the same day. At 10 pm in 2012/5/9, the patient was agitated, and due to very low platelet (7000), platelet transfusion began. At 1:30 am, the patient had mild epistaxis and was experiencing abdominal pain in the morning.

At 9 am, surgical consultation begins which had been recommended to perform maintenance treatment. Oliguria and dark occurred at 7 pm and 11 am with free fluid in the patient ranging from moderate to severe. FFP and platelet were again injected for the patient. At 7:30, antibiotic therapy started for the patient, with urine and nephrology consultation which were conducted. Ribavirin and IVIg were disconnected. Sonography was performed again in terms of hydronephrosis evaluation which proved to be non-problematic.

The patient's condition became complicated with a wide rectorhalgia during his transfer to the ICU where he received platelet and liquid. There were also signs of respiratory distress. According to

the order of nephrology specialist, if there was no urination up to 12 hours and he showed symptoms of overload, dialysis could be ordered via phone. The patient had worsening respiratory distress and abdominal distention. Four unsuccessful attempts were made to apply the dialysis catheter by first-year surgical residents. Meanwhile, the patient's condition became complicated with a cardiac arrhythmia and bradycardia. At 04:15 pm upon which CPR and intubation were performed. The catheter was reinserted by the vascular fellowship. However, he was again arrested at 05:30 and CPR ended was announced at 6 pm.

Case Presentation

The present study is a descriptive study which was conducted through qualitative method. Root Cause Analysis (RCA) is a term which represents methodologies and tools of retrospective and systematic survey of the medical errors¹⁰. RCA's main steps include: defining the incident, gathering data, drawing practical factors, analyzing the data and identifying the root causes and offering recommendations and implementation through providing a report⁷.

Following the incident on April 2013, analysis of the root causes was done from April 2013 to June 2013 by an expert team. This team consisted of 9 impartial, independent people who had been given the authority to decide and had been trained for RCA. The team members were 7 doctors and 2 nurses (supervisor of infection control and head of the infectious ward). After the formation of the team through brainstorming, the incident was defined. Afterwards, the team started collecting data through interviews with people and making a list of the factors involved in the incident and other available documents. Consequently, the timeline of the incident was drawn. On the next step, the team tried to identify the issues and analyze them by the cause and effect diagram. Finally, with respect to the identified causes involved in the incident, certain recommendations were made and the report of the incident was completed.

Results:

Following the formation of the team and definition of the incident and reviewing the documents and records of the patient, a list of the key people involved in the

incident was written down. According to a program designed in advance and at the appointed time, the subjects (N = 34) were interviewed. After interviewing the people and according to their statements, the work of staff was evaluated.

Upon performing these steps and different meetings of the RCA team, the timeline of the incident was plotted (Figure 1). After the RCA team reviewed the patient's records, hospital mortality committee reports, forensic reports, reports of the medical facilities evaluation, they performed interviews with the people involved in the incident and overviewed other documentation. As a result, they identified the main problems in the care provided to the patient. To analyze the identified problems, cause and effect diagram and brainstorming were used.

According to this chart, separate other charts were plotted for each of the main problems and the problems related to each of the factors relevant to the team, communication, task, patient, organizational and strategic factors, equipment and resources, condition of environment, training and education were identified. According to the cause and effect diagram, the root causes of the incident were identified which are illustrated in Table 1.

Among the illustrated in Table 1, six causes were identified as root causes of the incident which are as follows: absence of a quarantine area in the emergency section, lack of emphasis on the need for the isolation of the patient by the infectious diseases ward's senior residents, the responsible intern's likely lack of attention to similar cases mentioned in the morning report, no surgical consultation by the senior residents according to the hospital policy, non-compulsory training on the standard precautions for staff and students and the lack of clear written guidelines for effective cooperation between the surgery team and the vascular surgery team.

Medical and surgical:

With regards to the identified causes, the team of analyzing root causes made some recommendations which are presented in Table 2.

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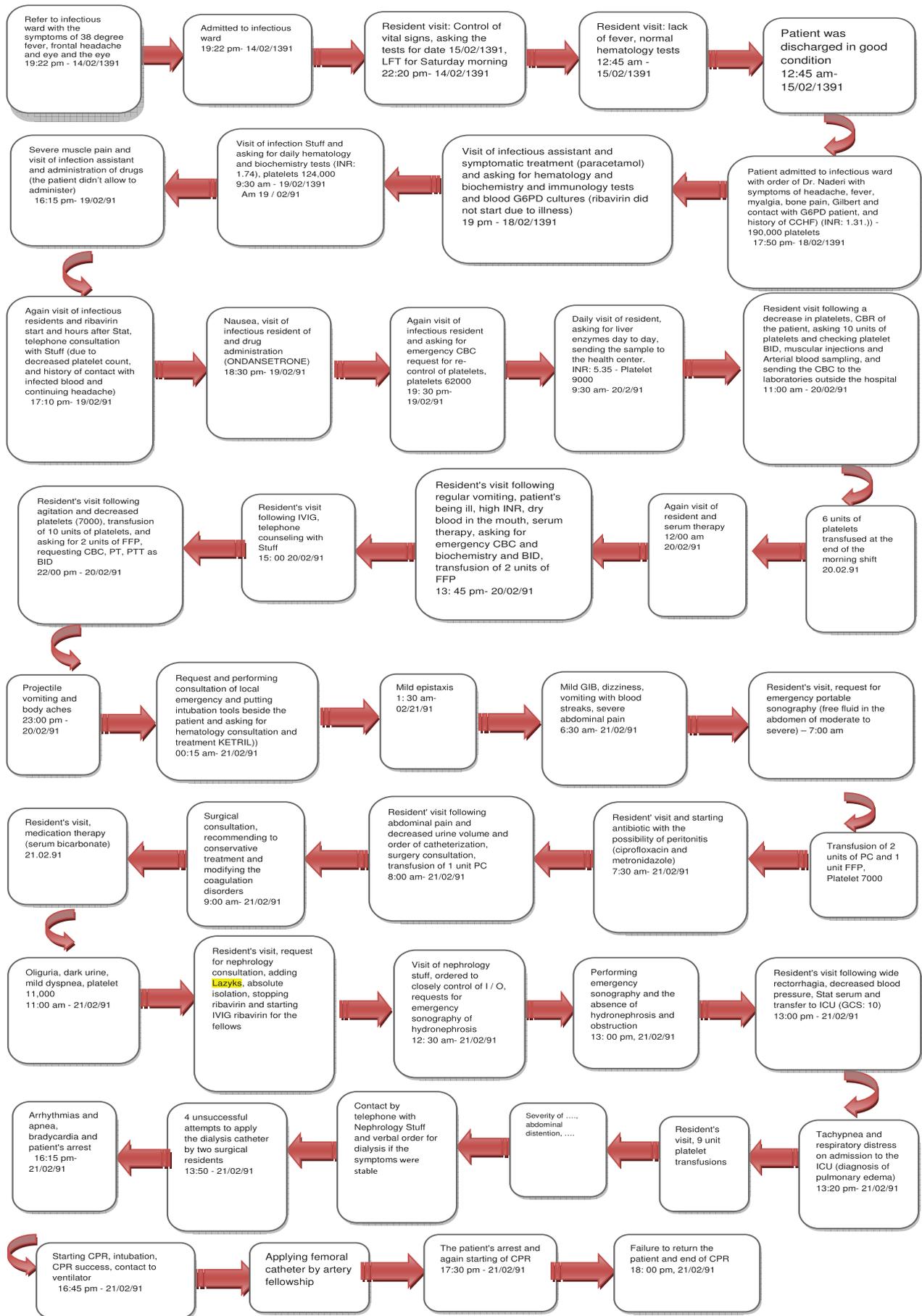


Table 1: Incident Analysis - Identifying the factors involved in the incident, the root causes

List of root causes	
Strategic and organizational factors	<ul style="list-style-type: none"> -obligation of the resident to admit the infectious patient due to the hospital being the center despite the fact that there was no infectious ward and specialist in this particular hospital -Lack of executive power in not admitting the end stage patient due to the fear of legal issues -Non-surgical consultation in accordance with the hospital policy (disregarding the hierarchy of BS to notify the vascular fellowship and staff) -Lack of preventive strategies for the senior resident due to not performing previous counseling -Lack of compulsory education on standard precautions for staff and students -Lack of isolated areas in the emergency section of the hospital -external pressures (outside the medical team) to promote irrational treatment interventions -Lack of proper management on behalf of the resident in case of critical condition -Lack of clear organizational process for direct admission of patients to the ward
Factors related to the staff (individual factors)	<ul style="list-style-type: none"> -high stress level in the medical team - high risk of infectious ward resident in medical decision-making without consulting the internal or infections staff -High confidence of surgical junior resident who performed catheterization during the next step -emotional intervention of the medical team - Lack of consultation with the internal staff (Hematology ward) -Lack of the responsible intern's attention to similar issues mentioned in the morning report -Lack of attention on behalf of the junior resident at the time of the intern's informing about the patient's admission in order to quickly visit the patient during the waiting period to transfer him to the ward -heavy workload of the residents (years 1 and 3) and delayed visit of the patient -emotional connection prevented rational and accurate decision-making of the medical team -patient's discharge due to his own insistence and contrary to the opinion of the physician -Low risk-taking ability of the physician -neglecting the risk of disease infection by the senior resident based on no possibility of CCHF -negligence of the senior resident about possible spread of the disease
Factors related to the job	<ul style="list-style-type: none"> -Lack of distribution of new national protocol -Lack of written, transparent and administrative policies for effective cooperation between the surgery team and vascular surgery team -absence of resident for quick visit of the patient and remembering the standard precautions -no routine admission of the patient, no triage for the patient and no determined physician responsible for the patient -not visiting the patient by the emergency medical team despite seeing the patient in the hallway -Lack of quick access to test results and other tests such as serum level of C6PD

Factors related to the conditions of work environment	<ul style="list-style-type: none"> -time shortage as to decide for medical treatment with regard to the rapid progression of the disease -Lack of medical team confidence about timely attending of the staff who were to be consulted -unknown high-risk of the patient for the intern -Lack of legislation for the benefit of individuals health -not defining the strategy for purchasing of laboratory equipment necessary to implement the protocol, despite the annual incidence of the disease in the country
Factors related to education	<ul style="list-style-type: none"> incorrect estimation of the infectious ward's resident about the required volume (no request for CVP insertion to obtain the volume before the worsening of the patient) - lack of authority of the infectious ward's specialist in 17 Shahrivar Hospital to treat the patient at the same center -Lack of request for specific tests necessary for accurate diagnosis between hemolysis and DIC -Lack of immediate access to test results to confirm CCHF -incompetency of scientific information of the infectious ward's resident -the infectious ward's resident's not considering the need to make a consultation request -insufficient experience of the resident (first-year medical student) (first encounter with CCHF patient) - inadequate knowledge and experience of the intern
Factors related to equipment	<ul style="list-style-type: none"> ➤ observe -long duration of CCHF test outcome (3-2 days) and the availability of the patient to be observed -late preparation of the tests' results

Table 2: Recommendations presented to prevent the recurrence of similar incidents

Factors related to physical environment
<ul style="list-style-type: none"> -Lack of isolated areas in the emergency section 1. changing the use in one of the emergency rooms to become an isolation area 2. Direct transferring of admitted infected patients to the present isolation area in the ward and modifying of the existing process 3. Increasing the number of isolation areas in the ward to reduce the waiting time for patients in the acute emergency department 4. Temporary isolation of the location of the infectious patient by partitioning until creating isolation areas 5. Explaining the policy of transferring admitted dispatched patients to the ward
Actions related to the task
<ul style="list-style-type: none"> - Lack of emphasis on the need for isolating the patient by the infectious ward's Senior Resident 1. The prediction of a punishment policy for those who play in role in the catastrophic incidents. 2. Creating the need to the commitment of standard precautions 3. Noticing to the importance of personal protective equipment for staff (gloves, masks, gowns, etc.) 4. Having regular staff supervision on residents' work 5. Determining the crisis policy of the ward 6. Creating motivation and incentives to promote safe behaviors 7. Audit and feedback about observing of local and national standards 8. Removing the incentives for behaviors associated with risk 9. Limiting the number of peoples who visit quite contagious patients and confining to theory teaching about students 10. About seasonal diseases, before the prevalence, holding training sessions in the ward If there was a national protocols for a specific disease, update information to medical team

Actions related to the task

- Lack of written, transparent and implementation policies for effective cooperation between the surgery team and vascular surgery team
- 1. Provide adequate information and instructions for staff
- 2. Implementation of root cause analysis and evaluation of risks and implement of appropriate measures according to the results of this study
- 3. Production and application of new or revised policies, procedures and guidelines
- 4. Determining the policy of method of consultation in each group according to the Education Curriculum of that Department
- 5. To inform developed strategies to all medical personnel
- 6. Availability of on-call list of all the courses at the hospital site
- 7. Developing the local task descriptions for each ward with signature of director for residents
- 8. Standardizing the tasks and procedures or treatment programs
- 9. Performing invasive actions after completing the course in the relevant ward
- 10. Creating a framework for more effective cooperations between different wards

Discussion

Root analysis of the incidents is a technique for systematic understanding of the causes of an event which is beyond the involvement of a person or persons and includes the underlying and the environmental causes which resulted in the occurrence of the incidents. This technique has been designated to be versatile as well as retrospective going back from the event time letting the real causes of the incident be known¹¹.

Other benefits of the analysis of the root causes can be named as modifying the deficiencies and using suitable methods which can improve service offering, reducing the costs on the patient and healthcare system as well as improving the output of the medical team in times of crisis all of which result in the accurate identifying the main cause of an incident¹³. The results of Sanvl and colleagues¹⁴ and Packstone¹⁵ studies reported that applying the strategy of clear, transparent and implementation procedures are considered to be effective strategies as to prevent medical errors. These studies confirm the results of the present study.

Therefore, we can say that implementation policies and methods are guidelines of performing hospital activities in line with its own strategies. Hospitals with written documentation of policies and procedures require all the staff to comply with them. Thus, it helps guarantee the patients' safety as well as not allow errors occur easily and negligently. Furthermore, Anousheh and colleagues (16) reported that a shortage of facilities and equipment are predisposing causes of errors in nursing care. The present study also confirmed the results of their study.

Helmreich and Musson (17) also reported that the factors related to professional culture, organizational culture and national culture are systematic hidden threats in the incidence of medical errors.

Conclusion

The result of this study is consistent with the results of those mentioned above in terms of the rules and regulations, national and organizational culture and professional culture. Therefore, the error incidence, rather than punishing those responsible for the errors, must induce them to design the idea and improve the mechanism which is associated with finding the systematic causes of error incidence. In another study, Garnerin and colleagues¹² investigated the root causes of a case of airway filter obstruction.

Their results claimed that the obstruction had not been diagnosed because the filter was hidden beneath the patient's head. To reduce the occurrence of such incidents, they proposed that the filters be visible and placed above the level of the patient's body. Garnerin and colleagues also stated that to perform appropriate corrective actions, critical events should be evaluated systematically using the analysis of root causes.

In the present study six root cause of the incident were identified which were briefly described to be in relation with the defects in some organizational processes, defects in the training of human resources and its deficiencies, factors related to employees, factors related to the task, factors related to work environment and factors related to the facilities. Given the role of such factors as to prevent the recurrence of such incidents, some suggestions are presented for the improvement of the physical environment and the actions related to the task.

Given the usefulness of the analysis of root causes

on patient safety, it is recommended that critical incidents in the field of healthcare services be dealt with systematically using this particular technique. However, the formation mechanism of a blame-free culture and sharing the experiences of occurred medical errors, analysis of the event and designing of interventions should be provided. **Acknowledgement:** Hereby, all the persons who

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Conflict of interest: None declared

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