PREVENTING MEDICAL ERROR TO SAVE THE BRAND IMAGE OF THE HOSPITALS USING POKA –YOKE TECHNIQUE

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ABSTRACT

Poka-yoke technique is a Japanesetechnique, which helps to create error free services to the organization.Poka yoke works toprevent defects, detecting defects or alerting a worker when a mistake has been made or taking proactive actions to avoid error.The main goal of the study is to comprehend how Poka-yoke technique is used in Indian hospitals to lower the frequency of medical errors and contribute to sustenance and brand name of the hospital for both quality and trust. The brand image of Indian hospitals is getting affected because of the continual rise in medical errors which needs severe and immediate attention.Proper implementation of Poka-yoke techniques will also reduce the financial burden of medical errors at the hospitals. Every day some serious issues of medical error reported athospitals in India whichaffects the image of the hospital. In this study, researchers covered role of Poka-Yoke, Medical error, and its impact on the Brand Image of the hospitals and try to understand the reason and prevention of medical error for ensuring a meaningful customer experience and retention.
Key words: *Poka-yoke, error proofing, Medical Error, Hospitals and Brand Image*

INTRODUCTION:

Poka-Yoke is a Japanese term that means "mistake proofing". This term was first used by Shigeo Shingo,an Engineer working for Toyota inthe 1960's.Poka-yoke was the original term, whichstands for "idiot-proofing," but the term was changed due to negative connotations.Poka-yoke aids in enhancing the mechanics of devices and guarantees that either they are operating correctly and adhering to regulatory standards of working that are installed on procedure, equipment or work pieces that makes it intolerable to produce faults to move to a product which is lacking the desired characteristic before it movesto the next process. **[10].**

Trial and error arecomponents of the learning process in humans.There isa highprobability of inaccuracy when examining the boundaries of scientific research, clinical practices, and suggesting the medicines subscriptions. Errors may be foreseen, predictable, and harmless expressions of an advancing art and science used on a population with a wide range of health conditions.Due to lack of clarity and novel experiences associated with innovative products, some nations have a unique legal boundary with the exception for new medical devices. **[1].**The IOM report from 2006 explored the following ways to decrease pharmaceutical errors:

First, services that are provider-centric should give way to partnerships in communication between patients and their healthcare professionals. In other words, people should be more accountable for tracking their medication. The Agency of health care research and quality (2021)stated that the case of patient safety has been improved by 1% annually. The original IOM cost estimate for this error was $ 21-22billion annuallyresulting in the health care cost increasing by 5.5% annually**[9].**It was suggested that information booklets distributed by pharmacies be standardized and improved so that more drug information canbe made accessible online, and that a national hotline with 24-hour availability should be established.

Second, medical professionals need to use information technology more effectively. The use of electronic prescriptions to check automatically expected medication allergies, drug-drug interactions, and excessively high doses is one example. Another is the use of electronic prescriptions to prevent errors from handwriting orders. Third, packaging and labeling must be improved. Designing new drug information sheets is equally necessary.

ERROR BY CHANCE OR BY MISTAKES

Errors are natural or most of the times man made. This is the most debatable subject now a days. The proverb "Without mistake, a leader cannot learn" somehow supports the validity of the errors. However, in the case of medical procedure, if an error occurred, it may damage a chain of activity and leave a long-lasting impact on the economy and human loss. Failures due to lack of accountabilitystandhighestbecause of human errors and mistakes. The main cause of errors are as follows: -

The foremost reason for the error is misunderstanding and communication failure. In medical procedure understanding about the disease and related symptoms is very difficult. It leads tothe identification of real problems and raisesthe number of cases of error. Medical caregivers takemany precautions with good intentions but sometimes not properly implemented. At the time of medical emergency and in urgent medical procedure, there are many challenges before the caregivers comeup with the problems identification and sometimes solution.Therefore, there is ample chanceof missing or adhering to the main process. Moreover, incorrect precision while and during procedure or a part of the equipment might be leftduring surgical intervention unintently but threatening the life of the patient**[15].**

Training inthe new technology is very important. Lack of the training meanslessexpertiseand, in this case,follow-upand recommending newer solutions and proactive problem identification also becomes difficult. Today there are number of new technologies like IoT and Artificial intelligence-basedmethods to telemedicine to use of robotics, application of virtual reality and augmented reality during diagnosis, prescribing medication or also during any surgical intervention. Like google lens and virtual reality can be used during surgical procedures to record the operation for the budding medical practitioner.

Another important challenge that affects the quality of services is the work pressure and availability of resources.Trained caregivers provide the right information about the patients to their related staff, decision makers and even to the extended families who are equally under pressure to perform. All the above must be prevented with the help of the Poka-yoke.

There is another factor which is psychology of human beings as professionals, an open mindset, innovative design thinking approach and a culture wherein every case and mistakes made are well discussed, analyzed and then thoughtful interventions are planned will even help to resort behavior, psychological and relationship issues amongst the clinicians, family of patient, patient, and doctor and even within the staff as well. Humans have the power to bring change and adopt better methods, approaches and procedures that help in keeping the medical process under control.[11].

Errors will still be committed. On the other hand, accidents can be largely avoided by making creative and sensible use of additional indicators that alert people to possible mistakes and enable them to be addressed before any loss incurs. Physical design should be utilized whenever possible to prevent damage due to error. This is so because it is a well-designed and framed way of following a correct protocol for the benefit of all.**[2]**

In continuation with the problem ofoverload and lack of manpower, which is amongst a common problem for majority hospitals, the nursing staff is overburdened thus there are high chances that due to overburdening and psychologically being occupied there are chances that nurses may sometimes be incapable to remember to prepare the medication either timey or in correct dose.It is generally seen that manufacturing activities will be missed by 1 in 10,000 to 1 in 100,000 times without being noticed and so the defect rates up to 100 ppm will be caused by omission mistakes alone which is equivalent to mistakes when things go unintently wrong.

In the case of manufacturing too the same principle applies wherein it is understood that each work cycle should last no longer than one minute in efficient production operations, with a worker doing each cycle about 400 times each day.

In settings like nursing care, where each specific type of procedure, like administering an injection, may only be repeated a few times a day, omission errors will happen even more frequently. One sort of mistake is mental lapse. Nurses may unintentionally choose the incorrect drug, misread the prescription, choose the incorrect dose, administer the medication to the incorrect patient, choose the incorrect quantity of capsules or pills, or unintentionally drop a pill without being detected.**[3].**

These are only a few of the numerous mistakes that could take place. Thus, even while each kind of error is a rare occurrence on its own, mistakes as a group are likely to be the main cause of poor-quality medical care. The author saw seven mistakes in two hours while visiting a hospital's clinical chemistry lab, including a blood sample with the wrong patient's name, specimens loaded on the incorrect processing equipment, and misplaced specimen labels.

The idea that mistakes are the primary cause of healthcare issues is supported by the large range of potential errors and mistake rates for common processes.The findings of investigations into the causes of quality issues have consistently supported this view. According to the Harvard Medical Practice Study10 conducted in 1991, medical treatment errors resulted in serious injuries in 3.7% of hospital patients, with management errors accounting for 58% of these injuries. Due to prescription errors, 6.5% of patients admitted to hospitals encounter harmful medication effects. The fact that 1% of these errors were deadly highlights how dangerous they were understanding the expectations of stakeholders.[**8**].

In the case of health care services, brand image of the hospitals is based on the belief, ideas, and impression of the patients. The qualities of the availed services determine the value and approach of the hospitals. A perfect and highly satisfactory brand image is not possible since services are not aligned being outstanding.

The treatment experience and services quality of the caregivers is the criteria that forms a brand image of a hospital. Additionally, the hospital's brand image serves a strategic function. A hospital's brand image can be leveraged to boost its competitive position through strategic marketing initiatives **[13]**. Therefore, a positive hospital brand image contributes to strengthening the purpose for what peoplehave, while choosing a hospital.

Hospital brand image refers to a set of perceptions associated with a brand and reflects a customer's overall view of a brand. **[6]**. Given how crucial it is to customer decision-making, brand image has been extensively examined in relation to consumer purchase behavior. **[7]**.

Brand image is a notion that relates to both corporate entities and tangible objects. A company's brand image is the collection of perceptions about its name and reputation, and it stands for both practical and emotional aspects of a business.**[4]**. In today's competitive business world, a company's brand image is a critical success component in all industries, particularly the service industry. Indian hospitals have good image among the countries in southeast Asian continents. A service provider's ability to maintain its market position depends on its brand image. **[5]**.

The brand image of hospitalshas strategic implications for attracting and retaining customers in the Medical Industry.Brand image in the medical industry plays a critical role in attracting customers, and itplays an important role in brand building. Irrespective of a well created and established brand image, with a single medical error it can damage the popularity and reputation of the Hospital**[14]**.

RATIONALE OF THE STUDY:

Elimination of medical error helps in reduction of the medical cost. According to a report plenty of the cases of medical error reported every year in hospitals of USA. Moreover, if we look across the world, the numbers of cases are uncountable. According to the report of WHO, the death toll with the cases of medical error is higher than the cases of road accidents every year in India. In these connections, researchers took the initiative to find how by deploying this technique medical errors can be reduced.

OBJECTIVE OF THE STUDY:

This study's main goal is to comprehend the Poka- yoke techniques and its role in a mistake proof environment in medical procedure in Indian hospitals. Since Poka-yoke is a Japanese technique which helps to make an error free environment in Indian Hospitals, keeping all these things in mind this study included the role of Poka-Yoke in Indian hospitals and how care givers may use this method in their day-to-day operations.

The key objective for this study is.
- To explore the role of Poka-Yoke in prevention of the medical error in Indian Hospitals.
- To explain the role Poka yoke in brand building of the Indian Hospitals.

RESEARCH METHODOLOGY:

As poka-yoke is a tool which used in different procedures in the organizations. The study was conducted between the November 13, 2022, to February 2023, using a sample of 300 with 160 Males and 140 Females caregivers at the various hospitals of Delhi and NCR.

This research was being conducted with the help of the Schedule which was prepared by the researchers. Before administration, the schedulewent through the pilot study to check the reliability of the questions. For the data collection government, semi-government and private hospitals were selected.

This study was not possible without the help of students pursuing management programs. A groupof students helped in data collection[17]. A very interesting job to transfer knowledge the students'because they can provide their services as enumerator. There were three groups of students who went in three geographieswhere major government and private hospitals were present. Research is the systematic process in which researchers work based onevidence and experiences. While research helps in determining the direction, determination of the appropriate research design is a valuable part of quantitative research. Research design is different in logic, rigor or even specific in many cases. If data set is complicated, Researcher must use a robust approach to research design from the outset, making research conclusion convincing to special audiences[12].

Cluster sampling is used in this research where researcher selected a specific cluster of the government and private hospitals and data has been collected from this cluster where caregivers had given their view without any hesitation.Responses received with the help of schedule by the researcher are as follows.

Care givers	Government Hospitals	Private Hospitals
Male	84	76
Female	75	65

HYPOTHESIS FOR THE STUDY:

Formulation of hypotheses without prior information of the data allows one to prove or disprove their theory. It also allows one to contemplate the results. Hypothesis is also known as the tentative solution toproblems. A sound hypothesis always helps researchers to understand the contemporary situation of the real problems and help to quantitatively approval of the tentative solution.

In exploratory research, making hypothesis requires more emphasis on the experiments being the key fact of the research design. Another terminology is exemplary design research. It has been suggested that in conventional design research, there is a substantial relationship between research topics, research programs, and design experiments.

HYPOTHES FOR THE STUDY: Hypothesis formulation helps to get the results tentatively for the study. As this study is dealing in Poka- yoke techniques, researchers collected information with the help of schedule and will analyze raw data with the help of quantitative analysis.

The hypothesis for the study is as follows.

H1: Poka-Yoke is a revolutionary technique used in Indian hospitals to reduce medical errors.

> **H1:** Poka-yoke procedures and the reduction of medical errors in Indian hospitals are not significantly related.
>
> **Ho:** Significant connections exist between the uses of Poka-Yoke techniques and Prevention ofmedical error in Indian hospitals**.**

H2: The brand image of Indian hospitals improves with the help of error free medical services.

> **H1:** There is no association between the brand image of the hospitals and Medical error.
>
> **H0:** There is a considerable association between hospital brand image and medical error.

HYPOTHESIS TESTING:

Testing of the hypothesis is an important process in any research. Scientific as well as in non-scientific research, without hypothesis means, the level of the validity is not good for the study. For the present study, the first hypothesis would be tested.

> **H1:** There is no significant relation between the uses of Poka-yoke techniques and Medical error in Indian hospitals.
>
> **Ho:** There is a strong correlation between the uses of Poka-Yoke techniques and medical Error in Indian hospitals**.**

Table-1, Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Poka-yoke	1.6375	400	.79541	.03977
	Medical error	1.7175	400	.74436	.03722

Table-2, Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Poka-yoke& Medical-error	400	-.008	.868

Table-3, Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Poka-yoke& Medical-error	-.08000	1.09389	.05469	-.18753	.02753	-1.463	399	.144

This study found that Poka Yoke and Medical error havesignificant relations which focuses on the hypothesis. After the analysis ofdata, it has been found that the calculated value of t is 1.463 and p is 0.144.The estimated value of p is smaller than the standard value, which compared with the Alpha value at 95% of the confidence level (.05).

Thus,researchers are failing to accept the null hypothesis. Accordingly, it was found that there is a considerable connection between the Poka-Yoke and medical error.

H2: The brand images of Indian hospitals improve with the help of error free medical services.

   H1: There is no significant association between hospital brand image and medical error.

   H0: There is a significant association between hospital brand image and medical error.

Table-4, Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 2	Brand Image	2.0600	400	1.13562	.05678
	Medical Error	1.8900	400	.72402	.03620

Table-5, Paired Samples Correlations

		N	Correlation	Sig.
Pair 2	Brand Image &Medical Error	400	.115	.022

Table-6, Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			

Pair 2	Brand Image &Medical Error	.17000	1.27482	.06374	.04469	.29531	2.667	399	.008

In the next hypothesis of the study where researcher tried tounderstand the relationship between Brand Image and Medical error where after applying the t-test the value of p is 0.008 which is below the standard value.Therefore, the researcher rejects the null hypothesis, and it can be concluded that there is a considerable association between medical error and the brand image of hospitals.

DISCUSSION
In thefirst hypothesis, it has been concluded that there isa significant role of the Poka- Yoke in prevention of medical error. Hospitals using Poka-Yoke have the least number of cases of medical error. However, inthe second hypothesis the rejection of the Null hypothesis shows that Hospitals Brand Image is strongly related with the case of medical error.

In India patientsare having more faith in all those hospitals where incidents of medical errors are less. It is impossible to blame a human being for a mistake because people do not behave like computers and make mistakes by nature. We cannot hold people accountable for every error. Human nature also includes intelligence, allowing us to govern one nature by another.

Poka yoke is merely a tool for that intelligence. At the time of patients' admission, every medical institution must ensure an error free procedure, even though many people die or are injured every year by the medical device failure. To prevent life-threatening mistakes in health care services Poka-Yoke is used widely.

In the case of uses of the medical devices, mistake proofing is very important, and implementation of such tools prevents the patients from human error[16]. There is no doubt that this Japanesetechnique needs extensive training to limit the possibility of these errors. Lean manufacturing mistake- proofing techniques of Poka-Yokehelp to design safety proof devices, which reduce the chances of serious medical error and this technique, have covered a long distance in this direction.However,manufacturers of medical devices follow the highest standard protocol and any failure in the devices may lead the wrong diagnoses, injury or sometimes thepatient collapses.

Hospitals are assessed based on their error proof medical services to the patients. An error proof hospital is itself a marketing tool for their organization and patients are having more trust. It means customers have faith in a brand, which is error free. The brand image of the hospitals is directly proportional to their error-free services.

Whenever customers think about the any product or a service, the prime objective is to determine the brand and their attributes. Customers always think ofbetter brands to compensate for paucities in quality or services.Customer loyalty is directly related to customer satisfaction and if outstanding services are provided by the hospitals, they become the brand, and the hospital image attracts more customers. An error-free medical service means there are several psychological factors thatcome in between which create a long-lasting, mutually profitable partnership between the hospital and its clients.

CONCLUSION
Services at the hospitals are the key to the satisfaction of the patient and mistake proof service is the tool to make hospital as a brand. A customer spends money for their well- being and the limitation of the study includes the types of research design and level of the respondents. This

study is descriptive,and Poka-yoke is such a subject, where the range of possiblevariables are large.

Several other variables like health status of patients, hospital characteristics, and health care experiences may be included. Poka yoke effectively covers the aspect of detection and prevention of medical error. While manufacturing medical devices, a small error fortified the chance of the error in many folds. Pokayoke supports the caregivers as alarm. The design of the device helps caregivers to send a signal before any mistake and user can quickly correct the problem.

SCOPE OF THE STUDY

To take corrective actions while all medical procedures save patients from any harm. This study is moving around the problem of medical error.Medical error may take place at any stage. As a human being, keeping concentration allthe time in any work is not possible. However, mistakesmay beinevitable at any stage, so effective usages of Poke-yoke prevent and the cases of medical error and helps to the hospitals in their brand building.

The brand image of any hospital is based on their qualitative services. If there, will be mistake proof services in the hospitals, it will enhance the value of the hospital and help to create brand Image for the respective hospital. Hospitals have their own limitations, and they never compromise with ethics and try to maintain the quality of the services.

Model Statistics: Data was normally distributed, so t-test analysis was used.

Funding Sources: No fund has been taken from any source.

Ethical Issue: We hereby declare that there are no ethical conflicts in this research study.

Conflict of Interest: There are no conflicts of interest in this research work.

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What is already known in this topic? Since quality adherence is an essential part for any hospital services, their previous studies have emphasized on role of this technique in improving the technical and surgical intervention largely. The papers published till date have majorly

focused on how this technique can help to improve the health outcome for any medical institution.

Previous studies have also highlighted how doctors and staff can utilize the benefits of the technique.

2.What does this study add?

The present study adds the following in-depth benefits-

a. It is based on primary study and supported by statistical tools that makes the study relevant and reliable for implications.

b. The novelty of the study lies in exploring and identifying the role of this technique in both Government and private hospitals as the work setting, resources availability, physical infrastructure, budget, expertise is quite different than the Private hospitals. Thus, the study finds relevance of the technique in both settings.

c. The Third important uniqueness of the study lies in assessing how the adoption of Poka yoke technique as a distinct method also helps in improving the brand image of hospitals. Thus, the study covers the impact of adoption of modern techniques for quality excellence on branding of hospitals for betterment and customer service excellence.
    This being at a time of competition being the severest most need for ensuring competitiveness. Positioning and sustainability.

3.Suggestions for further development?

As the study focuses on service quality excellence by adoption of effective quality methods and understand the relevance of rising health complexities, role of health equity and rising Government interventions for ensuring good health for all, it becomes imperative that such topics hold great relevance in improvising and providing excellence in health service. Since it affects the positioning and branding of health sector thus the impact of adoption of these techniques can be paired with other variables as well like leadership, competition strategic outcome etc. It can also be conducted across different geographical settings to measure impact.