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Identification and Assessment of the Potential Error Causes in a Fertility and Infertility Center Using Pareto Analysis in Isfahan, Iran

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ABSTRACT

Introduction:
Identifying errors and examining their causes in diagnostic and therapeutic processes is special conditions which has considerable impact on fertility medicine.
Porpuse: The purpose of this investigation is to identifying and assessing the causes of potential errors in the Isfahan Fertility and Infertility Center using Pareto analysis
Materials and Methods:
Data for this study were a Descriptive-analytic study approach was adopted to assess the management practice of twofold: 1. identification of errors in process of from admission to stimulate ovulation and 2. Evaluation of causes of errors in process by using Pareto analysis.
Results:
Of the 5 proposed processes, 123 errors were identified. The result ,as shown in chart1, indicate that the most common causes of error in each of the 5 processes related to "Mistake in entering the system information by personnel(13%), patient's swarm(25%), Lack of knowledge(33%), Occupation of personnel(39%) and Doctor mistake in prescription(record, date and condition tests(45%).In fact, 80% of the causes of the error were in each of the 5 processes considered at 20% of them.
Conclusion:
Pareto chart seems to be a useful tool for identifying the main problem created by diagnostic and therapeutic processes and can identify the true cause of errors, including common errors.

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Introduction

Infertility is an important aspect of reproductive health (1). The issue of medical errors and unpleasant events has received considerable critical attention in international concern (2). There is a growing body of literature that recognizes the importance of events and faults in assisted reproductive techniques.

Reproductive medicine is a special condition, which has a considerable impact on safety and faults (3). Moreover, it is a fundamental property of reproductive health rights (4). Recent technological developments have contributed to the improvement of women's fertility in developed countries; however, there are still problems in this regard in developing countries.

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Therefore, it is essential to simplify diagnostic and therapeutic procedures in these countries (5). According to recent evidence by the World Health Organization, one out of every 10 patients is affected by medical errors (6). Furthermore, the results of the studies conducted by the American Institute of Medicine reveal that one and a half million people are injured every year, 400,000 of which is preventable (7).

A study of medical errors in Iran during 2009 on the popular complaints showed that errors were within the range of 42% to 53%. Out of this range, 22%-42%, 35%, and 27% of the errors resulted in death, and had side effects as well as physical injuries, respectively (8).

However, the synthesis of the identification and evaluation of errors in reproductive medicine remains a major challenge. Attempts to reduce the range of errors in diagnostic and treatment processes can play an optimal role in providing services, increasing efficiency, and reducing costs. Therefore, it is of critical importance to have a systematic look at errors in order to improve the care system. Individuals will repeat the errors continuously unless the possibility of errors is reduced to zero (9). Debate continues about the best strategies for quality management and fertility services (10). The main purpose of the investigation and identification of errors is to determine the root causes of the occurrence of a real understanding of what happened to prevent its reappearance.

One of the important steps and tools to improve quality is the utilization of the Pareto chart. Since this chart shows the true causes of the error, it is fast and becomes a key instrument in quality improvement. This diagram is at the heart of our understanding of which causes are really involved in the errors, and it has long been a question of great interest in a wide range of fields. Central to the entire discipline of Pareto is the concept of comparing the error causes due to their frequency. In general, this chart is a way to prevent risks, and it is regarded as a method that prevents any errors in any of the treatment processes (11). Gardner et al. have noted that one of the things that are recommended in quality management for medical services is attention to the processes involved in diagnostic and therapeutic procedures (12). Therefore, infertility centers should be managed in some way in the service processes so that the best practices are provided with the least error (13). Although some research has been carried out on the identification and evaluation of errors in Iran, no studies have been found in this regard in infertility centers. The importance of examining the errors in medical services is growing increasingly in the occurrence of errors (5). The consequences of errors and failure to identify them in infertility centers have a direct relationship with psychosocial effects and sustained critical periods (14). Therefore, an increase in the quality of fertility and infertility services will reduce the mortality rate of women (15). Despite the importance of errors in infertility, a paucity of evidence remains on their identification and evaluation.

This study aimed to identify and evaluate the causes of errors from admission to ovulation induction process in an infertility center in Isfahan, Iran, using the Pareto analysis.

Materials and Methods

This descriptive-analytic study was conducted to identify the errors that occurred from admission to ovulation induction and evaluate the causes of errors using the Pareto analysis in a fertility and infertility center in Isfahan, Iran.

Part 1: Identification process was conducted using the following steps:

A: Process selection and establishment of a team

Given that service processes are not the same in each infertility center, part of the information about infertility processes was obtained through field surveys and conversations with officials from each unit. Accordingly, five processes were selected from admission to ovulation induction, which included admissions and midwifery counseling, hospitalization, Eritron, Andrology, and Pathology.

To collect the main information about the errors and their causes, a team was chosen consisting of researchers, two infertility

center supervisors, one obstetrician, the head of the center, the first and second admission experts, the experts in the Departments of Andrology and Erythron, Pathology, as well as Midwifery Counseling, and the head of the inpatient department from each of the five selected processes.

B: Preparation of the involved process diagram

At this stage, the researcher carefully observed the processes and received confirmation and feedback from the team. Subsequently, the charts of each process were plotted, and a researcher designed a flow diagram using VISIO software (electronic development company walnut Shahmirzad). Following that, the primary version was sent to the team members, and it was then evaluated, modified, and finally approved during a session with the members.

C: Identification of potential errors in processes

At this stage, all possible errors in the process were noted in the sheet. In the next stage, a meeting was held with the members of the team, and feedbacks were received from them. Subsequently, the highest frequency of errors in each process was recorded according to their repetition rate in the event of an error.

D: Determination of the error causes in each process

At this point, the causes of errors are listed in each process as in the previous step and recorded along with each error.

Part 2: Evaluation of the error causes using the Pareto analysis

The most common causes of the errors were analyzed in this stage using the Pareto analysis.

The results of the Pareto chart showed the frequency distribution in terms of descriptive data. Moreover, the horizontal dimension of the descriptive and verbal data revealed the frequency or percentage of each section of the errors. The drawing steps of the chart was the same as drawing a column chart. Errors were sorted in descending order, which was given in Table 1. The frequency of all errors was determined at 80%, which was shown in a linear graph using Excel 2010 software.

Ethical Considerations

The study protocol was approved by the Ethics Committee of Isfahan University of Medical Sciences, Isfahan, Iran. Informed consent was obtained from the authorities and personnel who participated in the sessions.

Result

Initially, 123 errors were identified out of five proposed processes. Subsequently, 32 errors obtained the highest frequency in terms of the error causes. Table 1 presents an overview of all error causes, which are obtained from any of the five processes. In the next stage, after listing and determining the frequency of error causes, the Pareto chart was drawn up using the results obtained from the analysis (Chart 1).

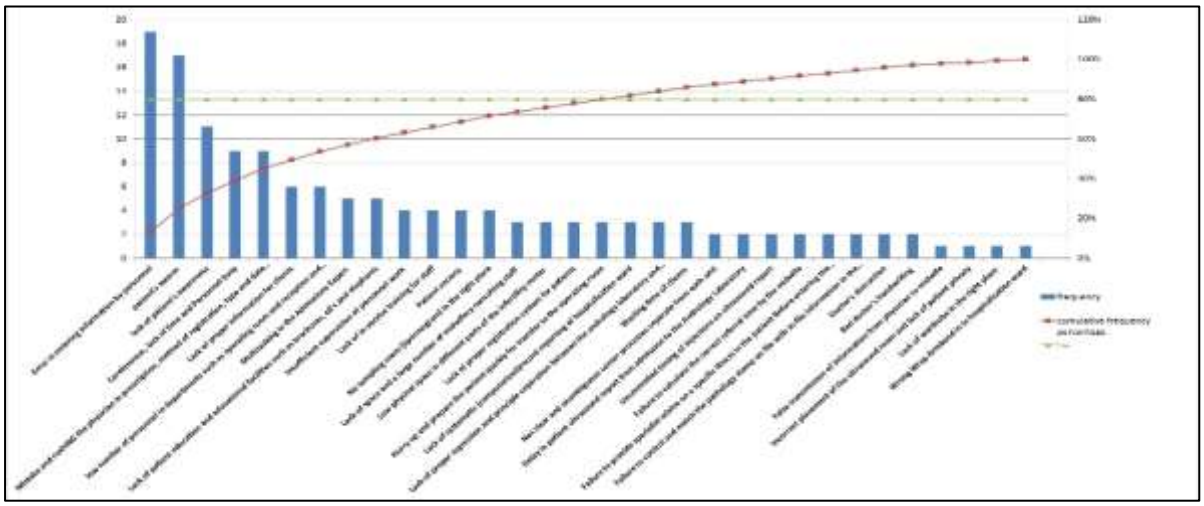

Chart 1: Most common causes of error using the Pareto analysis

The results indicate that the most common causes of error in each of the five processes are related to "mistakes in entering the system information by the personnel (13%), patient's swarm (25%), lack of knowledge (33%), personnel occupational status (39%), and prescription errors made by doctors (record, date, and condition tests [45%]). In fact, 80% of the final errors in each of the five processes resulted from 20% of them.

Table 1: Error causes and frequency

No	Causes of Medication Errors	Frequency
1	Mistakes in entering the system information by personnel	19
2	Patient's swarm	17
3	Lack of knowledge	11
4	Personnel occupational status	9
5	Prescription errors made by doctors (record, date, and condition tests	9
6	Lack of proper notification to the clients	6
7	Low staffing in the hospital	6
8	Multi-tasking expert reception	5
9	Lack of training to the patient and lack of training opportunities	5
10	Lack of adequate supervision over personnel	4
11	Lack of continuous training for personnel	4
12	Patient concealment	4
13	Absence of the right place for the preparation of a spermogram	4
14	Lack of space and a large amount of staff in midwifery counseling	3
15	Low physical space in different parts of the infertility center	3
16	Lack of proper registry system for patients	3
17	Rush and prompt patient preparation to transfer to the operating room	3
18	Lack of registration system reporting in hospital	3
19	Lack of proper deployment and principled separation between the laboratory of Andrology and Erythron	3
20	Wasting time of customers	3
21	Transparent and non-written processes in each sector	2
22	Delay in the ultrasound report of the patient from the hospital to endodontic department	2
23	Failure to control the time of injection of ovulation induction medication and not to match the patient's ultrasound	2
24	Failure to accurately calculate the midwife for the next patient visit	2
25	Lack of specialist patient consultation on the presence of specific disease before entering admission	2
26	Non-re-control to ensure that the pathologic specimen is recorded in the case with the outside of the case in the hospital, operating room, and department of pathology	2
27	Distracted doctoring	2
28	Doctor's handwriting (illegible)	2
29	Transferring wrong information from doctor to midwife	1
30	Wrong layout of ultrasound room and patient's privacy	1
31	Lack of a dressing room in a suitable place	1
32	Closing an inappropriate colored armband to transfer the patient to the operating room	1

Discussion

This study aimed to identify and evaluate the error causes from admission to the ovulation induction process in an infertility center in Isfahan, Iran, using the Pareto analysis. The most obvious finding to

emerge from this study is that 123 errors were identified out of which 32 errors obtained the highest frequency for the error causes. Moreover, the most common causes of error in each of the five processes were related to "mistakes in entering the system information by personnel (13%), patient's swarm (25%), lack of knowledge (33%), personnel occupational status (39%), and Prescription errors made by doctors (45%) (record, date, and condition tests). In fact, 20% of the major error causes contribute to 80% of the final errors. The evidence from this study list all detected errors separately for each process considering the causes of the errors. This model was similar to the one presented by John Attar et al. and Paula Lago et al. (16, 17). Taken together, it seems that the findings highlight the focus of the planners on corrective actions to identify errors and their root causes. Although Yarmohammadian et al. (1387) carried out a study on the frequency of potential malfunctions separated from the processes of the medical records department, Attar et al. has not established this mechanism. However, it is one of the important features, which was included in the present study (16,18). The highest error frequency (42 error) was related to the admission, as well as midwifery and hospitalization potential. On the other hand, the least frequent error was related to the pathology process with five potential error states. Furthermore, Mazlome et al. classified errors in three areas related to physicians, patients, and nurses with the highest frequency in patients (19). In these studies, due to the diversity of research environments, one can expect differences in the frequency of error detection. However, the high-frequency errors detected in a process cannot be considered the less important ones in other processes with less frequency. Therefore, the pathological process obtained the least frequency in error identification in this study, which is consistent with the results of a study conducted by Waghefi et al. (20). The present study used Excel software, Pareto analysis, or the 20/80 rule. The findings showed that the most remarkable results to emerge from the data were the same. These early successes should be transferred to authorities and managers, including the directors of the fertility and infertility centers focusing on this fact that 20% of the major error causes contribute to 80% of the final errors. The results of this study showed that the most common causes of the error were the first five cases shown on the Pareto chart. According to a study conducted by Mostadam et al. entitled “Improvement of Patient Satisfaction Index in the Health Care Center using the Pareto Mapping", a reduction was observed in the treatment time from 89 to 62 days. Moreover, this study identified the critical stages in the treatment that resulted from the physician's undesirable actions and long-term treatment duration (21). The study performed by Atashgar and Khosravi to improve the quality and reduce the costs in medical institutions showed the efficiency of this chart in the identification of the true and hidden causes of errors (22). After reviewing various databases, no studies were found related to the improvement of the quality of the therapeutic processes of the infertility centers, which was used to identify the true and hidden causes of errors.

Conclusion

This study identified and evaluated the error causes from admission to the ovulation induction process in an infertility center in Isfahan, Iran, using the Pareto analysis. The most obvious finding to emerge from this study is that 32 errors obtained the highest frequency for the causes of the errors. The most common causes of the error in each of the five processes were related to mistakes in entering the system information by personnel, patient's swarm, lack of knowledge, personnel occupational status, and prescription errors made by doctors (record, date, and condition tests). Although this study focuses on the Pareto chart, the findings may well have a bearing on the root causes of errors. This study has demonstrated, for the first time that the Pareto chart seems to be a useful tool to identify the main problems created by diagnostic and therapeutic processes, and true causes of errors, including common

errors. The Pareto chart indicates that 80% of the errors are hidden in 20% of their causes. Therefore, Pareto's use of all diagnostic and therapeutic processes in the fertility and infertility centers and efforts to minimize errors is felt by comparing the errors and their underlying causes. Moreover, the authorities in these centers should focus on the smallest process errors accompanied by several possible causes to improve the quality.

Limitations of study

Unfortunately, this study provided researchers with no sufficient opportunity to take corrective actions and review the results to assess error reduction.

Recommendation and implication

This study has raised many questions to be answered in further investigations. If the debate is going to move forward, it is important to have a better understanding of the root causes of the errors using the Pareto analysis. This finding suggests the improvement of several courses of action to enhance the identified process errors and error assessment in the operating room section of the infertility centers. Moreover, the role of managers should be investigated in this regard to improve the quality of services provided in diagnostic and treatment centers.

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