Original Article

Assessment and Reduction of Human Error using SHERPA Technique in Chemotherapy Department of a Large Military Hospital

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Abstract

Background: Medical errors are numerous in medical activities. Considering the sensitivity and importance of the medical group's professions, the emergence of an apparently simple error can cause the death of an individual or even a group of individuals. The present study aims the evaluation and reduction of human error using a system human error reduction and prediction approach System Human Error Reduction and Prediction Approach (SHERPA) in the nurses of Baqiyatallah hospital's chemotherapy ward in 2019. **Materials and Methods:** A cross-sectional study was conducted in the chemotherapy ward using the SHERPA technique. Then, the duties were determined in detail using Hierarchical Task Analysis (HTA). The errors were identified using the SHERPA checklist, and the risk outcomes and intensities were finally evaluated. **Results:** Based on the study findings, there are 109 possible errors for 48 sub-duties. The most frequent errors fall in the functional area (54%) and the least frequent errors pertain to the area of selection (3%). **Conclusions:** In order to reduce the errors and increase the quality of the services and safety of the patients, errors can be identified by using the SHERPA technique; after identifying these errors, using this technique, it is possible to prevent the recurrence of the identified errors by careful planning. Considering the fact that the most frequent error was found in the functional domain, modern protocols can be codified in this area, and standards can be observed for putting the problems of this section atop of the priority list and reducing the errors and increasing safety of the patients.

Keywords: *Human, medical error, nurses*

Introduction

Human beings are intelligent and adaptable creatures featuring the faculty of learning but all human beings are prone to error, as well.[1] Errors and actions taken do not match with an individual's intention and are not in accordance with the extant regulations and are envisioned as not being correct from the perspective of a third overseer; the performance of such error actions causes the system to lose its defined limits.[2] Human errors are important factors giving rise to the emergence of death-resulting accidents, damages, and harm.[3] Medical errors are defined in short as the error performance of the programmed actions for the achievement of a goal or another.[4] The vista of medical errors in medical activities is very vast and such errors include errors in diagnosis, prescription, recording, and treatment and they are also dependent on the organizations' technologies and, considering the sensitivity and importance of the jobs in the medical group, the emergence of a seemingly simple mistake can cause the death of an individual or a group of individuals.

It has been expressed that 10% of all the patients' hospitalizations and admittances are due to unwanted damages with 75% of such accidents being predictable. The offering of unsafe healthcare can cause the emergence of many side effects like high mortality rates and adversely influence the hospitals' efficiency.[5] The importance of the side effects stemming from medical errors is so high that it can be compared with that of incidents like car accidents or cancer.[6]

Besides the above-mentioned cases, unsafe healthcare incurs the healthcare systems a considerable economic load and directly influences the profitability of the hospitals, and increases the costs imposed on the healthcare systems. Based thereon,

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the governments, managers, and policy-makers of both the developed and developing countries make efforts to reach an acceptable level of safety in the hospitals.[7] The experts of the healthcare system domain believe that almost more than half of these errors can be prevented but evidence indicates despite the costs incurred and investments made that the uprooting of the medical errors cannot be sufficiently successful for such a reason as not exercising systematic evaluation and supervision. There are numerous methods for the identification and evaluation of errors in various occupations. One of the methods used for the identification and analysis of human error is the System Human Error Reduction and PredictionApproach (SHERPA). It is a systematic technique by which human mistakes can be investigated based on the error type, contingent outcomes, and control and prevention solutions.[8] SHERPA deals with errors based on human psychology principles drawn on an analysis of the duties. Numerous studies have dealt in Iran with the prediction of human error in the treatment cadres, including the study by Khandan *et al*.[9] who investigated the management of the healthcare services and improvement of the patients' safety in the nurses in 2016 using SHERPA, and their results indicated that 159 errors can be possibly made in the 89 identified duties.

Chemotherapy is one of the common treatments following the diagnosis of individual cancer and it is accompanied by numerous side effects.[10] The aim of the present study was the evaluation and reduction of human error in nurses in the chemotherapy ward of a large military, training, and reference hospital in Tehran, using the systematic technique of predicting and reducing human error (Sherpa).

Materials and Methods

This cross-sectional study was performed from April 2019 to February 2020 to identify human errors in the chemotherapy ward of a military, large, reference, and training hospital in Tehran. The method of collecting samples was census, and all the nurses of the chemotherapy department of this hospital were studied. The nurses' interventions in this ward were investigated in five primary areas (general interventions, preparation of the chemotherapy drugs, injection of the chemotherapy drugs, interventions during the injection of the chemotherapy drug, and the interventions after the drug's injection). The results obtained from the hierarchical analysis of these duties have been presented in the section on the results. In order to investigate the errors related to these duties. Validity and reliability of SHERPA technique of which have been confirmed in various studies.[8,11,12] In Iran, as well, this method has been utilized in various studies for exploring and identifying human errors in healthcare services and this instrument has been found useful in the identification of the errors.[13,14] The SHERPA was implemented in eight stages: 1) Hierarchical task analysis (Task/sub-tasks analysis by interviews and observation); 2) Task classification (Dividing tasks based on the behavior taxonomy); 3) Human error identification (Using error code); 4) Consequence analysis (Examining the consequences of each error); 5) Recovery analysis (Which action is necessary to error prevention); 6) Ordinal probability analysis (The probability of the error is determined); 7) Criticality analysis (The severity of damage caused by error is determined); and 8) Remedy analysis (Practical ways to control and prevent error). In this study, the research team referred to the ward at various times and, after explaining the objectives of this study to the nurses, the nurses' tasks were observed and the patient's conditions were evaluated. After observation and interviews with the head nurses, instructional supervisors, and experienced nurses, the intended information was collected. Then, the SHERPA work paper was completed following which the error level and intensity estimation were carried out and the results were presented to two of the sophisticated nurses who had been working in this ward for years so that they can be given a final confirmation.

Ethical considerations

The study was accepted by the Ethics Committee of medical sciences (Ethics code: IR. BMSU.RECEARCH.1398.337). Informed consent was also performed at the beginning of the study.

Results

A total of 109 errors were identified for 48 studied duties in this research paper. The most frequent errors were found pertinent to the interventions during the injection of the chemotherapy drug, and the least frequent errors were found related to the duty of "preparation of the chemotherapy drug". The most frequent error was a functional one with a total number of 59 (54%), and the second rank went to checking errors with a total number of 24 (22%). The errors related to the exchange of information reached in number to 11 (10%). The errors related to retrieval were found to be 12 in number (11%), and the selection errors reached number 3 (3%) [Table 1]. The results obtained from the evaluation of the risk level of the identified errors in the chemotherapy ward of Baqiyatallah (may Allah hasten his honorable reappearance) Hospital showed based on [Table 2] that the number of errors with unacceptable risk level was the lowest and the errors with unfavorable risk level were the highest. Most of the unfavorable errors, as well, were found related to the interventions during the injection of the drug and reached in number to 20. Out of the two errors pertinent to the unacceptable domain, one was in the functional area and the other was in the checking area. In the domain of unfavorable errors, the highest error rate was related to functional mistakes followed by checking mistakes. Among the functional errors, errors coded A8 and A9 that were, respectively, related to forgetting and imperfect performance accounted for the highest number of mistakes [Tables 3 and 4].

Table 1: Types of the identified errors

Primary processes	Total number of the identified errors	Functional		Checking		Retrieval		Information exchange		Selection	
		Number	percent	Number	percent	Number	percent	Number	percent	Number	percent
General interventions	21	5	23.80	11	52.38	3	14.28	2	9.52	0	0
Preparation of the chemotherapy drug	15	12	80	1	6.66	1	6.66	0	0	1	6.66
Injection of the chemotherapy drug	24	18	75	3	12.5	1	4.16	2	8.33	0	0
Interventions during the drug injection	28	11	39.28	9	32.14	5	17.85	3	10.71	0	0
Interventions after drug injection	21	13	61.90	0	0	2	9.52	4	19.04	2	9.52

Table 2: Risk evaluation matrix

Risk intensity / Occurrence possibility	Catastrophic (1)	Critical (2)	Borderline (3)	Trivial (4)
Repetitive (A)	1A	2A	3A	4A
Contingent (B)	1B	2B	3B	4B
Occasional (C)	1C	2C	3C	4C
Less likely (D)	1D	2D	3D	4D
Unlikely (E)	1E	2E	3E	4E

Table 3: Risk index-based decision-making scales

Risk scale	Risk classification
Unacceptable	1A, 1B, 1C, 2A, 2B and 3A
Unfavorable	1D, 2C, 2D, 3B and 3C
Acceptable but in need of revision	1E, 2E, 3E, 4A, 4B and 3D
Acceptable without any need for revision (safe)	4C, 4D and 4E

Discussion

Based on the present study's findings, operational errors account for the highest rates of mistakes in duties of the chemotherapy ward's nurses. Since a vast part of the nurses' activities is operational, this high error rate can be attributed to the high number of the duties in this area. The results of the prior studies in the area of healthcare services, as well, are consistent with what has been found in the present study.[9,11,14] The lowest error rate was found in the area of selection, and this finding is also consistent with the results of the other studies.[4,9] This consistency of the results can be due to the fact that the nurses' duties are generally lower in the selection domain as compared to the other areas. Based thereon, the error rates are also lower in this domain. The rate of unacceptable errors was the lowest, and the rate of unfavorable errors was the highest. These rates have also been stated in similar studies identical to what has been found herein.[9,14] As it was mentioned, functional errors are the most frequent errors for such a reason as forgetting and imperfect performance. The reason for such errors was clearly vivid in the observations and interviews. Due to the non-observance of the standard ratio of bed to nurse, the workload of the nurses is increased and they may subconsciously forget some of their duties because of their high workload, and they may also even perform some of their duties imperfectly in spite of their will and want. One of the other error areas was communication, and this error is mostly made in the communication between the nurses and the patients. The industrious Iranian nurses make a lot of efforts to properly perform this duty of themselves, especially in the chemotherapy ward; however, due to the high workload and extreme busyness and lack of information, and it becomes more likely for them to make such human errors. In information retrieval, cases that heighten the error possibility are lack of sufficient knowledge, non-holding of the instructional courses, and absence of close communication between the treatment cadre.[9] Some of the errors are multifactorial and their roots need to be located. The studies in various countries demonstrated that large work volume,[15] long shifts,[16] and work quality[17] are three important factors contributing to the nurses' making of errors. Another study asserts that the constant investigation of the status of the services offered to the patients and the reporting of clinical errors can bring about improvement in patients' safety.[18] The creation of motivation in the treatment cadre for exact reporting of the nurses' mistakes is one factor that can contribute to the improvement of safety and reduction of human errors. This is while only less than 8% of the errors are reported,[19] for such reasons as the fear of being penalized, fear of the creation of negative attitudes toward the mistaking person, and the fear of the reduction in the other's trust. By interventions like offering error reports in anonymous forms, rewards for the reporters and learning from the reported errors, and also corroboration of such ethical traits as honesty and work conscience in the nurses. The errors are expected to be more frequently reported. In order to better investigate possible errors, it is suggested that this study be carried out in different hospitals and by different people so that expected errors can be identified more accurately and their occurrence can be prevented.

Conclusion

The results of the present study are expressive of the idea that the amount of error occurrence is high; thus,

Table 4: Determination of the risk level of the identified errors

Essential interventions	Total number of identified errors	Unacceptable		Unfavorable		Acceptable but in need of revision		Acceptable but with no need for revision	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
General interventions	21	1	4.76	10	47.61	3	14.28	7	33.33
Preparation of the chemotherapy drug	15	0	0	5	33.33	7	46.66	3	20
Injection of the chemotherapy drug	24	0	0	12	50	9	37.50	3	12.50
Interventions during the drug injection	28	0	0	20	71.42	6	21.42	2	7.14
Interventions after the drug injection	21	1	4.76	12	5714	4	19	4	19

considering the importance of the chemotherapy ward and the very high sensitivity of this ward's patients and knowing that very simple error may cause serious damage to the patients of this section, the implementation of error management systems should be more carefully taken into account. Some reasons for the error emergence like the high workload of the nurses, job burnout, and non-observance of the standard ratio of bed to nurse have been vividly clear in this study. So, by the use of a series of macro-level planning such as the removal of payment injustice with respect to the nurses in the treatment system and improvement of the nurses' work conditions, many of the prevention errors can be prevented. Some of the errors are multifactorial and they need root-finding and extensive research so that the primary cause as well as the removal solutions can be figured out. It is by designing a series of novel medical protocols based on human factors and ergonomic issues that the error rates can be decreased and the services' quality can be increased.

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Conflicts of interest

Nothing to declare.

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