## Editorial

### **Cost Containment in Healthcare**

Cost containment in healthcare can be defined as the conscious activities and policies, processes and norms adopted for reducing the cost without compromising the outcome and quality of care. In today's healthcare scenario, healthcare expenditure even in developed countries has increased by 5–7% of GDP. Per capita cost of healthcare has similarly increased. Elderly, representing 11%, use about 30% of healthcare costs. In our country, out of pocket expenditure by the clientele is maximum. In this dynamic environment it is imperative that cost containment is one of the major drivers for healthcare industry to grow further.

Cost containment is the business practice of maintaining expense levels to prevent unnecessary spending or thoughtfully reducing expenses to improve profitability without long-term damage to the company. Cutting expenses in ways that decrease quality or reduce marketing efforts to bring in new business can lead to a company's demise and are not examples of a cost-containment strategy.

Healthcare ecosystems involve the balance between the demographic and epidemiological developments, the progress in biomedical technology, the strong efforts to control supply, demand, and high medical costs, as well as the continuous exchange of ideas and experiences, ensuring quality health care and reaching out to the huge underprivileged ones. Actual trends, regardless of the organizational and financial structure of the healthcare system, point to cost-containment policies in the public or private health sector. The containment of public health expenditures is of utmost importance since their continuous and uncontrolled increase deprives other social sectors of public funds. In the private sector also, this cannot be overlooked because of inflationary tendencies in the health services cost, the burden falls primarily on the routine budget with a direct and indirect impact on the economy in general, leading to inequalities in the provision of health care and the access to healthcare services.

The doctor is the final health services administrator, exercising an influence on the diagnosis and treatment process. Hence, it becomes morally binding on him to strike the ethical as well as social balance to deliver effective health care. Various operational research tools such as cost-benefit analysis, program evaluation and review technique, break-even analysis, operational audits, are some of the methods to monitor cost containment. Thus cost-containment policies in the health sector do not mean cuts in health expenses, but rational and efficient allocation of scarce resources.

The problem is known as "cost disease" — the rapidly escalating costs of basic human services like health care, housing, education, construction, and infrastructure. Cost-containment measures in healthcare aim to prevent unnecessary tests, treatments, medical devices, or surgical procedures. Uncompensated care is overall measures of services provided for which no payments were received from the patient, client, or third-party payer.

Insurance sector is growing very rapidly and organizations, including government, are promoting this aggressively. The managed care, the insurance company, makes all-out effort to decrease healthcare costs and coordinates medical services. The two main types are: preferred provider organizations (PPOs) and health maintenance organizations (HMOs). PPOs contain cost by negotiating discounts for services with hospitals and physicians as a condition for being included in the organization. Receiving a discount allows the PPOs to reduce health insurance premiums and healthcare expenditures. In turn, the patient receives a greater percentage of cost covered by the insurance company if they stay with providers that are in the PPOs. The patient may choose a provider that is not in the PPOs, but will pay a higher amount out of his amount. HMOs provide healthcare services to members for a fixed yearly fee per member. Providing too much or too costly care, could cause them to lose money. Preventative care is encouraged with this type of structure, in an attempt to avoid more costly corrective care.

Efficiency measures, also known as cost-control measures, serve many important purposes, like measure of performance of one unit relative to other units of the same organization and as a measure of performance between similar organizations. It also facilitates performance auditing and acts as a tool for analyzing and controlling the cost of inputs, as well as an evaluation criterion for accrediting agencies and regulatory bodies.

The development of efficiency measures depends on the effectiveness of an organization's financial system. The process of determining efficiency measures needs information from different parts of the financial system such as financial and cost accounting, budgeting, and auditing. Once efficiency measures are developed, these serve as important ingredients in managerial decision-making in budgeting and may also serve as important benchmarks in both financial and performance auditing. The feedback mechanism between budgeting and auditing follows the accounting cycle.

Reducing patient length of stay has been one of the main targets for clinical cost containment in hospitals. Other method by which hospitals can contain costs is by implementing electronic alerting systems that notify clinicians when they've ordered tests or antibiotics with less expensive alternatives.

Some of the biggest challenges facing providers interested in implementing cost-containment strategies include capital investment requirement, which is a huge determining factor for healthcare organizations growth. Simultaneously emerging trends like data analytics and electronic health records are stepping in a big way. Artificial intelligence has also revolutionized healthcare delivery. Time is not far when various diagnostic services may be controlled under the domain of artificial intelligence thus leading to optimization of healthcare services. It is imperative that measures should be put in place to reduce litigations and fostering a culture of finding competent physician champions, administrative leaders or a clinical optimization officer to spearhead cost-containment efforts.

The scenario pertaining to healthcare remains grim in India in spite of much efforts. The doctor-patient ratio in the country is much lower than that advocated by the WHO. However, with the advent of technology and its spread to the healthcare sector, this gap is decreasing and time will bridge the gap with continuous efforts from all sides. Moreover, the change due to introduction of universal healthcare umbrella scheme of Ayushman Bharat is awaited despite the several odds facing its implementation and success.



There are many potential dangers of conflating cost containment and care coordination. It causes the merits of care coordination to be judged on the basis of savings, diminishing the importance of coordinated care itself as a worthy goal that can enhance patient experiences and improve outcomes even if it does not reduce utilization or produce net savings.

It could also prevent a meaningful science of waste reduction from emerging in health care. An overemphasis on care coordination as a cost-cutting strategy could divert attention and resources away from the development of approaches that eliminate the provision of low-value services more effectively. Innovation in this area is sorely needed but undercapitalized relative to the burgeoning industry of health analytics companies promising big returns from patient engagement and seamless care.

The existing evidence shows that the effectiveness of cost-containment policies varies greatly between policies, underlining the need for evidence. Future policy evaluations should focus on the effectiveness of cost-benefit analysis, cost-effect analysis and cost utility analysis as many evaluations do not take into account cost-shifting possibilities by providers and patients.

It is time that cost-containment strategies are augmented with evidence-based studies and this much-needed concept is realized to benefit maximum clientele.

### Shakti Kumar Gupta

Medical Superintendent All India Institute of Medical Sciences Dr RP Centre for Ophthalmic Sciences New Delhi, India Editor-in-Chief, IJRFHHA

> Maj Gen Sunil Kant, VSM MG (Med), EC Editor-in-Chief, IJRFHHA

# **GUEST EDITORIAL**

### National Cancer Institute, AIIMS, Delhi: A Pathbreaking Project to Bring in a New Era in Cancer Care in India

With the control of communicable diseases, noncommunicable diseases (NCDs) including cancers are fast becoming major causes of morbidity and mortality in India. Cancers have profound social, psychological and financial implications on the patients and their families. In India, it often leads to family impoverishment, physical and mental distress. In our country, the data on cancer in India is collected by Population Based Cancer Registries (PBCRs) of the National Cancer Registry Programme (NCRP) of Indian Council of Medical Research (ICMR). Realizing the success of the NCRP, it was extended to cover other common NCDs such as diabetes, CVD and stroke and was converted to National Centre for Disease Informatics and Research (NCDIR) under the ICMR in March 2011, because most NCDs have similar etiological factors. The broad and overall objective of the NCDIR is to sustain and develop a national research database of four common NCDs through recent advances in electronics and information technology with a national collaborative network. According to the NCDIR data, annual incidence of cancer which was 14.5 lakhs in 2016 is projected to be 17.5 lakhs by 2020. Breast



cancer incidence is expected to increase from 1.5 lakhs to 1.9 lakhs, whereas lung cancer incidence will rise from 1.14 lakhs to 1.4 lakhs by 2020. The cancer death per year is projected to increase from 7.36 lakhs to 8.8 lakhs in 2020. However, there is a wide demographic variation in the incidence of cancer across the country. Aizawl district in Mizoram has the highest age-adjusted rate (AAR) of 270.7 in males while the rural registry of Barshi in Maharashtra has the lowest AAR of 40.9 per 100,000 population. This suggests the impact of varied environmental, genetic and socio-cultural factors like tobacco use, infections, and other modifiable risk factors. AAR in India are, however, lower compared with the Western data. Significant progress is happening in the areas of avoidable cancer. Cervical cancer incidence is coming down in India. Besides this, the recent WHO report has shown that the tobacco smoking reduction target of 2025 has already been achieved by India. Significant progress and achievements have also happened in the treatment of cancer in different parts of the world. The cure rates of some of the cancers like prostate have reached nearly 100% in early stages. Some cancers like breast, melanoma and thyroid have reached a 5-year survival rate of 90% or more. The above achievements have been possible due to better understanding of the biology of cancer and results of translational research in the various aspects of oncology carried out all over the world. The three major publications from NCDIR on patterns of care and survival studies (POCSS), one each on breast, head and neck and cervical cancer document the magnitude problem of cancer in our country and the results of cancer treatment in our country.

The government and private sectors both have been continuously working towards infrastructure development and capacity building in cancer care in India. The National Cancer Control Programme (NCCP) is a centrally sponsored scheme by the Ministry of Health and Family Welfare, Government of India (GoI), which was initiated in 1975. Initial priority of this programme was to equip the premier cancer hospitals/institutions in India to make them capable of treating cancer. Later, more emphasis was placed on primary prevention and early detection of cancer with modifications in the year 1984. The District Cancer Control Programme (DCCP) was introduced during 1990–1991 and later modified in 2000–2001. NCCP was evaluated in 2004, and was further revised with effect from 2005.

In view of preventable common risk factors of cancer and other NCDs, the Gol also started the National Programme for Prevention and Control of Cancers, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) after integrating the NCCP with other NCDs. Under the NPCDCS, there is an allocation of 120 crores to each for the establishment of 20 State Cancer Institutes (SCI). A sum of 45 crores each has also been earmarked for 50 Tertiary Care Cancer Centers (TCCC). A total of 35 institutions across the country have been benefited under this program so far. Under the earlier NCCP, schemes like regional cancer centre, oncology wing in medical colleges and DCCP, augmentation of infrastructure of several institutions have been implemented. Significant achievements have been made through these planned activities and the geographical gap in the treatment facilities in the country has been reduced.

The delivery of affordable and equitable cancer care is one of our greatest public health challenges. Out-of-pocket payments are a big burden to the patients and their families. The Gol has recently launched a large scheme for the poor people of the country called National Health Protection Mission, also referred to as Ayushman Bharat or the Pradhan Mantri Jan Arogya Yojana. This scheme is the largest health insurance project so far. It has two main pillars: strengthening of universal comprehensive primary health care and a health insurance scheme to cover 500 million people in need to reduce catastrophic out-of-pocket health spending.

We presently need to invest in suitable surveillance systems to monitor the changing trends in NCDs. Cancer registration program, which is well regarded, needs further strengthening and extension to the states not covered particularly the large ones. This includes recording of cause of death reporting system. So, presently we have an increasing incidence of cancer with negative socioeconomic impact, poor coordination among various cancer centers in treatment and an even greater need to conduct innovative and well-coordinated research to improve cancer outcomes in our country.

The National Cancer Institute (NCI), in the second campus of AIIMS, in Jhajjar, Haryana, has been envisaged as an institute of national importance. The main focus will be on translational cancer research particularly for India-centric ones and formulation of modern therapy for cancer patients in India besides providing state-of-the-art cancer care at very low costs. The state-of-the-art center was dedicated to the nation on 12th February, 2019, by the honorable prime minister of India. When fully commissioned, it will have 710 beds and 2705 employees. The research wing will contain 15 departments and 200 beds dedicated for translational research. The NCI is spread over an area of 67 acres in a campus of 300 acres with all the departments to conduct research. Various research projects as envisaged in the INDO-US Memorandum of Understandings have already been initiated in very close coordination with the main campus at AIIMS, New Delhi. The major objectives of this center is also to provide affordable quality tertiary cancer care to cancer patients, to act as the



vi

### **Guest Editorial**

principal agency of the country for coordinating and conducting research in oncology, to undertake clinical trials of newer drugs as well as vaccines to treat and improve the existing outcomes of therapy on survival and quality of life of the cancer patients, to set standards for cancer treatment and to evolve, update and disseminate evidence-based guidelines to promote uniform patient care across the country, to develop and support training programs and generate trained human resources in all areas of cancer who can participate in basic and epidemiological research and cancer treatment programs, to support and coordinate quality cancer research in regional cancer centers, other governmental and nongovernmental agencies. It will also strive to improve and harmonize the quality of research in cancer across the country and to translate the knowledge gained from research to evolve national cancer control policies and programs to improve the quality of cancer care services and quality of life of cancer patients. Emphasis will be placed towards creation of an independent data-monitoring committee to monitor and intervene if necessary in various trials in the country. NCI, in coordination with AIIMS, has already started conducting bench to bedside research. We also wish to start a new degree called MD-PhD in due course of time, which will be a comprehensive 6 years integrated training program. At the end of this course, a new group of clinical oncologists will be available in the country every year. They will not only understand the disease better, but will also contribute to eradicate cancer by conducting both fundamental and clinical research in the various areas like prevention, early diagnosis, management and rehabilitation. Like the success of the londian Space Research Organization, we are very confident that the NCI project will be successful in eradicating cancer in the long run.

### Prof G K Rath

Head, National Cancer Institute, AIIMS Ansari Nagar, New Delhi, India

### **ORIGINAL ARTICLE**

# To Study the Attitude of Staff in a Tertiary-care Trauma Center toward Patient's Relatives

Ravinder Ahlawat<sup>1</sup>, Amit Lathwal<sup>2</sup>, Sanjay Arya<sup>3</sup>

### ABSTRACT

**Background:** In the developed countries, there is a building consensus for more open visiting polices and changing the role of family as the active care provider. Kangaroo mother care is one such accepted norm, which has transformed the organization of obstetrics and pediatrics ward. It is the right time to check for the readiness of our hospital staff for involving relatives as a co-care provider in our settings. In this part of globe, the presence of patient's relatives  $24 \times 7$  in a public hospital is an accepted norm; however, their role has not been studied by the hospital administration and adequate provision has not been translated in the hospital architecture.

Aims: To assess the knowledge and attitude of employees working at the apex acute care hospital, New Delhi toward patient's relatives.

Setting and design: The study design is a survey research using a self-administered questionnaire to elucidate knowledge and attitude of healthcare workers in the apex trauma center.

**Materials and methods:** A knowledge-and-attitude survey based on a questionnaire was undertaken during July 2016, among willing employees. The performa was distributed to different wards and areas, and was gathered the next day. The questionnaire was developed with the help of the faculty of hospital administration, and a beta analysis was performed before the final application.

**Results:** A total of 159 performas were collected, of which 2 were rejected because of being incomplete. An estimated 93.6% respondents favor the idea of family staying at the bedside of a patient in the wards. Most of respondents were young, have 5–10 years of service, were well qualified, and were well versed with patient-care-giving practices. The factors favoring family stay in wards were ease to handle patients with accompanying family, family role in perceived faster recovery, emotional support to the patient, positive role of family in patient feeding, and role of family in reducing patient safety incidence. However, the role of family members in HAI and concerns for the privacy of the relatives were negatively related to the family stay in wards. The majority were not satisfied with the provisions made for the relatives in the hospital. A very high percentage believe that the design of the hospital needs to be changed for providing more space for relatives. The idea of introducing a foldable bed was accepted by a huge majority.

**Conclusion:** With the accumulation of the knowledge that severe hospital-acquired infection (HAI) incidences are not affected by the presence or absence of the relatives near the patient, the level of anxiety, incidences of cardiac complication, and stress hormones' level in the blood are favorably affected by the presence of relatives; family involvement is not just an administrative issue, and it has found clinical implication also. It is time to give bigger roles to the family for patients staying at the hospital.

Keywords: Family of the patient, Indoor ward, Trauma center.

International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1102

### INTRODUCTION

During 1980–1990s, there was a negative perception among staff nurses toward the role of relatives in hospitals and it was believed that relatives hamper patient care. There were also concerns about privacy and stress level of the patients and confidentiality of the patients.<sup>1</sup>

However, in a Fumagalli et al.'s study on the effect of unrestricted visiting policy (UVP) and restricted visiting policy (RVP) on safety and health outcome of patient in an ICU setting, it was observed that UVP does not increase sepsis complication in patients and was associated with reduced cardiovascular complications.<sup>2</sup>

In another study by Kleinpell on visiting hours in ICU, it was reported that the physician felt that there was no delay or uneasiness while examining patient, family stress was reduced and family trust was increased, and there was no perceived interference with delivery of care.<sup>3</sup>

In another study by Marco in Spain to evaluate the role of the belief and attitude of ICU nurses on the effect of open visiting policy on patient, family and nurses, a positive effect of visits of family was observed on the patient as well as on the family.<sup>4</sup>

<sup>1</sup>Office of the Director General Health Services, Health Department of Haryana, Panchkula, Haryana, India

<sup>2,3</sup>Department of Hospital Administration, All India Institute of Medical Sciences, New Delhi, India

**Corresponding Author:** Amit Lathwal, Department of Hospital Administration, All India Institute of Medical Sciences, New Delhi, India, Phone: +91 9350481550, e-mail: amit.lathwal@yahoo.co.in

**How to cite this article:** Ahlawat R, Lathwal A, Arya S, *et al.* To Study the Attitude of Staff in a Tertiary-care Trauma Center toward Patient's Relatives. Int J Res Foundation Hosp Healthc Adm 2019;7(1):1–5.

Source of support: Nil

Conflict of interest: None

The design of the ICU has also undergone changes and the contemporary ideal patient room should incorporate three zones: a patient zone, a family zone, and a care-giver zone.<sup>5</sup> Involvement of the family in the care of indoor patients has been favored by many studies with varied benefits, like reduction of patient safety incidence ("a patient safety incident is any unintended or unexpected incident that could have or did lead to harm for one

<sup>©</sup> The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

or more patients receiving care).<sup>6,9</sup> A greater involvement of the family in the form of flexible visiting hours has been stated to be beneficial to the patient, family, and the staff.<sup>7</sup> The attitude of hospital staff toward participation of family members in patient care had been one of the major factors in family member's involvement.<sup>6</sup>

The Institute for Patient and Family-Centred Care in their Mini Toolkit "Partnering with Patients and Families to Enhance Safety and Quality" has advocated that the family is not a visitor to the hospital rather they are a partner in the delivery of health care. It has further highlighted the role that a family can play to reduce patient safety incidences. The role of the family varies across the globe, as the expectation of a family from a hospital and vice versa is different.

India, with lesser expenditure on the health care by the public sector, has a unique opportunity to associate family members as co-care provider during the patient stay in a ward. However, till date, no study has been published in India about the attitude and perception of the HCW toward involvement of family members in patient care.

On the basis of the attitude of the staff, hospitals can take a decision regarding the involvement of family members as co-care providers and if the hospital decides to involve the family members, then a decision has to be taken to provide facilities to the family members during their stay in the hospital.

### Аім

To study the perception and attitude of healthcare worker (HCW) and factors responsible toward involvement of family members in providing care to an in-patient.

### **O**BJECTIVES

- To study the perception and attitude of healthcare worker (HCW) toward involvement of family members in care of indoor patients.
- To identify the factors responsible for the perception and attitude toward involvement of family members in care of indoor patients.

### **Duration of the Study**

The study was performed during July and August 2016.

### **Study Population**

The doctors, staff nurses, paramedical staff, and support staff working at the hospital were included in the study.

### **Study Areas**

The wards, ICU and operation theatres, and support services were included in the study.

### Sampling

All willing staff members in the identified areas formed part of study. Simple random sampling was used to arrive at the desired sample size.

### Tool Used

A questionnaire was designed in the form of closed-ended multiple responses. The questionnaire was developed and a beta testing of the questionnaire was done on the staff nurses of two wards and the questionnaire was modified thereafter. It was validated by the experts on the subject.

### **ANALYSIS OF THE RESULTS**

SPSS and Excel were used for descriptive statistic and interrelationship of the various factors.

### **Observation and Result**

Of the 175 questionnaires distributed, 159 questionnaires were collected. Of the 159 questionnaires, 2 were not included in the study, as the information provided was grossly insufficient and remaining 157 were analyzed.

### Sociodemographic Profile

The respondents were aged between 21 years and 53 years, with the mean age of 33.10; a majority of them were males. Totally, 64% respondents were posted in wards, 15% in support areas, 11% in the operation theatre, and 10% ICU.

### Duration of the Service

Majority of the participants (63%) had an experience of 5–10 years.

### **Educational Qualifiction of the Participents**

Graduates were 47.77%, 40.13% under graduate diploma, and the rest were matriculates.

### Attitute Toward Family Involvement in Patient Care

An estimated 93.6% of the respondents favored the stay of family members with the patient, whereas 5.7% were against their stay and 0.6% were undetermined. These findings are in contrast to the study done in Belgium, in which authors had observed that nurses were not in favor of open door policy.<sup>8</sup> This response was also corroborated by asking a negatively worded question on the same aspect, wherein the respondents were asked whether the entry of family members in ward can be banned, and whether they will be able to handle the patient on their own. To this question, 74.52% HCWs felt that it will be difficult to manage if relatives are not allowed by the bedside, whereas 12.74% felt that they would be able to handle the patient on their own and 13% respondent were silent to this.

### Number of Family Members in the Ward

96.8% of HCWs opined that one relative should be allowed in the ward, whereas 3.2% believed 2 relatives should be allowed and none favored more than 2 attendants.<sup>8</sup>

### Perceived Factors in Favor of Relatives

### Ease to Handle In-patients

In the present study, 134 (85.4%) of the respondents felt that patients with family members can be handled with ease when compared to the patients who are without family members. It is evident that HCW's responsibility and work is offloaded by the family.

### Family Role in Fast Recovery

Majority of the respondents (i.e., 93.6%) believed that the presence of family members help in a faster recovery. Contrary to the present study, the hospital staff in Belgium felt that family members are important in patient recovery.<sup>8</sup> The acceptance of the family members by respondents in the present study could be due to several differences in the two systems (Fig. 1).



### Perceived Benefit from the Family Members

The majority of the HCWs opined that patients are less apprehensive and feel more secure in the presence of relatives. HCW felt that the presence of relatives by the bedside helps in overcoming fear (Fig. 2). The results are in sync with other studies



Fig. 1: Attitude toward family involvement in patient care









by Fumagalli et al., which reported a reduction in anxiety, cardiac complication, fear of the unknown in the presence of relatives. It has also been documented that the level of stress hormones in the blood of patients is affected by the presence or absence of relatives (Figs 3 to 8).



Fig. 2: Benefits of allowing family members with the patient



Fig. 4: Role of family members in HAI



**Fig. 6:** Should provision for the patient's family members stay be considered during ICU planning?

3



Fig. 7: Could relatives be part of clinical round?

### Role of Family in the Feeding

In the present study, 89.2% of the respondents feel that the relatives are helpful in feeding of the patients. The finding are in contrast with the finding of a Belgian study wherein the nursing staff did not feel so.<sup>8</sup>

### Role of the Family Members in Patient Safety Incidences

A total of 73.25% of the respondents opined that the presence of family members can help in the reduction of adverse patient safety incidences. It has been stated that the presence of family members improve communication and information-sharing between the healthcare worker and patients, which in turn help in prevention of adverse events. The study is sync with the Belgian study by Asiain et al., where hospital staff strongly disagreed with the possibility of an increase in errors with the presence of visitors.<sup>8</sup>

### **Potential Negative Effects of the Relative Presence**

### Role of Family Members in Hospital-acquired Infections

Of the total respondents, 114 (72.61%) perceived that the presence of family members increased the incidence of HAI, 30 (19.10%) were not sure, and 13 (8.28%) felt that they had no role in HAI.

### Privacy of the Patients

Participants also expressed concerns related to privacy of the patients. Forty HCWs opined that patient privacy was often an issue, 68 respondents said it was an occasional problem, while 49 said it was rarely an issue. The privacy of the patient has been stated to be an important issue in the mind of staff nurses from Belgium.<sup>8</sup>

### Ground Reality of the Patient Stay During Night

After excluding the multiple answers, it was found that, 54.30% respondents agreed that relatives were staying in the ward during night with the patient (although no provision for them had been made) and 32.45% respondents said that they stayed in corridors. Only 12.74% said they stayed in the waiting areas outside the hospital.

### Are the Provisions Made for the Family Members Sufficient?

64.33% (101) of the respondents felt that provisions made for the relatives were inadequate and requirements of family should be



Fig. 8: Should family be provided with foldable furniture?

considered during the planning stages, whereas 36 (19.11%) felt that the provisions were adequate. Rest had no firm opinion.

### Consideration for Family in Planning Premises of ICU Design

55.41% of the respondents favored the consideration of provisions for staying of family members during planning of ICU, whereas 36.31% were against the considerations and rest were not sure.

### Involvement of Family Members in Clinical Rounds

In the present study, 43.95% respondents were against the involvement of family members during clinical rounds, whereas 33.22% opined that family members should be present during clinical rounds. The possible reasons may be low literacy of general patient (particularly medical literacy), misplaced belief about medical conditions, irrelevant questions, and unjustified expectations of the family.

# *Provisions of Infrastructure for Stay of Family Members in the Patient Care Area*

119 HCWs (75.8%) felt that family members should be provided with at least some form of foldable furniture for rest, whereas 28 (17.84%) were against provision of furniture and 10 (6.37%) had no opinion.

### Factors Responsible for Framing the Opinion

What is there in the mind of HCW, which is responsible for such overwhelming support for allowing family in the ward? On applying Chi-square test on the HCWs opinion about allowing family in ward, it emerged that ease of handling patient, concern for sentinel events, educational qualification, privacy of patients and Apprehension about HAI were the factors with a *p* value of less than 0.001, which meant that these factors were the major variables in forming opinion about family involvement in patient care of admitted patients.

### DISCUSSION

Hospitals as a concept in its present form is 100 years old. It, being a social organization, has taken different sizes and the shapes which were affected by variation in the social structures, belief, and customs and value system of the respective geographical locations.<sup>10</sup> While in European countries it is an accepted norm that patient will spend his/ her night in hospital alone, without any family members or friends



in hospital. In Asian countries this is not the case. The restricted visitors' timing and other restrictions for the family members are now being challenged in western countries. Proponents of patients and family-centric care have favored more involvement of family in decision-making and participation in patient care.

It has been established that the presence of relatives may not be associated with increased incidences of septic infection even in ICU.<sup>4</sup> On the contrary, it is related to reduction in the incidences of cardiovascular episodes and thyroid-stimulating hormone level, reduction in anxiety scores, and lower mortality.

Not many studies that looked into the role or task performed by family members to supplement the efforts of HCW were found.

An overwhelming majority of staff members approved the stay of the family members with patient and their attitude was not influenced by age, gender, numbers of years of services, area of posting, or work assigned.

In Indian settings, it is usually observed that family members assume a significant role in non-clinical care of the patient, including nutrition and hygiene, clothing and sponging, arranging supplies not available in hospital supply. They also provide the moral support to the patient and act as a channel of communication between the hospital staff and patient.

However, education was found to be inversely related to the approval of the stay of family members in hospital. It might be due to the direct relation of education with earning. It has also been reported that poor get less-dignified treatment, lesser choice of provisions, and poorer quality of amenities.<sup>11</sup>

The experience of the respondents that the patients with family member are easier to handle, while it is more difficult to handle unknown and unattended patients was one of the factors responsible for a favorable attitude toward relatives' stay in the ward.

The role that the family members played in a patient's nutrition was favored by respondents in the present study. The role of the family members need to be further studied, particularly in cases of patients with catabolic conditions requiring special/higher nutrition.

Respondents also felt that patient safety sentinel events are reduced by the presence of the family members.

Role of relatives in increasing HAI is very difficult to understand. Though 72.16% of the respondents feel that relatives contribute toward HAI, but they still favor their stay and it is significant. The respondents who expressed their concerns about the provisions for the relatives were also in favor of patients being allowed in ward.

### Recommendation

Hospitals should rethink about the role played by the relatives in the overall care of patients. The design of hospitals need to be modified so as to incorporate provisions to allow relatives' stay with patients. There is a need for more studies on the debates about the role of family members during the patient care at hospital and thereafter.

### REFERENCES

- 1. Ismail S, Mulley G. Visiting times. BMJ 2007 Dec 22;335(7633): 1316–1317. DOI: 10.1136/bmj.39420.392373.BE.
- Fumagalli S, Di Bari M, et al. Reduced Cardiocirculatory Complications With Unrestrictive Visiting Policy in an Intensive Care Unit. Results from a Pilot, Randomized Trial. Circulation 2006;113:946–952.
- Kleinpell RM. Visiting hours in the intensive care unit: More evidence that open visitation is beneficial. Crit Care Med 2008 Jan;36(1): 334–335. DOI: 10.1097/01.CCM.0000295266.17378.BD.
- Marco L, Bermejillo I, et al. Intensive care nurses' beliefs and attitudes towards the effect of open visiting on patients, family and nurses. Nurs Crit Care 2006 January 3;11(1):33–41. DOI: 10.1111/j.1362-1017.2006.00148.x.
- Cadenhead CD, Anderson DC. Critical Care Unit Design, The Winners and Future Trends: An Investigative Study. World Health Design Journal 2009;2(3):72–77.
- Davis R, Savvopoulou M, et al. Predictors of healthcare professionals' attitudes towards family involvement in safety-relevant behaviours: a cross-sectional factorial survey study. BMJ Open 2014;4:e005549. DOI: 10.1136/ bmj open-2014-005549.
- Sims JM, Miracle VA. A look at critical care visitation: Thecase for flexible visitation. Dimens Crit Care Nurs 2006 july;25(4): 175–180.
- 8. Berti D, Ferdinande P, et al. Belief and attitudes of intensive care nurses toward visits and open visitng policy. Intensive Care Med 2007;33:1060–1065. DOI: 10.1007/s00134-007-0599-x.
- 9. http://www.npsa.nhs.uk/nrls/reporting/what-is-a-patient-safety-incident/.
- Smith L, Harrison MB. The impact of hospital visiting hour polices on paediatric and adult patients and families. JBI Library Syst Rev 2006 Dec 03;4(10):1–14.
- 11. Musgrove P, Creese A, et al. The World health report 2000: health systems: improving performance. 1211 Geneva 27, Switzerland: World Health Organization; 2000. p. 206.

# Impact of an Intervention on Hand Hygiene Practices among Various Categories of Healthcare Workers at a Tertiary Healthcare Teaching Institute in Lucknow, Uttar Pradesh, India

Richa Mishra<sup>1</sup>, Rajesh Harsvardhan<sup>2</sup>, Tulika Gupta<sup>3</sup>, Hem Chandra<sup>4</sup>, Aprajita Jaiswal<sup>5</sup>, Madhu Rendra Kumar<sup>6</sup>

### Abstract

Introduction: Healthcare-associated infections are major burdens for patients, society, and healthcare management. An infection control program is considered efficient which, when used appropriately, restrict the spread of infection among patients and staff in hospital. Materials and methods: The present study was conducted in a tertiary healthcare teaching institute from May 2017 to April 2018. The intervention program included following elements: administrative support, education and training, monitoring and feedback. Microsoft excels and Statistical Package for Social Sciences version 23 (SPSS 23) were used for statistical analysis.

**Observations and results:** The compliance with hand hygiene practices was observed to have been better by 24.37%, postintervention. And out of eight preidentified areas, the maximum 30% improvement in compliance with hand hygiene was found in neurosurgery ICU. **Keywords:** Hand hygiene, Hospital acquired infection, Infection.

International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1105

### INTRODUCTION

Healthcare-associated infections are major burdens for patients, society, and healthcare management. An infection control program is considered efficient which, when used appropriately, restrict the spread of infection among patients and staff in hospital. Good infection control program also considerably reduces patients' morbidity and mortality, length of hospital stay, and cost associated with hospital stay. This is achieved by the prevention and management of infections through the applications of research-based knowledge to practices.<sup>1</sup> Infection prevention and control (IPC) is a practical, evidence-based approach preventing patients and health workers from being harmed by avoidable infections.

The origins of hand hygiene and the empirical use of disinfectants date back to as early as 800 BC when Homer reported the use of sulfur as a disinfectant in The Odyssey. It was Dr Oliver Wendell Holmes in Boston in 1843 and Dr Ignaz Semmelweis in Vienna in 1861, who advocated hand washing to prevent the transmission of infectious disease. Streptococcus pyogenes bacteria were then specifically implicated in puerperal sepsis, a serious form of septicemia that resulted in high mortality during or shortly after child birth. Both physicians independently concluded that disease was transmitted from patient to patient by physicians and nurses on their hands and clothing.<sup>2-4</sup> Standard precautions are the minimum infection prevention practices that apply to all patient care, in any setting where healthcare is delivered. Standard precautionary measures are a set of infection control practices used to prevent infection from the health personnel to the patients and caregivers and vice versa. This is an important issue that needs attention. When health professionals do not follow infection control measures, then the healthcare settings will be a source for infections and at times it may also be a cause for outbreaks in the community. Compliance with infection control precautions is internationally suboptimal.

Improvement of the behavior of healthcare workers is an important aspect of infection control in healthcare. Despite all the efforts of infection control professionals, infections remain a major unwanted <sup>1</sup>Department of Microbiology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

<sup>2,3,5</sup>Department of Hospital Administration, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

<sup>4</sup>Hemwati Nandan Bahuguna Uttarakhand Medical Education University, Dehradun, Uttarakhand, India

<sup>6</sup>Department of Community Medicine, Dr Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

**Corresponding Author:** Rajesh Harsvardhan, Department of Hospital Administration, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Uttar Pradesh, India, Phone: +91 8004969828, e-mail: drrajeshharsvardhan@gmail.com

How to cite this article: Mishra R, Harsvardhan R, Gupta T, *et al.* Impact of an Intervention on Hand Hygiene Practices among Various Categories of Healthcare Workers at a Tertiary Healthcare Teaching Institute in Lucknow, Uttar Pradesh, India. Int J Res Foundation Hosp Healthc Adm 2019;7(1):6–10.

Source of support: Nil Conflict of interest: None

side effect of healthcare, often causing serious harm to patients. The statement of Johan Peter Frank, director of the General Hospital in Vienna around 1800, does not belong only in the past: "Can there be a greater contradiction than a hospital disease: an evil that one acquires where one hopes to lose one's own disease?" The biggest problem is not the lack of effective precautions and evidence-based guidelines, but the fact that healthcare workers apply these measures insufficiently.<sup>5</sup>

To improve this negligent behavior of healthcare workers is a main aspect of infection control in healthcare. Interventions to improve adherence to infection control measures should incorporate an evaluation of barriers to and facilitators of change. Through this study, the compliances towards hand hygiene practices among nursing, technical and class IV groups in preidentified

<sup>©</sup> The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

areas of tertiary healthcare organization were assessed through an observation checklist to identify problem areas, barriers, and facilitators, and the deficits identified were corrected by means of successful intervention program.

### MATERIALS AND METHODS

The present study was conducted in a tertiary healthcare teaching institute (Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Uttar Pradesh) of India. It was coordinated by the Department of Hospital Administration and carried out from May 2017 to April 2018. All patient care areas of hospital may contribute to the burden of hospital-acquired infection (HAI); however, keeping in view the constraints of time, following few areas have been identified for the study, which fairly represent the spectrum of therapeutic areas of hospital. The intervention program included the following elements: administrative support, education and training, and monitoring and feedback.

### **Study Population and Hospital Setting**

SGPGIMS, Lucknow is a 1,001-bedded tertiary care superspecialty hospital and is a premier public medical research institute in Asia. The institute caters to approximately 3,00,000 outpatients and 35,000 inpatients per year. The institute is dedicated to quality tertiary care at an affordable cost. The institute's SGPGIMS Hospital Infection Control Committee (SHICOM) serves as an apex committee for all the issues, ranging from policy formulation to operational execution and management that pertains to hospital infection control. Preidentified areas included in the study comprise endocrinology and gastroenterology wards, endocrine surgery and surgical gastroenterology wards, gynecology OT and eye OT, neurosurgery ICU and sample collection room. The total population in preidentified area of the hospital was 221. A total 196 staff were observed, out of which 109 nursing staff, 14 technical staff (Lab, ICU, and OT technicians), and 70 class IV and 15 others were identified. The observations were carried out by interviews and physical inspection as per predesigned checklist.

### **Study Design**

It was an observational, prospective, intervention study and was accomplished in three phases: the preintervention, the intervention, and the postintervention. The domain under which compliance with hand hygiene was aimed at are: the 5 moments of hand hygiene, the right technique, the right agent (alcohol-based handrub or soap and water), and the right duration as per WHO guidelines.

### **Data Acquisition and Interventions**

### Phase I

An appropriate tool (structured observation checklist) was drafted to ascertain the current status of hand hygiene practices as per selected NABH standards and objective elements. The elements used in the tool are: moments of HH—before patient contact, before aseptic task, after patient contact, after body fluid exposure risk and after contact with patient surroundings, 7 steps of hand hygiene, alcohol-based handrub or soap and water, handrub duration, hand wash duration, barrier to hand hygiene, availability of hand hygiene resources, and display of hand hygiene posters. These elements were aimed at finding the deficit(s) in compliance with hand hygiene practices among the staff of preidentified areas.

### Phase II

The deficit(s) present in preidentified patient care areas as observed along the predesigned tool that need improvement were identified,

and interventions specific to the parameter was done as follows: (i) longitudinal training program (LTP), (ii) displays: IEC (posters/ handouts), and (iii) one handrub per cubicle.

Longitudinal in-service training program: This program was conducted by Department of Hospital Administration for nursing staff, technical staff (Lab, ICU and OT technicians) and housekeeping staff from the preidentified areas for the duration of 6 months commencing from May 2017 to October 2017 to help them adopt the best practices for hand hygiene. Apart from the above training, interventions specific to this parameter was taken up for onsite training as well.

*IEC displays*: Upon approval to Hospital Infection Control Committee (HICCOM) of SGPGIMS, following posters—5 moments for hand hygiene "Steps of Hand Hygiene using Hand Rub", and "Steps of Hand Hygiene using Soap and water"—were appropriately displayed at preidentified study area. These educational materials were detailed with the moments, techniques, agents and duration of hand hygiene.

One handrub per cubicle: It was made necessary for each wards of preidentified study area to place at least one handrub outside each cubicles. This helped in easy accessibility of hand hygiene, and the staffs were instructed of appropriate use for the same.

### Phase III

Thereafter, the tool (same as pretraining) was used postintervention (10 days after training) to assess the impact in compliance and its sustenance in preidentified areas of the study by photo/videography. Based on the posttraining assessment, retraining if required was also done onsite by infection control nurses.

### Study Tool

To assess the impact of intervention, an observation checklist tool containing 14 objective elements of hand hygiene with maximum 140 scores was prepared. The assessment through checklist was conducted by direct observation (OB), staff interview (SI), and record review (RR). Compliance with hand hygiene elements was evaluated by obtaining scoring criteria of 0, 5 or 10 (score 0 for noncompliance, score 5 for partial compliance, and score 10 for full compliance).

### **Data Analysis**

Microsoft Excels and Statistical Package for Social Sciences version 23 (SPSS 23) were used for statistical analysis. Normality of data was tested, and a variable was considered normal when standard deviation (SD) was less than half mean value. For normally distributed data, descriptive statistics was presented in mean  $\pm$  SD. To compare the proportion among the groups, Chi square test/Fisher exact test as appropriate, was used. In case ANOVA test *p* value was found significant, *post hoc* test (multiple comparison) was used to find out pairs between mean differences was statistically significant (*p* < 0.05 considered as statistically significant).

### **O**BSERVATIONS AND **R**ESULTS

Out of total 196 study subjects, 52.55% were male while 47.44% were females. Majority (55.6%) of the study subjects belong to nursing group followed by class IV group (29.59%) and technical group (7.14%). Most of the study subjects had work experience of 3–7 years (31.12%) and greater than 13 years (31.12%) followed with experience of 8–12 years (19.38%) and others 1–2 years of experience. Almost 2/4th (43.87%) of study subjects were in the

7

age group of 30–44 years. Majority of the study subjects worked on rotation basis (60.71%), i.e., morning, evening, and night shifts, and rest (39.49%) of study subjects were on general duty. More than half (54.08%) of the study subjects worked as permanent employee (Fig. 1).

As per Table 1, a comparative observation in all the preidentified area of the study shows a significant increase in compliance with a median value of 62.50 during baseline to the mean value of 80.00 during round 3. Friedman test indicated that there was a significant difference in repeated observations among hand hygiene. Multiple comparison by Wilcoxon signed rank test indicated that out of six combination (HB-H1, HB-H2, HB-H3, H1-H2, H1-H3 and H2-H3) in five combination namely HB and H1,



Fig. 1: Distribution of study groups

Table 1:	Observation checklist analysis	

HB and H2, HB and H3, H1 and H3 and H2 and H3 was statistically significant (p value < 0.05).

Department-wise compliance is shown in Figure 2 wherein maximum (93.57%) compliance with hand hygiene was found in GH eye OT and GH gynecology OT. Highest (30%) change in improvement in compliance with hand hygiene (Fig. 3) was seen in neurosurgery ICU. Overall, preintervention compliance with hand hygiene was 50.44%, and postintervention compliance was 74.82% (HH% change = 24.37).

### DISCUSSION

There are increasing efforts in developing effective measures to improve hygiene and to reduce infections in hospital settings in India. In the past, HH has not received close attention and the HH facilities were essentially lacking in our hospital; some HCWs were not aware of HH requirements and regulations. To the best of our knowledge, the present study represents the first attempt in SGPGIMS to develop an interventional approach to improve compliance with HH in a hospital setting. In the present study, the mean of overall HH compliance rate improved from 50.44% in baseline phase to 74.82% in the intervention phase. Mu et al.<sup>6</sup> reported that the mean overall HH compliance rate improved from 37.78% in the baseline phase to 75.90 in the intervention phase, which is similar to our study. The demand for IEC posters and hand hygiene materials was observed to be increased significantly.

The overall compliance with hand hygiene practices was only 50.44% during preintervention and postintervention compliance was 74.82% (HH% change = 24.37) (Table 2). It was observed that preintervention, highest (71.43%) compliance was found in eye OT and gynecology OT of general hospital and lowest (35.71%) was found in sample collection room. But postintervention compliance with hand hygiene was maximum (93.57%) in both the operation

S. no.	Parameters	Observation	Baseline (B)	Round (1)	Round (2)	Round (3)	p value	Multiple comparison
1	Hand hygiene (HH)	Median	62.50	72.50	70.00	80.00	0.001	HB–H1, HB– H2, HB–H3
		Q1	60.00	61.25	65.00	71.25		H1–H2, H1– H3, H2–H3
		Q3	92.50	95.00	102.50	105.00		



Fig. 2: Department-wise hand hygiene compliance

8





Fig. 3: Compliance with hand hygiene: pre- and postintervention

 Table 2: Percentage change of compliance with hand hygiene parameters

S.		Mean	Std.	Percent	
no.	Checklist parameters	percentage	deviation	change	p value
1	HH preintervention	50.44	13.56	24.37	0.00
	HH postintervention	74.82	13.60		

Paired t test, p value < 0.001

theatres followed by neurosurgery ICU (79.29%). Least (54.29) improvement was found in sample collection room.

A study conducted by Dey et al., in a tertiary care hospital of NEIGRIHMS, Shillong similarly reported that overall compliance of hand hygiene was 28.57%. Ophthalmology OT had the highest incidence of hand hygiene (57.89%).<sup>7</sup> In a study conducted by Chassin et al., in United States it was seen that baseline hand hygiene compliance was 47.5% across eight hospitals,<sup>8</sup> which was similar to another study conducted by Eldridge et al.<sup>9</sup> Suchitra et al. from Mysore, India, in her study concluded that overall hand hygiene compliance was 63.3%.<sup>10</sup>

Compliance of hand hygiene significantly changed due to multimodal strategies of interventions, and the above study findings validate the findings of present study with approximately similar results. In this study, postintervention compliance of hand hygiene was improved in all the preidentified areas but neurosurgery ICU and gastrosurgery ward had shown maximum (30% change) improvement in adhering to hand hygiene practice. This improvement in hand hygiene practices was due to experienced staff and active participation of staff.

The Department of Hospital Administration under the aegis of SGPGIMS Hospital Infection Control Committee developed a series of actions to improve the medical staff's HH compliance, including improvements in HH facilities, awareness of HH, training, education, assessment, and establishment of a quality evaluation system through monitoring and feedback. In order to improve the HH awareness in all wards, HH posters were affixed on HH dispenser according to WHO guidelines. Also, handrubs was made easily available by installing handrub stands at every cubicles of preidentified wards and ICUs.

The most frequently reported methods of measuring compliance with HH are direct observation of the practice, measurement of the consumption of products used for HH, and electronic counters for dispensers of ABHR.<sup>11,12</sup> In the present study,

direct observation through structured checklist was chosen, and it was useful to quantify the number of gaps in institutional settings and adherence to HH practices. Based on this direct observation checklist results, the interventions were planned accordingly to increase the compliance among healthcare workers.

Accompanying the intervention, there was an overall improvement of compliance with HH among the HCWs. However, repeated training and reminding is required for appropriate hand hygiene culture in healthcare settings. Timely and regular feedback might be an added factor in improving and maintaining the compliance rate. On-site training as required among preidentified areas had enhanced the compliance with HH. Although the method of direct observation of HH has several advantages, it has a major disadvantage, which is that only a very small portion of all HH opportunities are captured besides being labor-intensive and time-consuming. Additionally, the presence of an observer may produce the Hawthorne effect.<sup>13,14</sup>

In the present study, the direct observation was centered on 5MHH, right time and right duration and the tight technique to perform HH. The quality of HH relies on the correct operation of all procedures at the right time. If not performed correctly, the removal of transient microorganism from HCWs' hands cannot be achieved.<sup>15</sup> In future studies, the consumption of hand hygiene agents and installation of accessible HH instruments should be emphasized in observation and analysis.

In conclusion, our intervention program resulted in significantly increased compliance with HH in all categories of HCWs in our hospital. HH seems to be simple, but persistence of HH is difficult<sup>16,17</sup> and requires long-term commitment to change from the part of hospital administration and all HCWs and patients.

### REFERENCES

- Organization ICMR. Hospital Infection Control Guidelines 2016. Available at https://icmr.nic.in/guidelines/Hospital%20Infection%20 control%20guidelines-.pdf; accessed on May 2, 2018.
- 2. Block SS. Historical review BlockSS Disinfection, sterilization and preservation. Philadelphia: Lea and Febiger; 1991. pp. 3–17.
- Heseltine P. Why don't doctors and nurses wash their hands? Infect Control Hosp Epidemiol 2001;22(4):199–200. DOI: 10.1086/ 501888.
- Risse GB, Semmelweis IP Dictionary of scientific biography. NY: Scribners & Sons; 1980.
- Duerink DO, Hadi U, Sri Lestari ES, et al. A tool to assess knowledge, attitude and behaviour of Indonesian health care workers regarding infection control. Acta Med Indones 2013;45(3):206–215.
- Mu X, Xu Y, Yang T, et al. Improving hand hygiene compliance among healthcare workers: an intervention study in a Hospital in Guizhou Province, China. Braz J Infect Dis 2016;20(5):413–418. DOI: 10.1016/ j.bjid.2016.04.009.
- Borah TJ, Dey S, Yunus Md, et al. Compliance of hand hygiene in the operation theatre in a tertiary care hospital: An observational study. Ann Int Med Dent Res 2017;3(Suppl 1):2395–2822. DOI: 10.21276/ aimdr.2017.3.S1.16.
- Chassin MR, Mayer C, Nether K. Improving hand hygiene at eight hospitals in the United States by targeting specific causes of noncompliance. Jt Comm J Qual Patient Saf 2015;41(1):4–12.
- Eldridge NE, Woods SS, Bonello RS, et al. Using the six sigma process to implement the centers for disease control and prevention guideline for hand hygiene in 4 intensive care units. J Gen Intern Med 2006;21(Suppl 2):S35–S42. DOI: 10.1111/j.1525-1497.2006.00361.x.
- Suchitra JB, Lakshmi Devi N. Impact of education on knowledge, attitudes and practices among various categories of health care workers on nosocomial infections. Indian J Med Microbiol 2007;25(3):181–187.

- 11. Magnus TP, Marra AR, Camargo TZS, et al. Measuring hand hygiene compliance rates in different special care settings: a comparative study of methodologies. Int J Infect Dis 2015;33:205–208. DOI: 10.1016/j.ijid.2015.02.016.
- 12. Chou DT, Achan P, Ramachandran M. The World Health Organization '5 moments of hand hygiene': the scientific foundation. J Bone Joint Surg Br 2012;94(4):441–445. DOI: 10.1302/0301-620X.94B4.27772.
- Braun BI, Kusek L, Larson E. Measuring adherence to hand hygiene guidelines: a field survey for examples of effective practices. Am J Infect Control 2009;37(4):282–288. DOI: 10.1016/j.ajic.2008.09.002.
- 14. World Health Organization WHO guidelines for hand hygiene in health care; 2009.
- Aldeyab MA, Baldwin N, McElnay JC, et al. Strategy for improving and maintaining compliance with adequate hospital hand hygiene practices. J Hosp Infect 2011;77(1):87–88. DOI: 10.1016/ j.jhin.2010.09.016.
- Mortell M, Balkhy HH, Tannous EB, et al. Physician 'defiance' towards hand hygiene compliance: is there a theory-practiceethics gap? J Saudi Heart Assoc 2013;25(3):203–208. DOI: 10.1016/ j.jsha.2013.04.003.
- 17. Michaelsen K, Sanders JL, Zimmer SM, et al. Overcoming patient barriers to discussing physician hand hygiene: do patients prefer electronic reminders to other methods? Infect Control Hosp Epidemiol 2013;34(9):929–934. DOI: 10.1086/671727.

10



# Healthcare Failure Mode and Effect Analysis: Dispensing Errors in the Pharmacy of an Outpatient Department of a Public Sector Tertiary-care Teaching Hospital

Rajat Prakash<sup>1</sup>, Shashikant Sharma<sup>2</sup>, Ashutosh Sharma<sup>3</sup>

### Abstract

**Background:** Dispensing failures mean that a breach has occurred in one of the last safety links in the use of drugs. Although most failures do not harm patients, their existence suggests fragility in the process and indicates an increased risk of severe accidents.

**Materials and methods:** To address these gaps in our understanding of dispensing errors, we conducted a direct observational study to determine the various failure modes, categorize the types of errors, and evaluate their potential to cause patient harm using healthcare failure mode and effect analysis (HFMEA).

**Results:** The high-risk failure modes identified were as follows: patient unable to understand the prescription, illegible prescription, medication dispensed to wrong patient, counseling about new dose does not occur or ineffective, and patient taking incorrect dose.

**Conclusion:** None of the steps in the drug-dispensing process were free of potential failure modes, but six failure modes emerged as the most vulnerable steps [with risk priority numbers (RPNs) over 168]. The most critical elements in the dispensing of drugs in the present setting were where patient does not understand proper use of prescription of potentially dangerous drug interaction (RPN 432) followed by illegible prescription. There is a dire need of application of systems theory with actions needed at every level of drug dispensing mechanism. Quality tools such as HFMEA and root cause analysis are warranted to forecast various failure modes and to find out root causes of adverse events that happen. **Keywords:** Failure mode and effect analysis, Medication errors, Patient safety, Quality.

International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1106

### INTRODUCTION

Patient safety became an important issue in health care, particularly after the publication of the report "To Err is Human: Building a Safer Health System" by the Institute of Medicine in the United States in 1999. This report made the general public, healthcare policy makers, and healthcare providers aware that targeted actions are needed to increase patient safety. The report placed patient safety high on the healthcare agenda. In October 2004, the World Health Organization (WHO) launched the World Alliance for Patient Safety. Several interventions were started to improve the safety of patients. For instance, the WHO Collaboration Centre for Patient Safety invested with several countries in projects on managing concentrated injectable medicines, assuring medication accuracy at transitions in care and performance of the correct procedure at the correct body site. Range of other strategies and policies have been developed with the intention to enhance patient safety.

Risk associated with medical drugs, one of the main tools used today to protect, maintain, and restore health, has increased. The onset of adverse effects, with its damaging consequences for patients, healthcare professionals, and healthcare institutions, is a reason for concern in most health-related sectors. This concern, in fact, is linked to the origin itself of therapeutics. The archaic Greek word "*pharmakon*" means a sacrifice made to the gods to seek a cure and bears a double meaning: remedy and poison.

Drug safety is not a static concept. The perception of what is acceptable as risk or benefit together with safety evidence requirements has radically changed during the 20th century. This is in tune with therapeutic developments and the resulting disasters related to such developments. <sup>1</sup>Department of Hospital Administration, Army Hospital Research and Referral, New Delhi, India

<sup>2,3</sup>Department of Hospital Administration, Armed Forces Medical College, Pune, Maharashtra, India

**Corresponding Author:** Shashikant Sharma, Department of Hospital Administration, Armed Forces Medical College, Pune, Maharashtra, India, Phone: +91 8412821773, e-mail: shashi0681@gmail.com

How to cite this article: Prakash R, Sharma S, Sharma A. Healthcare Failure Mode and Effect Analysis: Dispensing Errors in the Pharmacy of an Outpatient Department of a Public Sector Tertiary-care Teaching Hospital. Int J Res Foundation Hosp Healthc Adm 2019;7(1):11–18.

Source of support: Nil

Conflict of interest: None

### Medication Errors

Medication errors are common and often preventable. The hospital pharmacy's medication dispensing process is a source of many medication errors and potential adverse drug events (ADEs). Hospital pharmacies dispense hundreds of thousands to millions of medication doses annually, and therefore, even low dispensing error rates can generate many errors. Research indicates that nurses only intercept 33% of serious medication dispensing errors before medication administration, so many of these errors could reach patients.<sup>1</sup>

### **D**ISPENSING MEDICATION

Dispensing medication is the core function of pharmaceutical care and millions of medicines are dispensed each year by

<sup>©</sup> The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

community and hospital pharmacies. Dispensing is a complex process unequivocally under the supervision of the pharmacist. Traditionally, dispensing has involved pharmacy staff manually selecting medications from shelves, transferring the correct number of medication dose units to a container, and/or labeling the assembled product. However, in recent years the use of automated dispensing systems has been widely advocated to improve efficiency, maximize storage capacity, and minimize dispensing errors. Consequently, automated dispensing systems are becoming increasingly commonplace in hospital and community pharmacies across the world.<sup>1</sup>

Errors can arise at any stage during the dispensing process. It is estimated that each year 1,34,341 dispensing errors occur in community pharmacies in England and Wales. The majority (85%) of these errors are detected by pharmacists before the medication is supplied to the patient. However, some errors are undetected and may cause serious harm to patient and result in death occasionally. Thus, it is imperative that pharmacists review data on dispensing errors so that risk-reduction strategies are developed to safeguard the quality and safety of patient care.<sup>1</sup>

### DEFINITION OF A DISPENSING ERROR

A dispensing error is a discrepancy between a prescription and the medicine that the pharmacy delivers to the patient or distributes to the ward on the basis of this prescription. It includes dispensing of a medicine with inferior pharmaceutical or informational quality.<sup>2-7</sup>

### CATEGORIES OF DISPENSING ERRORS

If dispensing errors are considered from the perspective that the quality of all pharmacy-related activities should be assured by the pharmacist, this list can be extended by the addition of three other categories:

- Failure to detect and correct a prescribing error before dispensing;
- Failure to detect a manufacturing error before dispensing; and
- Failure to provide adequate patient counseling in order to prevent administration errors.

These categories arise in other segments of the pharmaceutical patient care chain, but they are nevertheless important when one strives for a full assessment of the pharmacy's performance.<sup>8,9</sup> Table 1 identifies different categories of dispensing errors.

### UNDERLYING CAUSES OF DISPENSING ERRORS

Causes of dispensing errors can be traced by root cause analysis or by eliciting explanations from practicing pharmacists by means of a survey. Root cause analysis comes closer to reality, because a survey measures only the perceptions and opinions of pharmacists.

An example of the former or latter type was a study in a UK hospital in which the researchers used semi-structured interviews of pharmacy staff about self-reported dispensing errors.<sup>2</sup> In all, 106 error-producing conditions were mentioned in the interviews. The most common causes mentioned were as follows: being busy (21%), being short-staffed (12%), being subject to time constraints (11%), fatigue of healthcare providers (11%), interruptions during dispensing (9.4%), and look-alike/sound-alike (LASA) medicines (8.5%).

In a Danish study, a research team analyzed self-reports of community pharmacies to identify the causes of dispensing errors.<sup>10</sup>

 Table 1: Categories of dispensing errors

Dispensing medicine to the wrong patient (or to the wrong ward) Dispensing the wrong medicine Dispensing the wrong drug strength Dispensing at the wrong time Dispensing the wrong quantity Dispensing the wrong dosage form Dispensing an expired or almost expired medicine Omission (e.g., failure to dispense) Dispensing a medicine of inferior quality (pharmaceutical companies) Dispensing with the wrong information on the label Incorrect instruction (including incorrect dosage) Incorrect drug quantity Incorrect dosage form Omission of additional warning(s) Dispensing with the wrong verbal information to the patient or representative

The research team identified four causes: poor, often unreadable, handwriting; "traps" (LASA medications); lack of effective controls; and lack of concentration caused by interruptions.

In a Finnish study, a survey questionnaire was used to elicit pharmacists' perceptions and opinions.<sup>11</sup> There were five main categories of potential causes. The first was related to organization (37% of all potential causes given). The other categories were as follows: individual professionals (30%), prescriptions (17%), drugs (10%), and problems with customers (4%). Examples of the last were talkative customers, conversations with customers, customers with many prescriptions, and customers in a hurry.

Two studies have investigated the potential causes of failure to detect and prevent drug-drug interaction problems during dispensing. In the first study, the researchers calculated the dispensing ratios for 11 undesirable drug-drug interactions in 256 Dutch community pharmacies; only one of these was significantly related to determinants—the type of medication surveillance system and whether the pharmacy was part of a healthcare center.<sup>12</sup> The second study was performed in the USA and evaluated the relations between handling 25 potential drug-drug interactions and the operational characteristics of community pharmacies; the risk of dispensing drugs with potential drug-drug interactions was significantly related to pharmacist workload, overall pharmacy workload, and automated telephone systems for prescription orders.<sup>13</sup>

### FAILURE MODE AND EFFECT ANALYSIS

Failure mode and effect analysis (FMEA) is a method used in industry to assess complex processes according to a standardized approach with a view of identifying the elements that carry a risk of causing harm and, consequently, prioritizing remedial measures. It is based on the concept that a risk is related not only to the likelihood of a failure occurring, but also to the severity of the failure's consequences and the feasibility of detecting and intercepting a failure before it occurs.

The FMEA approach also enables each of the elements comprising process under investigation to be attributed accumulative numerical value, the RPN, which can be used to



prioritize the action to be taken because it is a numerical rating of the severity, probability, and detectability of each failure mode.<sup>14</sup>

### **FMEA T**ERMS

### **Failure Mode**

A failure mode is the way in which the component, subassembly, product, input, or process could fail to perform its intended function. Failure modes may be the result of upstream operations or may cause downstream operations to fail, that is, things that could go wrong.

- Effect: the impact on the process or customer requirements as a result of the failure;
- · Severity: the impact of the effect on the customer or process;
- Root cause: the initiating source of the failure mode;
- Occurrence (or frequency): how often the failure is likely to occur; and
- Detection: the likelihood that the failure will be discovered in a timely manner, or before it can reach the customer.

### **FMEA in Health Care**

Failure mode and effects analysis was developed outside of health care and is now being used in health care to assess the risk of failure and harm in processes and to identify the most important areas for process improvements. Failure mode and effects analysis has been used by hundreds of hospitals in a variety of institutes for healthcare improvement programs, including idealized design of medication systems, patient safety collaborative, and patient safety summits.

### **Steps for Conducting FMEA**

### Step 1

Select a process to evaluate with FMEA. Evaluation using FMEA works best on the processes that do not have too many subprocesses. Instead of doing an FMEA on a large and complex process, such as medication management in a hospital, try doing an FMEA on sub-processes or variants. Conducting an FMEA of the entire medication management process would be an overwhelming task. Instead, consider individual FMEA analyses of the medication ordering, dispensing, and administration processes.

### Step 2

Recruit a multidisciplinary team. Be sure to include everyone who is involved at any point in the process. Some people may not need to be part of the team throughout the entire analysis, but they should certainly be included in discussions of those steps in the process in which they are involved. For example, hospital may utilize couriers to transport medications from the pharmacy to nursing units. It would be important to include the couriers in the FMEA of the steps that occur during the transport itself, which may not be known to personnel in the pharmacy or on the nursing unit.

### Step 3

Have the team meet together to list all of the steps in the process. Number every step of the process and be as specific as possible. It may take several meetings for the team to complete this part of the FMEA, depending on the number of steps and the complexity of the process. Flowcharting can be a helpful tool for outlining the steps. When you are finished, be sure to obtain consensus from the group. The team should agree that the steps enumerated in the FMEA accurately describe the process.

### Step 4

Have the team list failure modes and causes for each step in the process, and list all possible "failure modes"—that is, anything that could go wrong, including minor and rare problems. Then, for each failure mode listed, identify all possible causes.

### Step 5

For each failure mode, have the team assign a numeric value (known as the RPN) for likelihood of occurrence, likelihood of detection, and severity. Assigning RPNs helps the team prioritize the areas to focus on and can also help in assessing opportunities for improvement. For every failure mode identified, the team should answer the following questions and assign the appropriate score (the team should do this as a group and have consensus on all values assigned):

- Likelihood of occurrence: How likely is it that this failure mode will occur? Assign a score between 1 and 10, with 1 meaning "very unlikely to occur" and 10 meaning "very likely to occur."
- Likelihood of detection: If this failure mode occurs, how likely is it that the failure will be detected? Assign a score between 1 and 10, with 1 meaning "very likely to be detected" and 10 meaning "very unlikely to be detected."
- Severity: If this failure mode occurs, how likely is it that harm will occur? Assign a score between 1 and 10, with 1 meaning "very unlikely that harm will occur" and 10 meaning "very likely that severe harm will occur." In patient care examples, a score of 10 for harm often denotes death.

### Step 6: Evaluate the Results

To calculate the RPN for each failure mode, multiply the three scores obtained (the 1–10 score for each of likelihood of occurrence, detection, and severity). For example, the failure mode "Wrong medication selected" has a 3 for likelihood of occurrence, a 5 for likelihood of detection, and a 5 for severity, for an overall RPN of 75. The lowest possible score will be 1 and the highest 1,000. Identify the failure modes with the top 10 highest RPNs.

These are the ones the team should consider first as improvement opportunities. To calculate the RPN for the entire process, simply add up all of the individual RPNs for each failure mode. Use RPNs to plan improvement efforts. Failure modes with high RPNs are probably the most important parts of the process on which to focus improvement efforts. Failure modes with very low RPNs are not likely to affect the overall process very much, even if eliminated completely, and they should therefore be at the bottom of the list of priorities.

### AIM OF THE STUDY

To use FMEA to identify potential failure modes of dispensing errors in the pharmacy of a outpatient department (OPD) of a public sector tertiary care teaching hospital.

### **O**BJECTIVES

The objectives of the study are as follows:

- To study and map the complete process of dispensing of medications in the pharmacy.
- To identify various failure modes and effects in dispensing of medications to the patients.

- To each failure mode assign a numeric value (known as the RPN for likelihood of occurrence, likelihood of detection, and severity.
- To prioritize various types of failure modes using risk priority matrix and use RPNs to plan improvement efforts and purpose strategies and recommendations to avoid such errors.

### MATERIALS AND METHODS

To address these gaps in our understanding of dispensing errors, we conducted a direct observational study to determine the various failure modes, categorize the types of errors, and evaluate their potential to cause patient harm.

### Setting

The project was conducted at the pharmacy of an OPD in a tertiary care teaching hospital providing super-specialty care. It is also an academic institution providing undergraduate training and postgraduate training to medical students.

Outpatient area has its own therapy order form, where physicians write their prescriptions. All prescriptions are, still, calculated manually by physicians and are handwritten on the therapy order form. Finally, the actual dispensing of medicines is done by the pharmacist. The pharmacy staff are also responsible for the drug inventory within the unit. Although with different levels of responsibility, and always under supervision, trainee residents and trainee pharmacist are also involved in prescribing and dispensing.

### Composition of the Team and Analysis of the Drugdelivery Process

The team consisted of eight members between the frontline staff who were familiar with the process, including doctors, residents, nurses, and patients' safety experts, risk management experts, and/ or a quality improvement specialist. A pharmacist, a representative of service for health professions, and an administrative officer were involved when specific identified risks were analyzed. As FMEA is performed by process mapping and then identifying failure modes for each step, their responsibilities were as follows:

- To identify and describe the steps involved in the process of prescribing, and dispensing drugs at the OPD and pharmacy (producing flow diagrams).
- To highlight possible sources of errors at each step.
- To clarify the reason why a failure might occur in completing each step.
- To quantify the severity of the effects of such potential failures.

The team was then asked to estimate (score) the likelihood of a specific error occurring, its severity, and the chances of the error being detected and intercepted before it could occur, calculating the specific RPN. This permitted the prioritization of the multiple failure modes, identifying those at greater risk of harm. Each member identified from this analysis the higher risk failure modes as those with the highest severity and frequency scores and lowest likelihood of detection, plotted in the red or yellow area of the priority matrix (Fig. 1) and developed corrective actions assigning them an appropriate priority.

A value in the range of 1–10 was attributed to each step in the drug-delivery process to quantify the potential occurrence of a failure (O); the severity of its potential negative impact on the overall process (S); and the chances of the failure being detected and intercepted before it occurs (D), according to the joint commission classification.  $^{\rm 14}$ 

All the numerical scores were directly proportional to the estimated frequency of the failure, the severity of its impact, and the difficulty of intercepting it. Values of 10 thus reflected a nearcertain likelihood of failure, the effects of which would be fatal, and there was practically no chance of the failure being detected before it caused harm.

The agreement on the final score to attribute each critical step in the complex process of ordering and dispensing drugs was reached by asking each member of the team to quantify their personal estimation of the related risk according to the previously defined, precise, and strict criteria, followed by a shared discussion in the case of overt discordance (Table 2). The numerical value obtained by multiplying these three factors is the RPN (O × S × D), which was used to grade the relevance of each step, in terms of its overall influence on the process. The RPN therefore enabled the elements most likely to contribute to serious drug dispensing failures to be pinpointed. The maximum RPN was 1,000. The RPN was also used to establish the priority of remedial measures.

The hazard analysis was completed by plotting the RPNs of higher risk failure modes in a priority matrix (Fig. 1), which is a graph divided into three colored areas reflecting different levels of priority for action:

- Area 1 (red) urgent action required;
- Area 2 (yellow) prompt actions required; and
- Area 3 (green) scheduled actions or monitoring required.

The priority matrix gave graphical evidence of which steps, in the complex process of administering drugs, more urgently needed corrective action to reduce the risk of failures.

### RESULTS

The team developed a detailed process map for the process of medication prescribing and dispensing, identifying failure modes for each step. As process steps may be susceptible to multiple failure modes, the calculation of RPNs is acceptable to identify the failure modes that pose the greatest risk of harm. Table 3 displays the number of process steps and the high-risk failure modes that team identified in multiple FMEAs with the RPNs count.

### **Failure Modes**

A total of 15 high-risk failures were identified, plotted in areas 1 (red), 2 (yellow), and 3 (green) of the priority matrix, with associated causes and effects mentioned in Table 4.

### DISCUSSION

The hospital utilizes an individualized direct drug-dispensing system, where the prescription is written over carbon paper and the prescription is taken by hand to the pharmacy for collection of medications by individual patients.

None of the steps in the drug-dispensing process were free of potential failure modes, but six failure modes emerged as the most vulnerable steps (with RPNs over 168) Table 4 shows the various failure modes along with cause and effect and suggested remedial actions. The most critical elements in the dispensing of drugs in the present setting were where patient does not understand proper use



Occurrence (O)		Severity (S)		Detection (D)	
Failure mode probability	Score	Descriptive of injury	Score	Likelihood of detection	
Remote: failure unlikely to occur (happening in 1 in 10000 episodes observed)	1	No injury or patient monitoring alone	1	Very high: detected 9/10 times	
Low: relatively rare failure (happening in 1 in 1000 episodes observed)	2	Temporary injury needing additional intervention or treatment	2	High: detected 7/10 times	
Moderate: occasional failure (happening in 200 episodes observed)	3	Temporary injury with longer hospital stay or increased level of care	3	Medium: detected 5/10 times	
High: recurrent failure (happening in 1 in 100 episodes observed)	4	Permanent effects on body functions	4	Low: detected 2/10 times	
Very high: common failure (happening in 1 in 20 episodes observed)	5	Death of permanent loss of major body functions	5	Remote: detected 0/10 times	
	Failure mode probabilityRemote: failure unlikely to occur(happening in 1 in 10000 episodesobserved)Low: relatively rare failure (happeningin 1 in 1000 episodes observed)Moderate: occasional failure(happening in 200 episodes observed)High: recurrent failure (happeningin 1 in 100 episodes observed)Very high: common failure (happeningin 1 in 20 episodes observed)	Failure mode probabilityScoreFailure mode probabilityScoreRemote: failure unlikely to occur1(happening in 1 in 10000 episodes observed)2Low: relatively rare failure (happening in 1 in 1000 episodes observed)2Moderate: occasional failure (happening in 200 episodes observed)3High: recurrent failure (happening in 1 in 100 episodes observed)4Very high: common failure (happening 5 in 1 in 20 episodes observed)5	Failure mode probabilityScoreDescriptive of injuryRemote: failure unlikely to occur (happening in 1 in 10000 episodes observed)1No injury or patient monitoring aloneLow: relatively rare failure (happening in 1 in 1000 episodes observed)2Temporary injury needing additional intervention or treatmentModerate: occasional failure (happening in 200 episodes observed)3Temporary injury with longer hospital stay or increased level of careHigh: recurrent failure (happening in 1 in 100 episodes observed)4Permanent effects on body 	Failure mode probabilityScoreDescriptive of injuryScoreRemote: failure unlikely to occur (happening in 1 in 10000 episodes observed)1No injury or patient monitoring alone1Low: relatively rare failure (happening in 1 in 1000 episodes observed)2Temporary injury needing additional intervention or treatment2Moderate: occasional failure (happening in 200 episodes observed)3Temporary injury with longer of care3High: recurrent failure (happening in 1 in 100 episodes observed)4Permanent effects on body functions4Very high: common failure (happening in 1 in 20 episodes observed)5Death of permanent loss of major body functions5	

Table 2: Rating scales to assign values to occurrence (	D), severity (S), and detection (D) scores	in FMEA of the drug administration process
---	--	--

The risk priority number (RPN) is calculated by multiplying the O, S and D scores.



Fig. 1: Hazard analysis

of prescription of potentially dangerous drug interactions (RPN 432) followed by illegible prescription, ineffective patient counseling, and wrong drug delivery to the patient. All of the above failure modes were identified as high risk requiring immediate attention.

### LIMITATIONS OF THE STUDY

This study has some limitations. As a single-institution study, the findings reflect the care delivery model in a particular setting, although many features are common to other healthcare organizations. For these reasons, the results might not be completely generalized to all the other organizations. Notwithstanding that, FMEA permits identification of higher risk of failure modes through a meticulous, time-intensive, and resource-intensive methodology. Its successful completion is highly dependent on the team member's aptitude and commitment to introduce corrective measures in clinical practice. For these reasons, it is important to create a multidisciplinary team of front-line people who know perfectly the process guided by an experienced facilitator. This can improve the consistency of an FMEA program and also minimize the number of hours it takes to complete an FMEA.

### Recommendations

There is a dire need of application of systems theory with actions needed at every level of drug-dispensing mechanism. According to systems theory, a change in one sub-system is bound to affect other subsystem.

Actions required at organizational level for the pharmacy in question:

- Use of bar coding technology in pharmacy;
- implementation of computerized physician order entry (CPOE);
- · clean and organized work area to avoid human factors errors;
- effective and efficient inventory control techniques;
- having a qualified pharmacist staff in pharmacy or available on telephone to consult patient questions; and
- Training and awareness of staff on effective communication techniques.

### **Actions Required at Physician Level**

- Training and awareness of doctors on benefits of prescription writing;
- Doctors to mention allergies boldly on patient treatment books;
- Formulation change should be clearly communicated to the patient and formulation change stickers can be used; and
- Adequate patient counseling. Repeat check-back procedure.

### **Actions Required at Staff Level**

- Training and education of staff on benefits of safe drug dispensing.
- Double check of patient name and identification.
- Double-check of medicines before dispensing.
- Checking on patient treatment book before dispensing medications.
- Qualified pharmacist available on board or on call to provide explicit instructions on prescription use and possible negative interactions with other drugs.

### CONCLUSION

In today's healthcare world, patient-safety issues are of major concern. Over the years, pharmacists have implemented various

Table 3: No of proc	cess steps with RPN scores								
Description	Failure mode	Causes	Effects	000	DET	$P = O \times D$	SEV	$RPN = O \times D \times S$	Actions
Doctor diagnosis	R1 Doctor indicates an incorrect strength or form of medication	Doctor uses incorrect abbreviation symbols indicating a solid strength versus a liquid strength or erroneously mentioning wrong dose	The pharmacist or doctor in civil OPD would ultimately catch this error, but if the medicine was dispensed as written, with strength for liquid applied to strength for solid, it could be harmful or even dangerous to the patient	2	ω	16	Би	80	IMDT: pharmacists review and questions any prescriptions that do not make sense. Long-term: implementation of CPOE system
	R2 Allergies not updated	Pharmacists/doctor forget to confirm allergies with patient	Delay, dispense something patient allergic to	4	m	12	<b>б</b>	108	Doctors to be advised to mention allergies boldly on the patient treatment books
Prescription input	R3 Prescription has incorrect name on it	Doctor or nurse made mistake	Medicine to the wrong patient, insurance may not be paid for the patient, or the patient will not be able to receive their medication	7	∞	10	~	112	Double-check patient name, have ID number to match name, ask patient name when receiving prescription
	R4 Prescription unable to be read	Illegible doctor handwriting, crumpled and smudged prescription	May give the patient the wrong medication, wrong strength, wrong frequency, and for the wrong length of time	Ŋ	8	40	σ	360	Use computer system not paper to manage prescriptions in database that allows doctor to directly enter
	R5 Prescription does not contain relevant information	Older prescription pads, or prescription pads used in the interim of new pads be in ordered	May cause physician authentication problems	<del></del>	ω	ø	-	ø	Double-check prescription on entry to ensure that all pertinent information is on prescription
Dispensing medication	R6 Incorrect medication sorted for patient	Careless errors Messy work area (may pick up the wrong drug)	Patient gets wrong medication and/ or wrong dosage. Could lead to hospitalization or possibly death	m	Ś	15	10	150	Keep work area clean so that medications are not mixed up due to human error
	R7 Incorrect medication delivered to patient	Patient picks up the incorrect set, may take the wrong medication	Could be severe if a patient receives and is administered incorrect medication	7	ω	16	10	160	At the pharmacy, all medications are double-checked as they are placed into the bags
	R8 Drug out of stock	Forgot to order, backorder, manufacturer cannot supply	Delay	Ś	m	15	7	30	Effective inventory control techniques to be utilized
	R9 Count wrong amount	Interruptions	Inadequate medication supplied to patient	4	Ŋ	20	7	40	Training and education of pharmacy staff
	R10 Medication picked up given to wrong patient	Patient not properly identified, LASA	Medication error	Ω.	~	35	6	315	Training and education of pharmacy staff
									Conta

16



Contd									
Description	Failure mode	Causes	Effects	OCC	DET	$P = O \times D$	SEV	$RPN = O \times D \times S$	Actions
	R11 Change of formulation not indicated on the prescription	Prescriber error	Reduced chance of detection of change by pharmacy, patient given new strength and not counseled about it	œ	7	16	Q	96	Checking of patient treatment book to confirm
Informing patient	R12 Patient does not un- derstand proper use of prescription of potentially dangerous drug interac- tion	No pharmacist/nurse present to counsel cus- tomers, pharmacy does not provide sufficient literature or explicit warnings about drugs effects	Prescription may be used incorrectly and potentially dangerously or in effectively. Patient may mix with another drug with negative effects leading to medical complications or injury	Q	ω	48	თ	432	Have pharmacist on staff in pharmacy or available by telephone to consult patient questions. Provide explicit instructions on prescription use and possible negative interactions with other drugs
Counseling patient about change	R13 Counseling about new dose does not occur	Person handing out medication unaware first time receiving new formulation strength so counseling about the new formulation does not occur	Patient unaware of the change so takes the incorrect dose	4	0	36	Ó	216	Formulation change sticker will clearly indicate whether patient needs counseling
	R14 Counseling ineffective	Patient does not listen or has trouble with English Ineffective communica- tion by HCP	Patient unaware of formulation change and takes the incorrect dose	4	ω	32	Q	192	Training and awareness amongst staff on effective communication techniques
Patient takes medication	R15 Patient takes incorrect dose	Confusion over change, no info given, and patient did not read/ listen to information. Patient has supply of both strengths at home and becomes confused and takes wrong strength	Patient takes wrong dose(higher dose potential risk of side effects)	4	~	58	Q	168	Adequate patient coun- seling, repeat back and check back procedure

International Journal of Research Foundation of Hospital and Healthcare Administration, Volume 7 Issue 1 (January–June 2019)

Risk no	Failure Mode	RPN no		
Area 1: Urgent ac	tion required			
R12	Patient does not understand proper use of prescription of potentially dangerous drug interaction.	432		
R4	Prescription unable to be read	360		
R10	Medication picked up given to wrong patient	315		
R13	Counseling about new dose doesn't occur	216		
R14	Couselling ineffective	192		
R15	Patient takes incorrect dose	168		
Area 2: Prompt actions required				
R7	Incorrect medication delivered to patient	160		
R6	Incorrect medication sorted for patient	150		
R3	Prescription has incorrect name on it	112		
R2	Allergies not updated	108		
R11	Change of formulation not indicated on the prescription	96		
R1	Doctor indicates an incorrect strength or form of medication	80		
R9	Count wrong amount	40		
R8	Drug out of stock	30		
Area 3: Scheduled	l actions or monitoring required			
R5	Prescription does not contain relevant information	8		

methods to reduce the rates of dispensing errors. With a view to reduce the risk of medication errors and to improve patient safety, the data presented here entitles to say that tools such as FMEA enable a prospective analysis of the process of drug delivery. This helps to decrease potential failure modes and their associated causes and assess which risks have the greatest concern. It also stimulates the most urgent improvement efforts in clinical practice to prevent errors before they occur and to identify opportunities to improve medication safety in healthcare delivery.

### References

18

Table 4: Classification of failure modes

- 1. James KL, Barlow D, McArtney R, et al. Incidence, type and causes of dispensing errors: a review of the literature. Int J Pharm Pract 2009;17(1):9–30.
- 2. van den Bemt PMLA, Egberts ACG. Drug related problems: definitions and classification. Eur J Hosp Pharm Pract 2007;13:62–64.
- 3. Beso A, Franklin BD, Barber N. The frequency and potential causes of dispensing errors in a hospital pharmacy. Pharm World Sci 2005;27(3):182–190. DOI: 10.1007/s11096-004-2270-8.
- Teagarden JR, Nagle B, Aubert RE, et al. Dispensing error rate in a highly automated mail-service pharmacy practice. Pharmacotherapy 2005;25(11):1629–1635. DOI: 10.1592/phco.2005.25.11.1629.
- 5. Cina JL, Gandhi TK, Churchill W, et al. How many hospital pharmacy medication dispensing errors go undetected? Jt Comm J Qual Patient Saf 2006;32(2):73–80.
- 6. Maviglia SM, Yoo JY, Franz C, et al. Cost-benefit analysis of a hospital pharmacy bar code solution. Arch Intern Med 2007;167(8):788–794. DOI: 10.1001/archinte.167.8.788.

- Chua SS, Wong IC, Edmondson H, et al. A feasibility study for recording of dispensing errors and near misses in four UK primary care pharmacies. Drug Saf 2003;26(11):803–813. DOI: 10.2165/00002018-200326110-00005.
- Rickrode GA, Williams-Lowe ME, Rippe JL, et al. Internal reporting system to improve a pharmacy's medication distribution process. Am J Health Syst Pharm 2007;64(11):1197–1202. DOI: 10.2146/ajhp060166.
- De Smet PA, Denneboom W, Kramers C, et al. A composite screening tool for medication reviews of outpatients: general issues with specific examples. Drugs Aging 2007;24(9):733–760. DOI: 10.2165/00002512-200724090-00003.
- Knudsen P, Herborg H, Mortensen AR, et al. Preventing medication errors in community pharmacy: root-cause analysis of transcription errors. Qual Saf Health Care 2007;16(4):285–290. DOI: 10.1136/ qshc.2006.022053.
- 11. Teinila T, Gronroos V, Airaksinen M. A system approach to dispensing errors: a national study on perceptions of the Finnish community pharmacists. Pharm World Sci 2008;30(6):823–833. DOI: 10.1007/ s11096-008-9233-4.
- 12. Becker ML, Caspers PW, Kallewaard M, et al. Determinants of potential drug–drug interaction associated dispensing in community pharmacies in the Netherlands. Pharm World Sci 2007;29(2):51–57. DOI: 10.1007/s11096-006-9061-3.
- Malone DC, Abarca J, Skrepnek GH, et al. Pharmacist workload and pharmacy characteristics associated with the dispensing of potentially clinically important drug-drug interactions. Med Care 2007;45(5):456–462. DOI: 10.1097/01.mlr.0000257839.83765.07.
- Joint Commission Resources, Joint Commission International Failure Mode and Effects Analysis in Health Care: proactive risk reduction, 3rd ed.; 2010.



### **ORIGINAL ARTICLE**

# Knowledge, Practice and Attitude of Hepatitis B Infection and its Prevention among Nurses in a Tertiary Eye Care Center of Delhi

Suman R Kashyap<sup>1</sup>, Seema Sachdeva<sup>2</sup>, Yangchen Dolma<sup>3</sup>, Anita Sarin<sup>4</sup>, Shakti K Gupta<sup>5</sup>

### Abstract

**Background:** Hepatitis B infection is a common disease all over the world. According to its endemicity, countries are divided into three groups (high, intermediate, low). India falls in the intermediate endemicity zone (prevalence of 2–8% with an average of 4%). The risk of contracting hepatitis B virus (HBV) is four times greater for healthcare workers, compared to that of the general adult population. So, the study was aimed to assess knowledge, practice, and attitude of nursing officers regarding hepatitis B infection and its prevention, its association with selected variables, and correlation between knowledge and practice.

**Materials and methods:** A cross-sectional survey was carried out among 180 nursing officers working in an ophthalmic center of a tertiary care hospital using 38 items, self-administered questionnaire with three sections for knowledge, practice, and attitude regarding HBV infection and its prevention. The data were collected in the morning and evening shift as per the subject's availability after obtaining a written consent from subjects. The analysis was performed using the statistical analysis software.

**Results:** Among 180 respondents, 8% had poor knowledge whereas 92% showed adequate knowledge about HBV infection and its prevention. Poor knowledge was apparent in items like diet required in hepatitis infection (29%); otherwise, in rest all the areas, adequate knowledge was observed. Regarding practice, 14% had poor practices whereas 86% showed good practices. With regard to attitude, majority of the subjects had positive attitude for the items like risk of getting HBV infection (80%), importance of HBV vaccination (97%), and using universal precaution (98%). Uncertainty and disagreement showing negative attitude was observed in items like revealing the HBsAg+ve status at work (73%), sharing utilities with an infected person (71%), feeling stressed to take care of an infected patient (38%), fear of social isolation (80%), and vaccination for an HBV-infected patient (60%).

Keywords: Hepatitis B virus, Infection prevention, Vaccination.

International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1104

### INTRODUCTION

Hepatitis B infection is one of the major public health problems and leading causes of morbidity and mortality worldwide.<sup>1</sup> In India, the prevalence of hepatitis B infection among the general population ranges from 2 to 8%, which puts India at the second place in the global pool for hepatitis B infection.<sup>2</sup> India has point prevalence of 2.1% and carrier rate of 1.7% for hepatitis B virus (HBV) infection. Some studies have shown higher carrier rate ranging from 11% in healthcare workers to 5% in general population.<sup>3</sup> Hepatitis B is an important occupational hazard for healthcare workers due to transmission via blood and body fluids. With the increasing number of invasive diagnostic and therapeutic procedures, the risk of infection among healthcare workers is two to four times greater than that of general adult population. About 66,000 hepatitis B viral infections are reported per year due to needle-stick injuries. Hence, the adherence to universal precautions is critical to prevent HBV transmission.<sup>4</sup> Along with this, a complete vaccination status is important for workers in the healthcare setting to reduce the risk of vaccine-preventable diseases (VPDs) among both healthcare workers and patients. Enhancing the knowledge about hepatitis B and crafting prevention practices are the major strategies to the prevention of the disease to a great extent. Knowledge and practices of healthcare workers play a key role in prevention of spread of infection.<sup>5</sup> Therefore, the present study aimed to assess the knowledge of risk factors for hepatitis B infection, its vaccination, and frequency of vaccination among the nursing officers in tertiary

<sup>1,3–5</sup>Dr Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India

<sup>2</sup>College of Nursing, All India Institute of Medical Sciences, New Delhi, India

**Corresponding Author:** Shakti K Gupta, Dr Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India, Phone: +91 9818837782, e-mail: shakti810505@gmail. com

How to cite this article: Kashyap SR, Sachdeva S, Dolma Y, *et al.* Knowledge, Practice and Attitude of Hepatitis B Infection and its Prevention among Nurses in a Tertiary Eye Care Center of Delhi. Int J Res Foundation Hosp Healthc Adm 2019;7(1):19–23.

Source of support: Nil Conflict of interest: None

eye care hospital, New Delhi, India. The objectives were to assess knowledge, practice, and attitude of nursing staff regarding hepatitis B infection and its prevention, its association with selected variables, and correlation between knowledge and practice.

### **O**BJECTIVE

To assess knowledge, practice, and attitude of nursing officers regarding hepatitis B infection and its prevention, its association with selected variables, and correlation between knowledge and practice.

<sup>©</sup> The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

### MATERIALS AND METHODS

A cross-sectional survey was carried out among nursing personnel working in the ophthalmic center of a tertiary care hospital, New Delhi, from April 2018 to July 2018. The total enumeration sampling method was used for a total population of 236. The subjects who were not available at the time of study or who did not gave consent were excluded. Finally, the 180 subjects participated in the study in filling questionnaire. A 38-items, self-administered questionnaire with 3 sections for knowledge, practice, and attitude was used along with 14 items related to sociodemographic characteristics and the self-reported vaccination status. The tool was validated by experts for face, content, and criteria validity. The internal consistency of the tool was calculated by appropriate statistical formulas. After getting ethical permission from the institute ethical committee (Protocol no. IEC/76/2/2018), a written informed consent from respondents was obtained. Subjects were assured about the confidentiality of their responses and their right to withdraw from the survey at any time. The data were collected in the morning and evening shift as per the subject's availability. Data were entered in the master sheet analyzed using the statistical analysis software (SAS). Descriptive statistics were used to illustrate demographic characteristics. Categorical variables were measured as percentages, while continuous variables were expressed as mean ± standard deviation. Inferential statistics (ANOVA, t test, p < 0.05) were used to assess the significance among study variables. Pearson coefficient correlation (p < 0.05) was used to evaluate the association between knowledge and practice.

### Results

20

Of the 236 participants, 180 (90%) completed the survey. The findings of 180 subjects showed that the majority of subjects (47%) were in the age group of 30–40 years, females were the dominant gender (89%), and 98 (54%) had diploma in nursing and 64% subjects had 2–5 years of professional experience. Majority (50%) were working in ophthalmic wards and OPDs. Around 83% subjects had never attended any in-service education related to hepatitis B. Most of the subjects were nonsmokers and nonalcoholic. Surprisingly, 60% subjects were never tested for hepatitis B, and 62% indicated that they had not received a vaccine for HBV.

### Assessment of Knowledge

Table 1 describes the knowledge of subjects regarding HBV infection and its prevention for each item under yes or no response. Knowledge score ranged from 18 (maximum) to 0 (minimum). The mean knowledge score for the entire study cohort was  $15.29 \pm 2.46$ . A cutoff level of <11 was considered as poor whereas  $\geq$ 11 was considered as adequate knowledge about HBV. Among 180 respondents, 14 (8%) had poor knowledge whereas 166 (92%) showed adequate knowledge about HBV infection and its prevention.

Poor knowledge was apparent in items like diet required in hepatitis infection (29%) and vaccination schedule (53%). Whereas good knowledge was observed in items like availability of vaccine (96%), screening in prenatal (89%), and transmission of infection (94%) (Table 1).

# Assessment of Practices toward Hep B Infection and Prevention

Practice was assessed by asking eight questions with yes or no response as shown in Table 2. The total scores ranged from 8 (maximum) to 0 (minimum). The mean practice score was  $6.60 \pm 1.14$ .

Table 1: Item-wise responses of subjects to knowledge items (n = 180)

		,	<b>J</b> = = = ( = = )
6		Correct	Incorrect
5. no.	Knowledge items	responses f (%)	responses F (%)
1	ls hepatitis B a bacterial disease?	135 (75)	45 (25)
2	Can hepatitis B cause liver cancer?	110 (61)	70 (39)
3	Can hepatitis B affect any age group?	173 (96)	7 (4)
4	ls jaundice a common symptom of hepatitis B?	155 (86)	25 (14)
5	Can hepatitis B spread through mother to child in pregnancy?	151 (84)	29 (16)
6	Can hepatitis B be transmitted by unsafe sex?	130 (72)	50 (28)
7	Transmission of hepatitis B by sterilized syringes/ needles	130 (72)	50 (28)
8	Can hepatitis B be transmitted by used blades for shaving purpose?	156 (87)	24 (13)
9	Is hepatitis B transmitted by contaminated water and food?	118 (65)	62 (35)
10	Treatability of hepatitis B with present line of treatment	134 (74)	46 (26)
11	Availability of vaccination for protection from hepatitis B	173 (96)	7 (4)
12	Specific diet required for Hep B	53 (29)	127 (71)
13	Are nausea, vomiting, and loss of appetite common symptoms of hepatitis B?	154 (85)	26 (15)
14	Common symptoms of acute hepatitis B	145 (80)	35 (20)
15	Can hepatitis B spread through unscreened blood or blood products?	169 (94)	11 (6)
16	Screening of hepatitis B required in the prenatal period	161 (89)	19 (11)
17	The schedule of Hep B vaccination	96 (53)	84 (47)
18	Therapy after exposure to Hep B infection	102 (57)	78 (43)

A cutoff level of <5 was considered as poor practice whereas  $\geq$ 5 was considered as good practice for Hep B infection prevention. Out of 180 subjects, 26 (14%) had poor practices with scores <5 whereas 154 (86%) showed good practices with scores >5.

Poor practices were observed for sharing items with an HBV+ve person (35%). Whereas good practices were observed in items like



Fable 2: Response of the subjects regarding Hep B infection-preventior
practices $(n = 180)$

-			
S. no.	Practice items	Yes f (%)	No F (%)
1	Do you take a new sterile syringe before use?	177 (98)	3 (2)
2	Do you look for screening of blood or blood products before transfusion?	175 (97)	5 (3)
3	Do you ask for change of blade before any procedure like shaving by barber or ear piercing?	170 (94)	10 (6)
4	Do you recap the needle after use?	43 (24)	137 (76)
5	Do you cut the needles and syringe hub before final disposal?	171 (95)	9 (5)
6	Do you share your items (food/ utensils/water) with an HB+ve per- son?	62 (35)	118 (65)
7	Do you wear PPE (personal protective equipment) while dealing with blood and blood products?	172 (95)	8 (5)
8	Have you completed your hepatitis B vaccination?	115 (64)	65 (36)



Fig. 1: Knowledge and practices of the subjects regarding hepatitis B infection and prevention

using sterile syringes, screening of blood, and use of fresh blades before shaving (94–98%) (Table 2).

The comparison of knowledge and practices in Figure 1 shows that majority of the subjects had both good knowledge and practices regarding hepatitis B infection and prevention.

### Assessment of Attitude

Attitude toward hepatitis B and its prevention was assessed by 10 items. Each question was ranked under agree, disagree, and uncertain categories. The respondents were allowed to choose to only one response as shown in Table 3. Ranking was performed under positive and negative attitude.

Majority of the subjects had positive attitude for the items like risk of getting HBV infection (88%), importance of HBV vaccination (97%), and using universal precaution (98%). Uncertainty and disagreement showing negative attitude was observed in items like revealing the HBsAg+ve status at work (53%), sharing utilities of a positive person with a noninfected person (58%), feeling stressed

S. no.	Items related to attitude	Agree f (%)	Disagree f (%)	Uncertain f (%)
1	Are you at risk to get hepatitis B?	158 (88)	7 (4)	15 (8)
2	Would you feel stress to take care of such patient?	71 (39)	73 (41)	36 (20)
3	Do you feel hepatitis B vaccination is important?	175 (97)	2 (1)	3 (2)
4	Would you like to reveal your HB status at work, if present?	83 (46)	15 (8)	82 (45)
5	Would you feel fear of social isolation/ stigmatized with HB infection?	63 (35)	72 (40)	45 (25)
6	Should a hepatitis B patient allowed to work routinely?	127 (70)	30 (17)	23 (13)
7	Should an HB patient be allowed to perform strenuous exercises?	40 (22)	92 (51)	48 (27)
8	Should an HBV- infected patient/ staff be allowed to share his utilities?	60 (33)	104 (58)	16 (9)
9	The patient with HB infection should get hepatitis B vaccination	107 (59)	46 (26)	27 (15)
10	Do you take extra precautions for a known case of an HbsAg+ve patient?	176 (98)	3 (2)	1

Table 3: Attitude item and its responses (n = 180)

to take care of an infected patient (61%), and vaccination for an HBV-infected patient (59%).

### **Correlation between Knowledge and Practice**

To find the correlation of knowledge with practice, a Pearson coefficient correlation was used with 95% level of significance (p = 0.05). Significant positive linear correlations were observed between knowledge and practice with r = 0.42 and p = 0.001.

# Association of demographics characteristics with mean knowledge, practice, and attitude scores

Table 4 describes the association of demographic characteristics like age, gender, education, experience, in-service education, and positive case of hepatitis B infection.

The variables like age, education, and experience were found to be statistically significant with p < 0.05 with knowledge and practice of subjects regarding hepatitis infection and its prevention. The knowledge and practices were better in younger age group (20–30 years) than 30–40 years (p = 0.002 for knowledge and p = 0.009 for practice) and >40 years (p = 0.005 for knowledge and p = 0.001 for practice). In education, degree holder subjects had more knowledge and good practices than diploma holders with p =0.008 and p = 0.001, respectively. Similarly, both knowledge and Table 4: Association of domographic characteristics with mean knowledge and practice scores

Variables	N	Mean K mean ± SD	p value	Mean p mean $\pm$ SD	p value
Age (in years) <sup>#</sup>					
20–30	33	16.12 ± 1.89	0.001*	7.36 ± 0.78	0.01*
30–40	84	15.68 ± 2.3		6.63 ± 1.01	
>40	63	15 <u>+</u> 2.23		6.10 ± 1.37	
Gender <sup>@</sup>					
Male	19	16.05 ± 2.19	0.32	6.68 ± 1.05	0.69
Female	161	15.20 ± 2.48		6.59 <u>+</u> 1.15	
Education <sup>@</sup>					
GNM	98	14.73 ± 0.26	0.008*	6.26 ± 0.12	0.001*
Bsc Nsg	82	15.9 <u>+</u> 0.23		7 <u>±</u> 0.09	
Experience (in ye	ears) <sup>#</sup>				
<2	19	15.5 <u>+</u> 1.9	0.05*	6.98 ± 0.89	0.001*
2–5	116	16.6 ± 1.52		7.15 ± 0.84	
>5 years	45	14.5 ± 2.50		6.42 ± 1.16	
In service educat	ion <sup>@</sup>				
Yes	45	15.54 <u>+</u> 2.52	0.89	6.68 ± 1.30	0.71
No	135	15.21 ± 2.45		6.58 ± 1.05	

<sup>#</sup>ANOVA, <sup>@</sup>two sample *t* test, \*p < 0.05 significant

practices were better in subjects with 2–5 years of experience than less experienced (<2 years; p = 0.52 for knowledge and p = 0.05 for practice) and also more experienced subjects (>2–5 years; p = 0.001for knowledge and p = 0.01 for practice).

### DISCUSSION

The prevalence rate of hepatitis B viral infection is about 2-10 times higher among healthcare workers than the general populations mainly due to percutaneous or mucosal exposure to infected blood or body fluids, using inadequately sterilized medical or surgical equipment or contact with the nonintact skin.<sup>6,7</sup> Despite increasing prevalence of this viral infection and increased risk among healthcare workers, there is paucity of information on knowledge and safe practices especially in developing countries like India.8 The present study conducted in tertiary care center, New Delhi, India, revealed that majority of the subjects had overall adequate knowledge (166 out of 180) and fair practices (154 out of 180) regarding hepatitis B infection and its prevention. Around three-fourth of the respondents in this study correctly mentioned the route of transmission of HBV, which was similar to other studies conducted among dental, nursing, and medical students in India.<sup>9,10</sup> However, answer to some items like diet showed inadequate knowledge. Similarly, poor attitude was found in sharing items with an HBV-infected person. A similar study on healthcare workers in Ghana showed overall knowledge and practices as satisfactory but lack of knowledge on fatality of the disease, other types of viral hepatitis, the route of transmission, and poor practices for recapping needle and needle-stick injury prevention.<sup>10</sup> Another similar study in Nigeria (2015) suggested most of the respondents underestimate the risk of transmission and this may put healthcare workers at risk of being infected with these pathogens following exposure.<sup>11</sup> The present study also identified good compliance with the use of simple personal protective equipment such as gowns, caps, and mask and goggles. The evidences of the present study revealed the need for consistent and appropriate safety precautions by hospital personnel as only 64% subjects were fully vaccinated for hepatitis B. The findings are consistent with a study done in a

tertiary care hospital, Delhi, India (2009), which reported that only 55.4% healthcare workers were vaccinated against hepatitis B, though there was adequate knowledge and fair practices.<sup>12</sup> With regard to attitude, majority of the subjects had a positive attitude for the risk of getting HB infection, importance of HB vaccination, and using universal precaution. Whereas a negative attitude was observed for sharing utilities with infected person, feeling stressed to take care of a seropositive patient, and revealing self seropositive status for HB at work and fear of social isolation. The findings go in line with the study done in southern Nigeria that displayed negative attitudes of healthcare workers regarding knowing their HBV status and patient's screening.<sup>13</sup> The demographics like age, education, and experience showed a significant association with knowledge and practice of subjects. The findings go in line with the study in Northwest Ethiopia on infection-control practices among healthcare workers, which suggested that older age, lengthy work experience, and a higher educational status were significantly associated with both knowledge and practice of infection prevention.<sup>14</sup> A positive but weak correlation was found between knowledge score and practice (r = 0.42, p = 0.001). The finding of weak correlation between good knowledge and good practice suggests that knowledge does not always translate into good practice. Whereas a positive correlation for awareness level and attitude was found in a study done on healthcare workers.<sup>5</sup>

### LIMITATIONS

The study was conducted in single center of a tertiary care hospital. The findings could vary among subjects from one center to other. The information was gathered via self-administered questionnaires, so the actual practices may vary from the responses given. The vaccination status was assessed through self-provided information, which is prone to recall bias.

### CONCLUSION

The overall knowledge and practice was adequate among subjects. Good knowledge and practices were observed for specific items



like use of personal protective equipment and recap and cutting of needle before disposal. Subjects had negative attitude for revealing seropositive status for HbsAg and sharing utilities with an infected person. Compliance of healthcare workers to hepatitis B vaccination deserves serious attention.

### Recommendations

Regular training and handholding activities are required to be an essential part of in-service education. The Indian Health Ministry should make hepatitis B vaccination mandatory for all healthcare professionals. Antibody titers should be routinely checked among those who are vaccinated.

### REFERENCES

- 1. Vinodhkumaradithyaa A, Srinivasan M, Sankarasubramanian RA, et al. Hepatitis B vaccination among medical students. Indian J Community Med 2008;33:67-68. DOI: 10.4103/0970-0218.39254.
- 2. Singhal V, Bora D, Singh S. Hepatitis B in health care workers: Indian scenario. J Lab Physicians 2019;1:41-48. DOI: 10.4103/0974-2727.59697.
- 3. Choudhury P, Mishra S, Kandula S, et al. Awareness of hepatitis B infection among healthcare students in a private medical college in Odisha. J Int Soc Prevent Communit Dent 2015;5(S2):63-67. DOI: 10.4103/2231-0762.171260.
- 4. World Health Organization Guidelines for the prevention, care and treatment of persons with chronic Hepatitis-B infection. Geneva: WHO Library Cataloguing-in-Publication Data, 2015, (ISBN 978 92 4 154905 9).
- 5. Gunson RN, Shouval D, Roggendorf M, et al. Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections in health care workers (HCWs):

guidelines for prevention of transmission of HBV and HCV from HCW to patients. J Clin Virol 2003;27:213-230. DOI: 10.1016/S1386-6532(03)00087-8.

- 6. Patil S, Rao RS, Agarwal A. Awareness and risk perception of hepatitis B infection among auxiliary healthcare workers. J Int Soc Prev Community Dent 2013;3:67-71. DOI: 10.4103/2231-0762.122434.
- 7 Singh A, Jain S. Prevention of hepatitis B; knowledge and practices among medical students. Healthline 2011;2:8-11.
- 8. Batham A, Narula D, Toteja T, et al. Systematic review and metaanalysis of prevalence of hepatitis B in India. Indian Pediatr 2007;44:663-674.
- 9. Sivarajasingam V, Laszlo J, Ogden GR. Extent of hepatitis B immunization among dental and medical students. Br Med J 1995;311:231. DOI: 10.1136/bmj.311.6999.231.
- 10. Yasobant. A study to assess knowledge and awareness about the hepatitis B and C among nursing college students of central India. J family med community health 2017;4(8):1136, from: https://www. researchgate.net/publication/282424489.
- 11. Kesieme EB, Uwakwe K, Irekpita E, et al. Knowledge of Hepatitis B vaccine among operating room personnel in Nigeria and their vaccination status. Hepat Res Treat 2011;2011:157089. DOI: 10.1155/2011/157089.
- 12. Singhal V, Bora D, Singh S. Hepatitis B in health care workers: Indian scenario. J Lab Physicians 2009;1(2):41-48. DOI: 10.4103/0974-2727.5969710.4103/0974-2727.59697.
- 13. Samuel SO, Aderibigbe SA, Salami T, et al. Health workers' knowledge, attitude and behaviour towards hepatitis B infection in Southern Nigeria. Int J Med Sci 2009;1:418-424.
- 14. Desta M, Ayenew T, Sitotaw N, et al. Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia, BMC Health Services Research 2018;18:465. DOI: 10.1186/s12913-018-3277-5.

# A Statistical Model to Estimate the Number of Registration Desks Required to Minimize Patient Wait Time in the Outpatient Department of a Multispecialty Hospital

Priya Darshini M Pedagandham<sup>1</sup>, Swapnil B Tak<sup>2</sup>

### Abstract

**Introduction:** Gap between demand and limited availability of resources often lead to delays, which in turn affect the patient flow in a typical hospital setting. Registration of new patients at front desk is one such place. Delays in the registration process can have an unwanted effect on patient-hospital relationship. Hence, it is important to reduce the delay.

Aim: To identify various reasons for delay in the registration process of a multispecialty hospital, and develop a statistical model to estimate number of desks to be operated to reduce the wait time.

Materials and methods: In a period of two weeks, a total of 923 new patient registrations were observed to collect the time consumed for various events of the registration process. Correlation analysis and statistical modelling are used in the study.

**Results and discussion:** It was found that various factors such as literacy level of patients, mode of payments, age etc. do not show significant correlation with the registration time, except for the hourly patient load. The number of patients arriving in an hour (patient load) showed a significant correlation, suggesting that number of desks operated on regular basis was not sufficient to handle occasional high loads. A simple model that accounts for hourly patient load, estimating the number of desks to be operated in a given hour, to minimize the wait times at registration desk has been suggested.

**Conclusion:** The model indicates that in the current setting, most of the times the resources were either underutilized or overloaded. The delays in registration process can be reduced by operating optimal number of desks as determined by the proposed model (i.e. function of hourly patient load).

Keywords: Hospital, Patient load, Patient registration, Resource planning, Wait time.

International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1101

### INTRODUCTION

A gap between the demand and availability of healthcare resources and maximization of their utility often leads to delays in the patient flow process.<sup>1</sup> Typically, patients visiting a hospital to avail various services may have to wait at various stages, such as patient registration for consultation with doctor, diagnostics, admission into a ward, transfer between wards, and discharge.<sup>2</sup> Depending upon the availability of required resources, the wait time can vary from few minutes to hours, which may result in displeasure among patients.<sup>3</sup> Hence, it is important for the hospital administration to develop and implement better processes to reduce possible delays while optimizing the resource utilization.

In general, every patient has to go through registration process during their first visit to the hospital to avail services offered.<sup>4</sup> Being the first step in the hospital–patient relation, delays in the registration process may affect the relationship. It is therefore important to monitor the registration process (besides various other processes resulting in delays) to minimize waiting time and to promote continuous improvement of the processes. Delays are typically due to a lack of synchronization between various activities.<sup>2</sup> The present work aims to develop a solution to address delays in the new patient registration process of a multispecialty hospital.

Registration process is usually concerned with collection and recording of demographic details of patients along with their brief medical history.<sup>2</sup> The process may vary a little from hospital to hospital. In the selected hospital, a patient when visiting for the first time is given a file with an empty registration form; the form

<sup>1</sup>Center for Health Management Studies and Research, Bharati Vidyapeeth Medical College, Bharati Vidyapeeth (Deemed to be University), Pune, Maharashtra, India

<sup>2</sup>Department of Preventive and Social Medicine, Bharati Vidyapeeth Medical College, Bharati Vidyapeeth (Deemed to be University), Pune, Maharashtra, India

**Corresponding Author:** Swapnil B Tak, Department of Preventive and Social Medicine, Bharati Vidyapeeth Medical College, Bharati Vidyapeeth (Deemed to be University), Pune, Maharashtra, India, Phone: +91 9822837373, e-mail: swapnil.tak@bharatividyapeeth.edu

How to cite this article: Pedagandham PDM, Tak SB. A Statistical Model to Estimate the Number of Registration Desks Required to Minimize Patient Wait Time in the Outpatient Department of a Multispecialty Hospital. Int J Res Foundation Hosp Healthc Adm 2019;7(1):24–28.

### Source of support: Nil

Conflict of interest: None

has to be filled and submitted to registration desk staff. The form contains patient information such as demographics, drug allergies, and emergency contact details. The information collected is fed into the hospital information system (HIS) and stored permanently. A unique identification number (also referred to as medical record number (MRN)) is generated and tagged with the patient's details in the HIS. The MRN helps to store and retrieve patient's data from the HIS when required. Flowchart 1 depicts the work flow of new patient registration. It involves various steps such as inquiries about

<sup>©</sup> The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.



Flowchart 1: A schematic representation of the workflow of patient registration process in the selected hospital

availability of doctors or services, collection and filling of various necessary forms, verification of the information by staff, generation of MRN, verification of patient's eligibility for discounts (if any), and payment of registration and/or consultation charges by cash or card transaction. Objective of the work is to measure the time taken for various subprocesses involved in the registration process, identify factors causing a delay in the registration process, and to develop a statistical model to improve the process (i.e., reduce wait times).

The rest of the article is organized as follows. Data collection methodology and analysis of data are discussed in Materials and Methods section. Results and Discussion section present the results of the study and findings are summarized in Conclusion section.

### **MATERIALS AND METHODS**

This is an observational study of registration process conducted in a multispeciality hospital for a period of two weeks between 9:00 and 17:00 hours. All the necessary permissions were taken from the hospital management for collection of the primary data. The time taken for the registration and its sub-processes was recorded. A digital clock with minutes as the least count was used to record the time of occurrence of various events. The time was recorded at the following stations as mentioned in Flowchart 1: arrival time of patient at the registration desk  $(A_t)$ , time at which the file was collected by the patient from the desk (C<sub>t</sub>), time at which the filled up form was submitted to the registration desk (D<sub>t</sub>), time at which staff began digitization (i.e., entry of patient's data into HIS) (S<sub>t</sub>), and time at which the registration process was completed  $(E_t)$ . In addition, various attributes pertaining to patients such as age, literacy level (qualification), mode of payment (cash or card), and eligibility for discounts were also recorded for further analysis.

The files are processed at the registration counters in firstin-first-out manner. Depending upon the patient load, the forms submitted to the registration desk may take some time to be fed into HIS, during which patients have to wait at the desk. Time taken by a patient to fill various forms (denoted as form time,  $F_t$ , Flowchart 1), time elapsed between submission of forms and initiation of digitization (wait time,  $W_t$ ) and the time taken by the staff to digitize the information and to book appointment (process time,  $P_t$ ) were computed from the recorded information as

$$F_{\rm t} = D_{\rm t} - C_{\rm t} \tag{1}$$

$$W_t = S_t - D_t \tag{2}$$

$$P_{t} = E_{t} - S_{t} \tag{3}$$

The total registration time  $(R_t)$  is

$$R_{\rm t} = F_{\rm t} + W_{\rm t} + P_{\rm t} \tag{4}$$

### Statistical Methodology

Correlation is a statistical measure that defines the association between a pair of variables.<sup>5,6</sup> Pearson correlation coeffcient "*r*" assumes values |r| = 0 for a pair of variables with no correlation and 1 for highly interdependent variables. Sign of the *r* indicates either a positive or negative relation between the variables (e.g., -1 indicates strong anti-correlation). On the basis of the value of |r|, the correlation between a pair of variables is classified into following categories. Very high correlation: 0.9 < |r| < 1.0; high correlation: 0.7 < |r| < 0.89; moderate correlation: 0.5 < |r| < 0.69; low correlation: 0.3 < |r| < 0.49; little (if any) correlation: 0.0 < |r| < 0.29.<sup>7</sup>

Scatter plot is a graphical representation of relation between a pair of variables (e.g., x and y). If x and y are strongly correlated, then the x vs y data fall along a line; otherwise it scatters all over. The scatter plot is a useful tool to identify the cause and effect relation.<sup>5,6</sup>

Box plot is a graphical presentation of characteristics of data such as median, first and third quartiles ( $Q_1$  and  $Q_3$ ), inter quartile range (IQR =  $Q_3 - Q_1$ ), and outliers. It also indicates variability and skewness in the data. It enables one to examine and compare two or more sets of data graphically.<sup>5</sup>

### **R**ESULTS AND **D**ISCUSSION

Data pertaining to 923 new patient registrations were collected during two weeks period, and computed the  $F_{tr} W_{tr} P_{tr}$  and  $R_{t}$  for each registration. The data were pre-processed to remove the outliers using box and whisker method.<sup>5</sup> Data points below ( $Q_1$ –1.5 IQR) or above ( $Q_3$  + 1.5 IQR) were marked as outliers. The identified outliers were replaced with the corresponding data of previous registration.

Figure 1 shows box-plots of  $F_t$ ,  $W_t$ ,  $P_t$ , and  $R_t$  for all the registrations. Variability of  $P_t$  is the minimum, followed by  $F_t$ ,  $W_t$ , and  $R_t$ . Minimum values of the  $F_t$ ,  $W_t$ ,  $P_t$ , and  $R_t$  were 1, 2, 3, and 4 minutes, respectively. Mean values of the respective  $F_t$ ,  $W_t$ ,  $P_t$ , and  $R_t$  are found to be 9.5, 5, 7.5, and 20 minutes.

A correlation analysis of the time consumed for the registration and the various factors associated with the process helps identify important factors affecting the registration process. It enables to improve the process by working on variables that have a dominant effect (i.e., high values of *r*).

The correlation was computed between hourly mean process time and various attributes such as hourly number of card transactions, number of registrations availing discounts, number of geriatric patients, and process interruptions. The respective correlation coefficients |r| were -0.04, 0.21, 0.23, and 0.29. A weak correlation shown by these attributes signifies that none of these attributes affect the process time. This is in agreement with the minimum variability shown by the  $P_{t}$  in Figure 1.

Figure 2 shows patient load as a function of the clock time from 9:00 to 16:00 hours. The patient load (i.e., the number of patients who undergo registration) peaks every day at 11:00 and 15:00 hours.

As shown in Figure 3, the hourly mean  $R_t$  also peaks around the same time as the patient load, suggesting an association between the patient load and the  $R_t$ .



**Fig. 1:** A box plot showing the distribution of various times:  $F_t$ ,  $W_t$ ,  $P_t$ , and  $R_t$  based on the data of 923 patients

### **Relation between Patient Load and Registration Time**

To study the effect of patient load on registration time, the correlation between the hourly patient load and the hourly mean  $R_t$  was calculated. A moderate correlation was found, with an *r* value of 0.54, as depicted by the scatter plot in Figure 4.

Furthermore, correlations between the hourly patient load and the time taken for various sub-processes were also computed. The *r* value obtained for the  $F_t$ ,  $W_t$ , and  $P_t$  vs the number of patients were 0.34 (weak correlation), 0.57 (moderate correlation), and 0.05 (no correlation), respectively. It implies that the wait time (i.e., the delay in registration process) is associated with the patient load, and also suggests that the number of registration counters operated (in general, three counters) may not be sufficient for catering to the incoming patients. A simple solution (but not the optimal one) would be to operate more number of registration counters than the typical number of desks operated, but it may lead to underutilization of the resources during the off-peak hours.

### **Optimal Number of Registration Counters**

In the selected hospital, typically, three registration desks were operated on a regular basis, which was resulting in either delays in the registration process or underutilization of the resources depending upon the patient load. It was therefore required to estimate the optimum number of registration desks to be operated as a function of patient load to improve the resource utilization and to reduce delays. A simple calculation procedure was proposed to estimate the optimal number of counters to be operated as a function of the hourly patient load.

The number of counters to be operated is defined as

Number of counters = Hourly patient load / Hourly number of registrations per desk (5)

It is to be noted that mean and standard deviation of the process time are 7.06 and 2.08 minutes, respectively. If only the mean process time is considered, the hourly number of registrations per desk will be

Hourly number of registrations per desk = 60 minutes / mean process time in minutes.









Fig. 3: Hourly mean registration time as function of clock time



**Fig. 5:** The number of registration desks to be operated as a function of the patient load. Circles represent the model predictions that account for variability along with the mean process time (eqn 6)

The variability in the process indicated by a finite value of standard deviation needs to be accounted. The hourly number of registrations per desk that accounts for 95% of variability in the process is given by

Solid line in Figure 5 shows the number of counters to be operated as per eqn 5 and 6.

In Figure 6, the optimum number of counters to be operated as a function of patient load (eqn 6) in a given hour is shown. For instance, the optimal number of desks, indicated by circles (Monday) and triangles (Tuesday), do not agree with the dotted line (3 number of desks) most of the times. The proposed model suggests operating four desks at 10–11 hours on Monday, but only one desk for 13–16 hours on Tuesday to optimize the resource utilization. To verify the model estimates for the optimal number of desks, hourly mean wait times observed on the same days are plotted in Figure 7. On Monday, wait times are high for 10 and 11 hours, for which the model suggests to operate 4 desks. Hence the proposed model is



**Fig. 4:** A scatter plot showing the relation between hourly average  $R_t$  and patient load at the corresponding time



**Fig. 6:** A comparison of the model suggested the number of desks to be operated (circles and triangles) with the number of desks operated on a regular basis (dashed line) as a function of the clock time. The discrepancy between the two indicates suboptimal utilization of the resources



**Fig. 7:** The wait time in minutes as function of the clock time for two days: Monday (triangles) and Tuesday (circles) for which the model predictions are presented in Figure 6

valid, and can be utilized to allocate the resources for registration desk such that the delays in the registration process can be reduced, while maintaining optimal utilization of resources.

### CONCLUSION

28

Delay in the registration process is one of the factors that can affect the patient flow in a hospital. In this study, data such as patient demographics and time consumed for registration process were collected for the new patient registrations in a time period of two weeks. Statistical analysis of the data suggested that factors such as patient age, qualification, literacy level, and mode of payment do not contribute to the delays in the registration process. The hourly patient load and registration time (wait time) were moderately correlated, indicating that non-operation of a required number of registration desks is the reason for delays in registration process. In this work, a simple model estimating the number of desks to be operated to minimize the delays in the registration process was proposed. The proposed model indicates that the registration desk resources were underutilized most of the time, and were not sufficient to handle patient loads during peak hours. The model predictions are supported by the observed wait times. The delays in registration process can be reduced by operating optimal number of desks, as determined by the model as a function of the hourly patient load.

### ACKNOWLEDGMENTS

Authors are grateful to Dr Mahesh Mynam for his contribution and support in this work. They are also thankful to Dr HS Acharya for his valuable inputs.

### REFERENCES

- 1. Su Q, Yao X, et al. Hospital registration process reengineering using simulation method. J Healthc Eng 2010;1(1):67–82.
- 2. Hall R, Belson D, et al. Modeling patient flows through the health care system. Patient Flow. Boston, MA: Springer; 2013; pp. 3–42.
- Jones P, Peppiatt E. Managing perceptions of waiting times in service queues. Int J Serv Ind Manag 1996 Dec 1;7(5):47–61. DOI: 10.1108/09564239610149957.
- Mohd A, Chakravarty A. Patient satisfaction with services of the outpatient department. Med J Armed Forces India 2014 Jul 1;70(3):237–242. DOI: 10.1016/j.mjafi.2013.06.010.
- 5. Chernick MR, Friis RH. Introductory Biostatistics for the Health Sciences: Modern Applications Including Bootstrap. John Wiley and Sons; 2003 Jun 24.
- 6. Van Belle G, Fisher LD, et al. Biostatistics: A Methodology for the Health Sciences. John Wiley and Sons; 2004 Oct 20.
- Asuero AG, Sayago A, et al. The correlation coefficient: An overview. Crit Rev Anal Chem 2006 Jan 1;36(1):41–59. DOI: 10.1080/10408340500526766.



# Impact of the Presence of Resident Specialists on the Emergency Department Performance Index at Hospitals of Mashhad University of Medical Sciences, Mashhad, Iran

Roghayeh Bakhshi<sup>1</sup>, Soad Mahfoozpour<sup>2</sup>, Khalil Alimohammadzadeh<sup>3</sup>, Hamed Norouzi<sup>4</sup>, Hamid Zaferani Arani<sup>5</sup>

### Abstract

Aim: The main purpose of an emergency department (ED) is providing high quality services in the shortest possible time. Presence of resident specialists is one of the elements in healthcare reform plan which has been implemented with the aim of resolving the main problems of the healthcare system. This study examines the impact of the presence of resident specialists on the emergency department performance index (EDPI) at hospitals of Mashhad University of Medical Sciences (MUMS).

Materials and methods: In this cross-sectional study, changes in EDPI were investigated over a period of June 2013 to June 2014 (before the presence of resident specialists) and June 2014 to June 2015 (after the presence of resident specialists). All hospitals in MUMS which implemented the presence of resident specialists were selected by the census method. Hospital General Information Form was used to collect data. Information required were collected and recorded after obtaining the permission from the health department. After collection, data were analyzed by SPSS 19.

**Results:** The percentage of disposed patients within 6 hours before the presence of resident specialists was 80.96% and after the presence of resident specialists was 89.07%. The percentage of leaving the ED in 12 hours before the presence of resident specialists was 86.21% and after the presence of resident specialists was 88.76%.

**Conclusion:** According to the results, it can be concluded that the EDPI in hospitals of MUMS after the presence of resident specialists has shown a significant difference, and improved, except for those left ED in 12 hours.

Keywords: Department performance index, Emergency department, Hospital, Resident specialists.

International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1099

### INTRODUCTION

Hospital is on top of the healthcare system.<sup>1</sup> Emergency department is considered as one of the most important hospital wards that has a great impact on the performance of other wards and patient satisfaction.<sup>2</sup> Emergency department is the center of hospital and due to the need for rapid, high quality, effective, multiple, and complex processes, emergency position in the hospital and healthcare system should be very exceptional and sensitive. Emergency department is of utmost importance because of receiving the most overcrowding, diverse, troublesome, and most sensitive group of patients.<sup>3–5</sup> On average, 50% of hospital beds are occupied by EDs, in which an approximately 25/7 percent of active beds accounted for them and damages that arise out of it are more than 500 million dollars worldwide.<sup>6,7</sup> Each year, this department receives nearly thirty million critically ill patients and outpatients throughout the country and provides them with immediate healthcare.<sup>8</sup> Ensuring optimal performance of emergency services and the realization of improvement in every aspect of quality entail measurement and continuous monitoring. Emergency measures are one of the tools for measuring the performance of emergency. The first issue of the quality of services and patient rights is patient's waiting time to receive services.<sup>9,10</sup> Indeed, the main purpose of an emergency is providing high-quality services in the shortest possible time. Long-term stop in emergency decreases providing services to other patients in need of medical emergencies and leads to patient dissatisfaction as well as additional losses due to disasters.<sup>6</sup> In contrast, lives of patients could be saved from certain death and disability with proper and timely care.<sup>11</sup> In May 2013,

<sup>1</sup>Department of Health Care Management, South Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>2</sup>Safety Promotion and Injury Prevention Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran; Department of Health Care Management, South Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>3</sup>Department of Health Services Management, North Tehran Branch, Islamic Azad University, Tehran, Iran; Health Economics Policy Research Center, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

<sup>4</sup>Department of Public Administration, Evolution Management, Suhrawardi Higher Education Institute, Ghazvin, Iran

<sup>5</sup>Young Researchers and Elite Club, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

**Corresponding Author:** Soad Mahfoozpour, Safety Promotion and Injury Prevention Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran; Department of Health Care Management, South Tehran Branch, Islamic Azad University, Tehran, Iran, Phone: +9821-22439982, e-mail: smahfoozpour@yahoo.com

**How to cite this article:** Bakhshi R, Mahfoozpour S, Alimohammadzadeh K, *et al.* Impact of the Presence of Resident Specialists on the Emergency Department Performance Index at Hospitals of Mashhad University of Medical Sciences, Mashhad, Iran. Int J Res Foundation Hosp Healthc Adm 2019;7(1):29–32.

**Source of support:** North Tehran Branch of Islamic Azad University of Tehran, Iran has supported this study

Conflict of interest: None

<sup>©</sup> The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

given the emphasis of policymakers and healthcare planners with three approaches of financial protection from people, creating equity in access to health services, and promoted quality of services, healthcare reform plan has been implemented in the country.<sup>1,12</sup> One of the healthcare reform plan packages is the presence of resident specialists in university hospitals for 24 hours.<sup>8,13,14</sup>

The overall goal is to provide timely benefit to the public health services through the constant presence of resident specialists in hospitals affiliated to Ministry of Health and Medical Education.<sup>12,15</sup> The implementation of this service package in line with the healthcare reform plan increases patient satisfaction and staff according to the availability of specialist physician as well as timely visits and consultations of patient and disposition of patients provides 24-hours responsiveness for health centers.<sup>12</sup>

All university hospitals affiliated with the Ministry of Health are under the program. In order to increase accountability, 24-hours medical centers/teaching hospitals and ensuring appropriate treatment services at any time of the day or night and in all parts of the country and improving the quality of healthcare services, medical universities are required in hospitals/hospital subsidiary, use of the specialists or pediatrician/fellowship as a resident specialist. Resident specialist is said to be specialist/specialty/ fellowship who from 2 pm until 8 am the next day in the working days and 24 hours on holidays in the hospitals/hospital subset universities of medical sciences and in the health center has the active physical presence. Resident specialists will do disease diagnosis and treatment to their patients.<sup>12</sup>

Monitoring the performance index follow-up in the ED will significantly help to evaluate the performance of the sector. Since more than 25 percent of patients admitted to the ED will be admitted in the hospital, the quality of services in this sector is thus representative of the general service status in the hospital.<sup>8</sup> Therefore, based on the aforementioned notes in the hospital, determination of index in different sectors representing the solution of the problems considerably contributes to policy-making and it is an important factor for the monitoring and control system.<sup>16</sup> It is obvious that the presence of resident specialists in the healthcare system might be considered successful if the program can improve public health and promote health system performance in the country. Therefore, in order to evaluate the performance of program, key index in the hospitals should be investigated. Given the importance of this issue, and considering to the limited number of studies in recent years in this field, we decided to evaluate and compare EDPI in the hospitals of MUMS before and after the presence of resident specialists. It is hoped that the results of this study might provide a good strategy for improving the public access to health services, improved service delivery, increased satisfaction of among patients, service providers, and policy makers in the country.

### **MATERIALS AND METHODS**

This was a descriptive and cross-sectional study. As the findings and results of this research can be used by authorities of studied hospitals and generally, healthcare policy makers, it is thus an applied research as well.

### **Study Population**

In the present study, the population consisted of hospitals in MUMS, in which resident specialist's presence is 24 hours. Hospitals included:

- Ommolbanin Hospital (the hospital is the gynecology),
- Dr Shariati Hospital (the hospital is the heart-general),
- Shahid Hashemi Nejad Hospital (the hospital is general-accidents),
- Imam Reza Educational, Research and Treatment Center (the center is the heart-general),
- Dr Sheykh Educational, Research and Treatment Center (which specializes in Pediatrics)
- Taleghani Educational, Research and Treatment Center (which is Accidents and Trauma Center),
- Kamyab Educational, Research and Treatment Center (which is Accidents and Trauma center)
- Ghaem Educational, Research and Treatment Center (the center is the heart-general).

### **Statistical Population**

The statistical population consisted of information resources related to the EDPI settings of hospitals of MUMS. According to the first phase of the health reform plan, changes in EDPI were considered over a period of June 2013–June 2014 (before the presence of resident specialists) and June 2014–June 2015 (after the presence of resident specialists). The inclusion criteria were affiliation to MUMS and the presence of resident specialists in hospitals, and the exclusion criteria were a lack of access to key index data for the studied courses.

### Sampling and Sample Size

All the hospitals affiliated to MUMS were selected by the census method. To conduct the research, information resources related to EDPI in hospitals of MUMS, during the years 2013 and 2014, were studied.

### **Data Collection Tools**

The tools used in this study included General Hospital Information Form containing components of names of hospital, EDPI, and some resident specialist's profiles. Because the actual data, health department in designed tools, were used in the study, there is no need to determine the validity and reliability. The index included: the percentage of patients were disposed during 6 hours, left ED in 12 hours, had unsuccessful cardiopulmonary resuscitation (CPR), and discharged against medical advice. Regarding the resident specialists profiles, we had access to the items by specialty type and the number of permitted residencies.

### **Data Collection**

In the present study, data were initially collected by library and then survey. A review of literature and other parts of research were carried out by referring to the library books, different articles, and Internet. Then, in the field survey, information required were collected and recorded after obtaining the permission from the health department. Ethical permission was obtained from the legal health department obtained.

### **Data Analysis Tools and Methods**

In the current study, collected data were analyzed by SPSS 19 software. After measuring data normality, Kolmogorov–Smirnov test results showed that all of the variables were normally distributed (p > 0.05) in which the parametric test was used to analyze *T* test. Descriptive statistics was also used to describe data and to answer research questions. A significance level of p < 0.05 was considered.



Table 1: Emergency department performance index before and after the presence of resid	dent specialists in hospitals of
Mashhad University of Medical Sciences* (MUMS)	

Index	Groups	Number	Mean standard error	SD	Mean
Disposed patients within 6 hours (%)	Before	96	276	27.7	80.96
	After	96	140	13.76	89.07
Left the ED in 12 hours (%)	Before	96	2.22	21.79	86.21
	After	96	1.71	16.77	88.76
Unsuccessful CPR (%)	Before	96	3.11	30.54	67.5
	After	96	2.88	28.28	56.21
Discharged against medical advice (%)	Before	96	0.81	7.97	11.68
	After	96	0.61	6.02	9.06

\*standard deviation

Table 2: t test for comparing the average the emergency department performance index before and after the presence of resident specialists in hospitals of Mashhad University of Medical Sciences

				95% confi	idence level	_ Standard error	Averaae
Index	Sig.	Degree free	t	Upper bound	Lower bound	of difference	difference
Disposed patients within 6 hours	0.000	95	-4.01	-4.10	-12.12	2.01	19.79
Left the ED in 12 hours	0.072	95	-1.82	0.22	-5.32	1.39	13.70
Unsuccessful CPR	0.000	95	4.56	15.55	6.12	2.37	23.27
Discharged against medical advice	0.000	95	4.25	3.84	1.39	0.61	6.03

### RESULTS

According to Tables 1 and 2, the percentage of disposed patients within 6 hours before the presence of resident specialists was 80.96% and after the presence of resident specialists was 89.07%. The percentage of those left the ED in 12 hours before the presence of resident specialist's was 86.21% and after the presence of resident specialists was 88.76%. The percentage of unsuccessful CPR before the presence of resident specialists was 56.21%. The percentage of discharged against medical advice before the presence of resident specialists was 11.68% and after the presence of resident specialists was 9.06%.

### DISCUSSION

The results of this study showed that the percentage of disposed patients within 6 hours has increased after the the presence of resident specialists than before it, so that before the implementation, 80.96% of emergency patients were disposed within 6 hours. However, it has been increased to 89.07% after the presence of resident specialists. The main reason for the increase disposition of patients less than 6 hours was the presence of resident specialists on the patients and their timely disposition. In the studies by Asadi and Yousefzadeh, these findings were also confirmed. The results of research conducted by Horwitz showed that 79 percent of EDs discharged at least 90 percent of their patients within 6 hours.<sup>6,11,17</sup> In a study by Jayaprakash, patients were disposed as short a time as possible by employing experienced physicians and specialists in the ED.<sup>18</sup> In the study conducted by Movahednia, timing indicators of emergency in Firoozgar hospital in the first 6 months of 2011 were at the standard level. It was due to the presence of emergency resident physician and patient's disposition committee in the hospital that is consistent with the results of the present study.<sup>19</sup> Javadzadeh has recommended the use of emergency residents as a strategy to overcome emergency

congestion.<sup>20</sup> The percentage of discharged against medical advice was 11.68% and 9.06% before and after the presence of resident specialists, which is inconsistent with the results by Asadi et al. It was reported 31.4% in the study by Asadi et al.<sup>11</sup> Before the presence of resident specialists, unsuccessful CPR index was 67.05% and 56.21% after the presence of resident specialists, which seems that its reduction was due to the timely presence of resident specialists. In the study by Montazar, 74.6% of the CPR was identified unsuccessful.<sup>21</sup> Index left the ED in 12 hours prior to the presence of resident specialists was 86.21% and was increased to 88.76% after the presence of resident specialists. However, the ascending trend did not show any significant difference. The results of this study are inconsistent with the results of Baratloo and Yousefzadeh.<sup>6,8</sup> In the study carried out by Baratloo, the rate of those left the ED in the 12-hours index prior to attending emergency medicine specialists was reported 97.3% and after the change was 90.4%, respectively. His research findings indicated that the establishment of emergency medicine specialists in the ED can contribute to efficient triage. But given the changes made after the establishment of this section, other index, including the percent of disposed patients within 6 hours, left the ED in 12 hours, failed cardiac pulmonary resuscitation, and discharged against medical advice, showed no significant improvement.

It seems that in the current study, the slight growth for those left the ED in the 12-hours index is due to the shortage of beds for the in-patients, an increase in occupancy rate of hospital beds (after the presence of resident specialists) and congestion in clinical departments, timely disposition of patients, the high number of referring patients, and a significant number of unnecessary and nonclinical emergency requests lead to significant number of patients and the patients who need special care to remain a long time in the ED, and as a result, the duration of the patients in the ED is increased. It seems that to give priority to emergency patients admitted, accurate and sufficient oversight, development of beds, staffing and experienced physicians in the ED, accurate documentation of standard forms for ED performance, and the establishment of emergency medicine in the hospitals are useful and effective for better promotion and improvement of the EDPI at hospitals.

According to the importance of index in decision-making, it is suggested that some measures should be taken at management and hospital levels to develop emergency beds for more accessibility. Meanwhile, the principle and scientific implementation of the presence of resident specialists, continuous benefit from emergency medicine services, and clarification of the duties of resident specialists in training centers, comparing the results disposed patients by emergency physicians, paying more attention to the committee to dispose, and extraction of long stay leads to improved conditions.

The limitations of the study can be noted of limited resources such as books, articles, official reports, credible and relevant to the presence of resident specialists, as well as the limitations on the effects of certain plan, the presence of resident specialists, and limitations to remove other factors.

### CONCLUSION

According to the results, it can be concluded that the EDPI in hospitals of MUMS after the presence of resident specialists have shown a significant difference, and improved, except for those left ED in 12 hours. Although the trend was improving, the difference was not significant.

In fact, the main purpose of an ED is providing high-quality services in the shortest time possible. Long-term emergency stop reduces offering services to other patients in need of emergency and this leads to patient dissatisfaction. Early diagnosis and treatment can reduce waiting time and duration of hospitalization, and by timely disposition, satisfaction will be also promoted. With the fundamental and scientific implementation of the presence of resident specialists as well as the benefit from the continuous services of resident specialists in the health systems, providing more than optimal service for the patients will be ensured, and thus, people can greatly benefit from health services.

### ACKNOWLEDGMENTS

The authors would like to thank all who sincerely helped in this study. Especially, we would like to appreciate the personnel and the staff of Statistics Department of MUMS.

### REFERENCES

- Rad EH, Khodaparast M. Inequity in Health Care Financing in Iran: Progressive or Regressive Mechanism? Eurasian J Med 2016;48(2):112. DOI: 10.5152/eurasianjmed.2015.32.
- Jafakesh mogadam A, Pournaghi S, et al. Study of speed of offering services in the educational hospitals of North Khorasan University of Medical Sciences in 2011. J North Khorasan Univ Med Sci 2013;5(2):307–313. DOI: 10.29252/jnkums.5.2.307.

- 3. Tabibi SJ, Najafi B, et al. Waiting time in the emergency department in selected hospitals of Iran University of Medical Sciences in 2007. Pejouhesh dar Pezeshki 2009;33(2):117–122.
- Rad EH, Karyani AK, et al. Access and necessity for road emergency sites. Trauma Mon 2017;22(2):e27577.
- 5. Rad EH, Tavakkoli M. Road Fatalities and Their Determinants in Iran: Evidence From Panel Provincial Data. Arch Trauma Res 2017;6(2):e27791.
- Yousefzadeh CS, Mohtasham AZ, et al. Patients discharged before and after presence of medical emergency specialists. J Holist Nurs 2014;24(1):64–70.
- Haghdoust Z, Yahyavi M, et al. Effect of Triage Education on knowledge, attitude and practice of nurses in Poursina Educational and Therapeutic Emergency center in Rasht. J Holist Nurs 2010;20(2):14–21.
- Baratloo A, Rahmati F, et al. Evaluation of performance indexes of emergency department. J Emerg Med 2015;2(1):33–38.
- Maleki A, Sajadi SM, et al. Explanation and improvement performance indicators of the emergency system using discrete event simulation (Case study: Arak Imam Khomeini Hospital). Health Inf Manag J 2014;11(1):4–16.
- Hashemi B, Baratloo A, et al. Emergency department performance indexes before and after establishment of emergency medicine. Emergency 2013;1(1):20.
- 11. Asadi P, Kasmaie VM, et al. Disposition of Patients Before and After Establishment of Emergency Medicine Specialists. Iran J Emerg Med 2014;1(1):28–33.
- Moradi-Lakeh M, Vosoogh-Moghaddam A. Health sector evolution plan in Iran; equity and sustainability concerns. Int J Health Policy Manag 2015;4(10):637. DOI: 10.15171/ijhpm.2015.160.
- Hatam N, Tourani S, et al. Estimating the relationship between economic growth and health expenditures in ECO countries using panel cointegration approach. Acta Med Iran 2016;54(2):102–106.
- 14. Rad EH, Hadian M, et al. Comparison the effects of health indicators on male and female labor supply, evidence from panel data of Eastern Mediterranean Countries 1995-2010. Iran J Public Health 2014;43(2):221.
- Keikha F, Vahdani FG, et al. The effects of maternal opium abuse on fetal heart rate using non-stress test. Iran J Med Sci 2016;41(6):479.
- Raadabadi M, Mobaraki H, et al. Investigitions the functional indicators change due to implementation information system in Sina hospital. JSUMS 2013;15(5):90–96.
- Horwitz LI, Green J, et al. US emergency department performance on wait time and length of visit. Ann Emerg Med 2010;55(2):133–141. DOI: 10.1016/j.annemergmed.2009.07.023.
- Jayaprakash N, O'Sullivan R, et al. Crowding and delivery of healthcare in emergency departments: the European perspective. West J Emerg Med 2009;10(4):233.
- 19. Movahednia S, Partovishayan Z, et al. A survey of timing indicators of emergency department at Firoozgar hospital: 2012. J Health Admin Educ 2013;16(51):95–102.
- 20. Javadzadeh HR, Davoudi A, et al. Assigning residents of emergency medicine to screen patients before admission: a strategy to overcome overcrowding. Trauma Mon 2012;16(4):191. DOI: 10.5812/ traumamon.2923.
- Montazar SH, Amooei M, et al. Results of CPR and contributing factor in emergency department of sari imam Khomeini hospital, 2011-2013. JMUMS 2014;24(111):53–58.



# Influence of Leadership Commitment on Patients' Satisfaction within Hospitals in Nairobi, Kenya

Pamleila N Ntwiga<sup>1</sup>, Maina Muchara<sup>2</sup>, Peter Kiriri<sup>3</sup>

### ABSTRACT

The study examined the influence of leadership commitment on patients' satisfaction with hospitals in Nairobi. A positivist research philosophy was applied in this study. A mixed research design was used to target employees and patients of hospitals within Nairobi, from whom data were collected through a self-administered questionnaire. The target population was the hospital employees and patients of level-four, level-five, and level-six public and private hospitals within Nairobi. Simple random sampling was used to select hospitals, while stratified random sampling was used to select the employees and patients. The data were collected from the closed-ended questionnaire, which was coded, analyzed, and presented in tables. The study findings showed that leadership commitment ( $\beta = -0.254$ , p = 0.001) and organization factors ( $\beta = 0.142$ , p = 0.00) had a significant influence on customer satisfaction. The leadership in healthcare should realign the staff inputs toward improving patient experiences.

**Keywords:** Leadership commitment, Patients' satisfaction, Total quality management. International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1103

### BACKGROUND

The positive outcome of an organization is not merely financial but high levels of customer satisfaction.<sup>1</sup> Furthermore, it was observed that application of total quality management (TQM) requires a combination of a set of management principles with the right tools and techniques to enable the employees to carry out those management principles in their day-to-day operation so as to amount to a continuous quality improvement.<sup>2</sup> Leadership commitment in the context describes the ability of the hospital leader to inspire employee confidence through vision development,<sup>3</sup> resource allocation, and strategic planning in order to achieve the desired hospital goals. Customer satisfaction is defined as the consumer's response to fulfillment.<sup>4</sup> Customer satisfaction further takes an approach that indicates that quality is anchored on leadership while focusing on the current and the future needs of the customer.<sup>2</sup> Currently health organizations are faced with many challenges such as the need to maintain cost effectiveness of healthcare services, rapid growth of medical technology requirement, and the pressure to improve quality that meets international standards in order to acquire or retain accreditation and most important to surpass customer needs.<sup>5</sup> These challenges have, therefore, forced health leaders to implement systems that can manage health care in an objective and measurable manner to offer a high-quality service, which is the aim of the quality management programs in hospitals that lead to patient's satisfaction.<sup>6</sup>

Healthcare administrators are under a constant competitive pressure to deliver high-quality healthcare services at a low cost and high-performance levels.<sup>7</sup> Theoretically, a quality initiative performs very well since structures are well defined to solve problems, increase efficiency, and increase performance. However, healthcare employees struggle with the implementation process.<sup>8</sup>

Some factors affecting the quality of health services in Kenya are poor communication processes and a lack of adequate resources such as human resource, financial resources, and facilities.<sup>9</sup> Enhancing quality in health care is a critical aspect of many nations and institutions. Consequently, the patient who is the customer for the healthcare organizations, or more likely a direct strategic <sup>1–3</sup>Chandaria School of Business, Strategic Management, United States International University, Africa, Nairobi, Kenya

**Corresponding Author:** Pamleila N Ntwiga, Chandaria School of Business, Strategic Management, United States International University, Africa, Nairobi, Kenya, Phone: +254 722715120, e-mail: pammugendi@ gmail.com

How to cite this article: Ntwiga PN, Muchara M, Kiriri P, *et al.* Influence of Leadership Commitment on Patients' Satisfaction within Hospitals in Nairobi, Kenya. Int J Res Foundation Hosp Healthc Adm 2019;7(1):33–38.

Source of support: Nil Conflict of interest: None

partner as a stakeholder, is now participating in a decision-making process for the hospital.<sup>10</sup> This has then resulted in the current changes in the environment and society; healthcare policies have noteworthy impressions on management in hospitals as well. There are challenges in managing healthcare organizations in a competitive marketplace with a little support from official bodies especially in a developing country such as Kenya.<sup>11</sup>

### STUDY OBJECTIVE

To determine the influence of top leadership commitment on patients' satisfaction with the hospitals in Nairobi.

### STUDY HYPOTHESIS

Hypothesis 01 ( $H_{01}$ ) effective leadership commitment does not have any significant influence on patients' satisfaction.

### LITERATURE REVIEW

### Leadership Commitment and Patients' Satisfaction

Leadership is the process of positively influencing others toward accomplishing some kind of desired outcome.<sup>12</sup> Also, leadership is an important element for the successful implementation of

<sup>©</sup> The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

TQM.<sup>13</sup> The achievement of leadership is mainly dependent on the commitment of the top leaders in resource allocation, strategic planning, and encouraging staff members toward the desired actions.<sup>14</sup> For operative and successful implementation of TQM leadership, commitment is a key prerequisite, whereby visionary leadership is needed to formulate a long-term organizational vision for its development, through proper planning, and formulating action plans. Once the plans are in place, the top leadership have a great role of positively stimulating the entire organization toward the direction of achieving such visions.<sup>15</sup> Leadership commitment during TQM implementation significantly affected customer satisfaction. Therefore, effective leadership in TQM is required in order to earn customer trust and loyalty.<sup>16</sup>

Strategic profits of TQM would subsequently lead to higher competitive advantage, enriched continuous quality improvement, and higher organizational performance.<sup>17</sup> Nonetheless, the key element of TQM application is synchronization in regard to the prominence of the support awarded by the senior leadership during the TQM implementation process. For instance, the key factors for a successful implementation of TQM are senior leadership commitment, staff involvement, and the effectiveness of how they carry out the allocated processes.<sup>9</sup>

There is a demand for true and efficient leadership, in order to create an environment that inspires excellence, aimed at exceeding operational complexities, beating external market pressure, and other potential entrances to service quality as may arise from time to time. This requires a clear and thorough understanding of customer satisfaction quality inputs and values.<sup>4</sup> Leadership is therefore the art of prominence and adopting mental and strategic changes within the organization while concurrently introducing and achieving changes that are practical in the same time, ensuring that there are proper systems that are measurable.<sup>17</sup> More and more service industries are making efforts to create a competitive edge; hence, leadership is taking up as much as 25% of their time to create strategic direction through implementation of TQM with the aim of increasing the market share as well as increase customer satisfaction and customer loyalty.<sup>6</sup> Awareness, knowledge, and understanding the basic TQM concepts and principles are the key prerequisite for top leadership for successful implementation of TQM principles in any organization.<sup>18</sup>

Leadership commitment during the implementation of continuous improvement process is critical for the achievement of such endeavors. The obstacles to TQM implementation in the service industry, including public healthcare, are that hospitals are every so often required to implement TQM to increase patients' satisfaction, and there is a lack of senior management commitment,<sup>17</sup> which is a key requirement for any quality initiative in order to succeed and gain maximum acceptance by the rest of the employees.<sup>17</sup>

It has been concluded that top leadership must establish the unity of purpose and course that the firm will take in order to be in a position of retaining the happiest patients.<sup>19</sup> This suggests that top leadership must be individually involved in setting and ensuring quality policy and thereafter have it communicated to the members of staff. For instance, the top leadership guides, determines, and supports quality issues in the organization. Therefore, top leadership commitment significantly affects the customer satisfaction.<sup>12</sup>

Leaders apply strategic planning as a method to formulate and implement approaches for ensuring that the best value to the stakeholders is delivered to achieve the specified goals of the firm. It is worth noting that for effective strategic quality planning, there is a need to make deliberate efforts aimed at improving staff performance, customer experiences, and social responsibility actions of the firm.<sup>20</sup> People at leadership positions within an organisation, people who have power to take the earlier-said strategic plan into action. Preferably, it encompasses the charting of long and short-term organizational objectives. After all, strategic planning has shown a significant link between strategic planning and customer satisfaction as well as employee satisfaction.<sup>20</sup>

Patients' satisfaction is the ultimate goal a well-charted vision on customer and staff satisfaction. Patients' satisfaction is an ultimate goal for any hospital that looks keenly into offering high-quality standards to its staff as a goal of service excellence that is drawn mainly from the hospitals' strategic plan.<sup>20</sup> Senior leaders are mandated to make any decisions that have a high level of relevance and are responsible for giving the direction the hospital should take in the future.<sup>21–26</sup> This will be done while drawing a parallel between the long-term plans that are perceived to be of significance in the future growth of the organization comparable to the past.<sup>27</sup> Hence, strategic planning occurs in four different yet harmonizing phases: the first phase is the strategic diagnosis, the second phase is the formulation of the firm's mission, the third phase is determination of tools to apply, which are prescriptive and quantitative, and the final phase entails evaluation and controlling the processes to ensure all is in track.<sup>28</sup>

Strategy formulation involves a detailed analysis that will bring environmental information to the organization about opportunities and threats. There has been a positive association between strategic quality planning and staff or employee performance; this<sup>29</sup> demonstrated that if consideration during development of organizational mission, strategy, and objectives was placed on employee opinions, it increases the likelihood that the employees will fully support them since such practices make the employees to feel as part of the firm. When employees feel as part of an organization, their level of motivation increases, creating an opportunity to effectively achieve the company objectives. This in turn leads to lesser absenteeism and a lower employee turnover. All these aspects of employee involvement are critical aspects of top leadership, ensuring that TQM implementation is flawless and successful.

However, in a study conducted in Malaysia to determine whether strategic planning is a good predictor of customer satisfaction outcome within small businesses, it was found out that strategic planning had no significant effect on customer satisfaction.<sup>14</sup> These findings agreed with a previous study that concluded that there is no direct or indirect association between strategic planning and customer satisfaction in their study of requirements for TQM with leadership as an ethical dilemma in Spain.<sup>21</sup>

These findings were in contrast with those that demonstrated that management practices and their relationship with customer satisfaction and productivity improvement had a positive association between strategic planning and customer satisfaction.<sup>22</sup> Another study suggested that the insignificant relationship between strategic planning and customer satisfaction in small service businesses in Malaysia could be a demonstration that leadership in such firms fail to commit to meaningful goals and objectives that are aimed at supporting customer needs that translate to customer satisfaction.<sup>14</sup> Iran healthcare system faces grave consequences in relation to efficiency and guality in the healthcare sector.<sup>23</sup> Reports of the successful implementation of TQM principles in other parts of the world encouraged Iranian decisionmakers to introduce the strategy to healthcare organizations with the hope of improving quality and efficiency.<sup>23</sup> Consequently, successful implementation of TQM has been applied in various healthcare organizations across the globe. The success of such implementation has



been positively attributed to employee satisfaction, whereby employee satisfaction is defined basically as the degree to which employees within an organization consider that their needs are constantly satisfied by the employer.<sup>24</sup> This makes consideration of the employee involvement as a key role of leadership commitment to achieving a successful TQM implementation process.

In the Kenyan context, a study on TQM, operations effectiveness, and competitive advantage in horticultural industry in Kenya concluded that leadership concentrated more on their firms getting quality certification, and therefore were not aware of the philosophical background of the quality management systems and hence making it difficult for them to be able to effectively apply TQM systems, although they apportion so much resources for the accomplishment of customer requirements as a means to certify and save for the implementation of effective quality systems.<sup>25</sup> Consequently, the TQM principle of leadership commitment focuses on the customer and had the strongest impact on the competitive advantage of the firm, resulting therefore in a higher customer satisfaction.

### **R**ESEARCH **M**ETHODOLOGY

The study applied positivism research philosophy as hypotheses were tested. The target population was the hospital employees and patient receiving inpatient care in those hospitals. Simple random sampling was used to select the hospital employees, while stratified sampling was used to select the patients. Data were collected using open- and close-ended self-administered questionnaires for both the patients and the employees (Table 1). Data were then analyzed for both descriptive and inferential statistics. The findings of the study were presented in graphs and tables.

### **R**ESEARCH **F**INDINGS

# Influence of Leadership Commitment on Patients' Satisfaction

The study sought to examine the extent to which top leadership commitment influenced patients' satisfaction with the hospitals in Nairobi. Top leadership commitments in the hospitals were determined through three parameters, namely visionary leadership, resource allocation, and strategic planning. The constructs for patients' satisfaction were timeliness of services cost of service; privacy and confidentiality; and dignity.

### Mean and Standard Deviation for Leadership Commitment

The respondents were requested to show their level of disagreement or agreement to a range of statements on a Likert scale of 1-5, where 1 showed that they strongly disagreed with the statement, 2 showed that they disagreed with the statements, 3 showed that they were neutral, 4 showed they agreed with the statements, and 5 showed that they strongly agreed with the statements. Table 2 revealed the means (M) and standard deviations (SD) for the responses to the questions that examined the influence of leadership commitment on patients' satisfaction with hospitals within Nairobi. The findings in Table 2 showed that on average, respondents agreed that the hospital allocates resources to ensure that quality is sustained (M = 3.75, SD = 1.060); they also agreed that the hospital leadership team uses the organization's values to guide the organization and staff (M = 3.76, SD = 1.132). The respondents agreed that their hospital leadership takes accountability for the effectiveness of the quality management systems (M = 3.54, SD = 1.187).

# Correlations between Leadership Commitment and Patients' Satisfaction

The statistical tool that examines the relationship between two variables and provides a measure of the strength that the variables associate with one another is correlation analysis. The coefficient, which is the measure, is denoted by (r) and is a value between -1 and +1. A correlation analysis was carried out to examine the strength of the relationship between leadership commitment and patients' satisfaction with hospitals in Nairobi.

Table 3 showed that the constructs for leadership commitment statistically and significantly correlated with patients' satisfaction. Patients' satisfaction strongly correlates with visionary leadership (r (268) = 0.418 p < 0.05) and resource allocation (r (268) = 0.385 p < 0.05). There was a significant correlation between patients' satisfaction with strategic planning (r (268) = 0.437 p < 0.05). The findings also indicated that leadership commitment significantly correlated with patients' satisfaction (r (268) = 0.413 p < 0.05).

		En	Employees		nts
Demography	Category	Frequency	Percent	Frequency	Percent
Gender of respondents	Male	69	51	43	32.1
	Female	65	49	91	67.9
	Total	134	100	134	100.0
Age of respondents					
	Employees			Patients	
Category	Frequency	Percent	Category	Frequency	Percent
25–34 years	64	48	<18 years	14	10.4
35–45 years	34	25	18–34	67	50.0
45–54 years	30	22	35–44 years	24	17.9
>55 years	6	4	45–54 years	10	7.5
Total	134	100	55–65 years	8	6.0
			>65	4	3.0
			Unspecified	7	5.2
			Total	134	100.0

Table 1: Demographic information

Table 2: Mean and standard deviation for leadership commitment

Descriptive statistics	Ν	Mean	Std. deviation
The hospital allocates resources to ensure that quality is sustained	134	3.75	1.060
The hospital leadership team uses our organization's values to guide our organization and staff	134	3.76	1.132
The managers creates a conducive work environment at all time	134	3.56	1.059
Our hospital leaders are flexible and can make changes quickly when needed	134	3.41	1.264
The staff understand the parts of our organizational plans that will affect them and their work	134	3.60	1.157
Our hospital leadership takes accountability for the effectiveness of the quality management systems	134	3.54	1.187
There is a documented strategic plan that the hospital always follow	134	3.69	1.106
There is a team that takes strategic decisions for the hospital	134	3.47	1.243
The hospital has a structured process of utilizing patients' satisfaction data	134	3.59	1.171
The hospital shares information about the quality indicators with the general public	134	3.25	1.278
The hospital has a formal/structured quality department	134	3.59	1.246
As our leadership team makes plans for the future, the staff ideas are considered	134	3.75	1.206
Our hospital leaders encourage totally new ideas (innovation)	134	3.34	1.138

Source: research data

 Table 3: Correlation between leadership commitment and patients

 satisfaction

	Overall satisfaction			
	Pearson correlation	Sig. (two-tailed)	Ν	
Visionary	0.418*	0.000	268	
Resource allocation	0.385*	0.000	268	
Strategic planning	0.437*	0.000	268	
Leadership commitment	0.413*	0.000	268	

\*Correlation is significant at the 0.01 level (two-tailed)

Source: research data

# Chi-squared Test for Leadership Commitment and Patients' Satisfaction

Pearson's Chi-squared test is also known as the goodness-of-fit test. It is a statistical test whose result is denoted by  $\chi^2$ . The Pearson's Chisquared test is used to examine the association between variables.

This study sought to examine whether there was a statistically significant association between leadership commitment and patients' satisfaction. The findings show that there was a strong and significant association between leadership commitment and patients' satisfaction,  $\chi^2$  (2652, N = 268) = 3166.852, p < 0.05. The result of the Chi-square is indicated in Table 4.

### Regression Analysis and Hypothesis Testing for Leadership Commitment

A statistical tool that is carried out to examine if one or more independent variables predict the changes in the dependent

Table 4: Chi-squared test for leadership commitment

	Leadership commitment			
Chi-square	3166.852*			
Df	2652			
Asymp. Sig. (2-sided)	0.000			
*Correlation is significant at the 0.05 level (two-tailed)				

\*Correlation is significant at the 0.05 level (two-tailed) Source: research data variable is known as a regression analysis. This study used multiple linear regression analysis to examine the influence of leadership commitment on patients' satisfaction with the hospitals in Nairobi. This study tested the null hypothesis:

### $H_{01}$

Leadership commitment does not have a significant influence on patients' satisfaction with the hospitals in Nairobi.

### **R**EGRESSION **M**ODEL **S**UMMARY

From the regression model summary, the findings showed that leadership commitment explained 23% variation in patients' satisfaction with the hospitals in Nairobi,  $R^2 = 0.230$ . This implied that 23% of the variations in patients' satisfaction levels within the hospitals in Nairobi could be explained by the leadership commitment. Table 5 showed the findings of the regression model.

### **R**EGRESSION **ANOVA**

The variability levels in a regression model are tested by the regression ANOVA. It also tests the significance of the model as well as whether the null hypothesis is rejected or not rejected. The findings are represented in Table 6. From the table, the results show that the model was statistically significant in linking leadership commitment and patients' satisfaction with the hospitals in Nairobi (*F* (4, 263) = 19.585, *p* < 0.05). The null hypothesis that leadership commitment does not have a significant influence on patients' satisfaction with the hospitals in Nairobi of the *F*-statistic was significant.

### **R**EGRESSION **C**OEFFICIENTS

A regression coefficient is a statistical tool that predicts how the dependent variable changes as a result of a unit change in the independent variable. The multiple linear regression was conducted with an aim of determining the magnitude and direction of the relationship between leadership commitment and patients' satisfaction with the hospitals in Nairobi.



**Table 5:** Regression model summary for leadership commitment and patients' satisfaction

 Table 6: Regression ANOVA for leadership commitment and patients' satisfaction

Model summary				
Model	R	<i>R</i> square	Adjusted <i>R</i> square	Std. error of the estimate
1	0.479*	0.230	0.218	0.27926

\*Predictors: constant, leadership commitment, resource allocation, strategic planning, visionary

Source: research data

	ANOVA*					
Model	Sum of squares	df	Mean square	F	Sig.	
1	Regression	6.109	4	1.527	19.585	0.000**
	Residual	20.510	263	0.078		
	Total	26.619	267			

\*Dependent variable: overall satisfaction

\*Predictors: constant, leadership commitment, resource allocation, strategic planning, and visionary Source: research data

### Table 7: Regression coefficients for leadership commitment and patients' satisfaction

		Unstandardized coefficients		Standardized coefficients		
Model		β	Std. error	β	Т	Sig.
1	(Constant)*	1.441	0.024		60.618	0.000
	Visionary	0.357	0.132	2.095	2.704	0.007
	Resource allocation	0.044	0.062	0.269	0.717	0.474
	Strategic planning	0.309	0.079	1.787	3.923	0.000
	Leadership commitment	0.071	0.010	0.413	7.407	0.000

\*Dependent variable: overall satisfaction Source: research data

The results from this study showed (Table 4) that visionary leadership and strategic planning significantly predicts patients' satisfaction ( $\beta = 0.357$ , t (268) = 2.704, p < 0.05;  $\beta = 0.309$ , t (268) = -3.923, p < 0.05, respectively). The results indicated that resource allocation did not significantly predict patients' satisfaction ( $\beta = 0.044$ , t (268) = 0.717, p > 0.05). From a general point of view, leadership commitment positively and significantly predicted patients' satisfaction ( $\beta = 0.071$ , t (268) = 7.407, p < 0.05). The implication of the results is that a unit change in leadership commitment would lead to an increase in patients' satisfaction with the hospitals in Nairobi by 0.071 units. This study, therefore, concluded that leadership commitment positively and significantly predicted patients' satisfaction with the hospitals in Nairobi.

### **C**ONCLUSION AND **R**ECOMMENDATIONS

### Conclusion

The findings of the multiple linear regression analysis established that leadership commitment positively and significantly predicted patients' satisfaction with the hospitals in Nairobi. The findings of this study led to rejecting the null hypothesis that leadership commitment had no significant influence on patients' satisfaction. From the findings of this study, it was concluded that committed leaders in the hospitals are leaders who have a great vision for the organization, they can effectively allocate resources for the benefit of the organization, and can strategically plan to effectively achieve patients' satisfaction.

### Recommendations

The results from multiple linear regression revealed that leadership commitment significantly predicted changes in patients' satisfaction with the hospitals in Nairobi. The leadership of the hospitals should be committed in bearing and delivering the vision of the hospital, effectively allocating resources of the hospital and strategically planning for the hospital. The study recommends the leaders in hospitals to make their establishment reliable in responding to the needs of the patients. They can achieve this by implementing strong communication channels between the staff and the patients and by engaging the staff through proper training that sensitizes them on the best practices of treating patients in their establishments. In addition, the leaders can use benchmarking and visit hospitals that have adopted TQM philosophies to enhance leadership commitment and adopt these programs to provide better levels of satisfaction to the patients. Adopting these recommendations will enable the leaders in the industry to develop organization goals, values, and systems that are focused on satisfying the expectations of the patients.

### REFERENCES

- 1. Kaplan SR, Norton DP. Mastering the management system. New York: Harvard Business School Press; 2008.
- 2. Orsini JN. The essential Deming: leadership principles from the father of quality. McGraw Hill Professional; 2013.
- Zeithaml VA, Bitner MJ, et al. Services Marketing: Integrating Customer Focus across the Firm, 5th ed., New York: McGraw-Hill; 2009.
- 4. Lussier RN, Achua CF. Effective Leadership, 5th ed., Canada: South-Western Cengage Learning; 2013.
- 5. Rad NF, Som AP, et al. Service quality and patients' satisfaction in medical tourism. World Appl Sci J 2010;10(1):24–30.
- Boiral O, Amara N. Paradoxes of ISO 9000 performance: a configurational approach. Qual Manag J 2009;16(3):37–60. DOI: 10.1080/10686967.2009.11918240.
- Aagja JA, Garg R. Measuring perceived service quality for public hospitals (PubHosQual) in the Indian context. Int J Pharmaceut Healthc Market 2010;4(1):60–83. DOI: 10.1108/17506121011036033.
- Chakrabarty A, Tan KC. The current state of Six Sigma application in services. Journal of Service Theory and Practice 2007;17(2):194–208. DOI: 10.1108/09604520710735191.

37

- Murugami RW. Challenges of Implementing Kenya quality model for health strategy in Kiambu County. (Unpublished Thesis for Master's). 2016, Retrieved from http://erepository.uonbi.ac.ke/bitstream/ handle/11295/75134.
- Coculescu B, Coculescu E, et al. Orientation to the patient as a marketing strategy in the Romanian healthcare system. J Med Life 2016;9(3):302–305.
- Wanyoike AN. Determinants of Demand for Healthcare Services in Private Hospitals in Kenya (Unpublished Master's thesis). 2016, Retrieved from http://erepository.uonbi.ac.ke/handle/11295/ 98297.
- De Jong JP, Den Hartog DN. How leaders influence employees' innovative behaviour. Eur J Innov Manag 2007;10(1):41–64. DOI: 10.1108/14601060710720546.
- Kendall K, Bodinson G. Leading the Malcolm Baldrige Way: How World-Class Leaders Align Their Organizations to Deliver Exceptional Results. New York: McGraw-Hill Education; 2016.
- Ooi KB, Lin B, et al. Are TQM practices supporting customer satisfaction and service quality? J Serv Mark 2011;25(6):410–419. DOI: 10.1108/08876041111161005.
- Sureshchandar GS, Rajendran C, et al. The relationship between service quality and customer satisfaction – a factor specific approach. J Serv Mark 2010;16(4):363–379. DOI: 10.1108/08876040210433248.
- Talib F, Rahman Z, et al. An empirical investigation of relationship between total quality management practices and quality performance in Indian service companies. Int J Qual Reliab Manag 2014;30(3):280– 318.
- 17. Latham JR. Leadership for quality and innovation: Challenges, theories, and a framework for future research. Qual Manag J 2014;21(1):5. DOI: 10.1080/10686967.2014.11918372.
- Han SB, Chen SK, et al. The impact of ISO 9000 on TQM and business performance. J Busin Econ Stud 2007;13(2):123.

- Sinhan N, Garg AK, et al. Effect of TQM principles on performance of Indian SMEs: the case of automotive supply chain. TQM J 2016;28(3):338–359. DOI: 10.1108/TQM-10-2014-0086.
- Kantabutra S, Avery GC. Vision effects in customer and staff satisfaction: an empirical investigation. Leadership Org Dev J 2007;28(3):209–229.
- 21. Gill L, White L. A critical review of patient satisfaction. Leadership in Health Services 2009;22(1):8–19. DOI: 10.1108/17511870910927994.
- 22. Terziovski M. Quality management practices and their relationship with customer satisfaction and productivity improvement. Manag Res News 2006;29(7):414–424. DOI: 10.1108/01409170610690871.
- 23. Sadeh E. Interrelationships among quality enablers, service quality, patients 'satisfaction and loyalty in hospitals. TQM J 2017;29(1): 101–117. DOI: 10.1108/TQM-02-2015-0032.
- 24. Evans JR, Lindsay WM. Managing for quality and performance excellence. Cengage Learning; 2016.
- 25. Muchara M. Total quality operations effectiveness and competitive advantage in horticultural industry in Kenya (PHD Thesis). 2012, Retrieved from http://erepository.uonbi.ac.ke/handle/11295/98297.
- Lee J. Effects of leadership and leader-member exchange on innovativeness. J Manage Psychol 2012;23(6):670-687. DOI: 10.1108/02683940810894747.
- 27. Böhme T, Childerhouse P, et al. A method for reconciling subjectivist and objectivist assumptions in management research. J Leadersh Organ Stud 2012;19(3):369–377.
- Rivers PA, Glover SH. Health care competition, strategic mission, and patient satisfaction: research model and propositions. J Health Organ Manag 2008;22(6):627–641. DOI: 10.1108/14777260810916597.
- 29. Sadikoglu E, Olcay H. The effects of total quality management practices on performance and the reasons of and the barriers to TQM practices in Turkey. Advances in Decision Sciences 2014;2014:5376605. DOI: 10.1155/2014/537605.



### **REVIEW ARTICLE**

# Framework for Patient Safety

Abdul K Mohiuddin

### ABSTRACT

Medication errors are common in general practice and in hospitals. Both errors in the act of writing (prescription/dispensing/administration errors) and prescribing faults due to flawed medical decisions can result in harm to patients. Any step in the prescribing process can kindle errors. Slips, lapses, or mistakes are sources of errors, as in unintended omissions in the recording of drugs. Faults in dose selection, omitted transcription, and poor handwriting are common. Inadequate awareness or competence and incomplete information about clinical characteristics and previous treatment of individual patients can result in prescribing faults, including the use of potentially incorrect medications. An unsafe working environment, complex or undefined procedures, and inadequate communication among healthcare personnel, particularly between doctors and nurses, have been identified as significant underlying factors that contribute to prescription errors and prescribing faults. Active interventions aimed at reducing prescription and prescribing faults are strongly recommended. These should be dedicated on the education and training of prescribers and the use of online aids. The complexity of the prescribing procedure should be reduced by introducing automated systems or uniform prescribing charts, in order to avoid recording and omission errors. Feedback control systems and immediate review of prescriptions, which can be performed with the assistance of a hospital pharmacist, are also helpful. Audits should be performed periodically.

Objective: Discussion and projection of medication safety and the strategies to improve its efficiency.

**Methods:** The research is conducted through secondary data search from several sources including books, technical newsletters, newspapers, journals, and many other sources. The present study was started since the beginning of 2018. PubMed, ALTAVISTA, EMBASE, Scopus, Web of Science, and the Cochrane Central Register of Controlled Trials was thoroughly searched. The keywords were used to explore different publishers' journals such as Elsevier, Springer, Willey Online Library, and Wolters Kluwer that were extensively followed.

**Findings:** A medication intervention is a sophisticated technique of both arts and science. Improvement is valued when the total system coordination brings an overall improvement in every aspect of prescribing, dispensing, administration, and monitoring. Error in any stage ruins the effort of the total system.

Keywords: Errors, Healthcare professionals, Medication, Patient, Reporting, Risk, Safety. International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1100

### BACKGROUND

A medication (a medicinal product) is "a product that contains compound(s) with proven biological effects, plus excipients or excipients only; it may also contain impurities; the active compound is usually a drug or a prodrug, but may be a component." The definition of a medication includes not only chemical compounds drugs, prodrugs (which may themselves have no pharmacological endeavor), stereoisomers that may have only adverse effects, or compounds that are used for diagnostic purposes (such as contrast media) but also includes cellular elements, such as inactivated or attenuated viruses for gene therapy, and embryonic stem cells; "contaminants" includes chemical and biological impurities and additives, the former being unintentionally present, the latter deliberately added. Medication errors can occur in:

- Selecting a medicine—irrational, inappropriate, and ineffective prescribing, underprescribing and overprescribing;
- Lettering the prescription—prescription errors, including illegibility;
- Manufacturing the formulation to be used—wrong strength, contaminants or adulterants, wrong or misleading packaging;
- Dispensing the formulation—wrong drug, wrong formulation, wrong label;
- Administering or taking the drug—wrong dose, wrong route, wrong frequency, wrong duration;
- Nursing therapy—failing to alter therapy when required, unintentional alteration.

Department of Pharmacy, World University of Bangladesh, Dhaka, Bangladesh

**Corresponding Author:** Abdul K Mohiuddin, Department of Pharmacy, World University of Bangladesh, Dhaka, Bangladesh, Phone: +880 1716477485, e-mail: trymohi@gmail.com

How to cite this article: Mohiuddin AK. Framework for Patient Safety. Int J Res Foundation Hosp Healthc Adm 2019;7(1):39–48.

Source of support: Nil

Conflict of interest: None

### INTRODUCTION

Medicines are the commonest medical intrusions used in healthcare and safe use is important. Over the past 20 years, a number of initiatives aimed at improving medication safety have been introduced into hospitals. Clinicians, policymakers, and patients now want to know whether progress has been made and where further enhancement may be required. Error offered a similar conclusion relative to safety: flaws are unacceptable and common. According to a 2,000 report citing UK medical defense organizations, 25% of all lawsuit claims in general medical practice were due to medication errors and involved prescribing and dispensing errors (including a wrong, contraindicated or unlicensed drug, a wrong dosage, or wrong administration); repeated prescribing without proper checks; failure to monitor progress; and failure to warn about adverse effects (which might, however, not be regarded as a medication error). The effective remedy is not to browbeat the

© The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated. healthcare workforce by asking them to try harder to give safe care, when in fact the courage, hard work, and the pledge of healthcare workers are the only real means to stem the tide of errors that are latent in the healthcare system. Growth in knowledge and technologies has never been so profound and prolific. However, research on the quality of care determines that the healthcare system falls short in its ability to translate knowledge to practice and to apply new technologies safely and appropriately. These principles healthcare organizations could take now or as soon as possible to substantially improve the patient safety include (1) offering leadership; (2) concerning human limits in process design; (3) promoting effective team functioning; (4) anticipating the unexpected; and (5) creating a learning milieu.

### **Important Definitions**

### Active Error

Active errors are those taking place between a person and an aspect of a larger system at the point of contact. Active errors are made by people on the front line such as physicians and nurses. For example, operating on the wrong eye or amputating the wrong leg are classic examples of an active error.

### Adverse Event

Untoward events may be preventable when there is a failure to follow accepted practice at a system or individual level. An adverse event attributable to an error usually is a preventable adverse event.

### Latent Error

These are errors in system or process design, faulty installation or maintenance of equipment, or ineffective administrative structure. These are present but may go unnoticed for a long time with no ill effect.

### Medical Error

The failure to complete the intended plan of action or implementing the wrong plan to achieve an aim. An unintended act or one that fails to achieve the intended outcome. This definition is clearly oriented to the outcome of the error. However, it does not take into account catastrophes that can occur during the whole process of prescribing, independent of any potential or actual harm.

### Prescription Error

Prescription errors include those related to the act of writing a prescription, whereas prescribing faults encompass irrational prescribing, inappropriate prescribing, underprescribing, overprescribing, and ineffective prescribing, arising from erroneous medical judgement or decisions concerning treatment or treatment monitoring. Appropriate prescribing results when errors are minimized and when the prescriber actively endeavors to attain better prescribing; both actions are required.

### Negligence

Failure to meet the reasonably expected standard of care of an average, qualified healthcare worker looking after a patient in question within similar conditions. For example, the healthcare worker may not check up on the pathology report which led to a missed cancer or the surgeon may have injured a nerve by mistaking it for an artery.

### Negligent Adverse Events

A subcategory of preventable, adverse events that satisfy the legal criteria used in defining negligence. The injury caused by substandard medical management.

### Near Miss

Any event that could have had an adverse patient consequence but did not. Near misses provide opportunities for developing preventive strategies and actions and should receive the same level of scrutiny as adverse events.

### Noxious Episode

Untoward events, complications, and mishaps that result from acceptable diagnostic or therapeutic measures deliberately instituted. For example, sending a hemodynamically unstable trauma patient for persistent imaging studies instead of the operating room. The result could be a traumatic arrest and death.

### Patient Safety

The process of improvement, avoidance, and prevention of adverse injuries or outcomes that arise as a result of the healthcare process.<sup>1</sup>

### **Scope of Safety Problems**

The provision of high-quality, affordable, healthcare services is a progressively difficult challenge. Due to the complexities of healthcare services and systems, investigating and interpreting the use, costs, quality, accessibility, delivery, organization, financing, and outcomes of health care services are key to informing government officials, insurers, providers, patrons, and others making decisions about health-related issues. Appropriate medication use is a complex process involving multiple organizations and professions from various disciplines combined with a working knowledge of medications, access to accurate and complete patient information, and integration of interrelated decisions over a period of time. The rising complexity of science and technology requires healthcare providers to know, manage, monitor, and involve more than ever before. Current methods of organizing and delivering care are not able to meet the new expectations of patients and families because the knowledge, skills, care options, devices, and medications have advanced more rapidly than the healthcare system's ability to deliver them safety, effectively and efficiently. The potential for errors of omission or commission to creep into the process is special. Workflow analysis has often been used with the goal of prosperous efficiency. In response to financial pressure and incentives driving provider organizations, minimizing slack time has become important.<sup>2,3</sup>

### UNDERSTANDING ERROR

Clinicians' fears of lawsuits and their self-perceptions of ineptitude could be dispelled by the organizational cultures emphasizing safety rather than blame. To comprehend what is known or what is not known about medication-related adverse events, common definitions must be established and understood. Organizations must come to a common understanding regarding medical errors (MEs), reporting requirements, and risks to capture and act upon error potential within their own medication use systems. The potential benefits of intrainstitutional and web-based databases might assist pharmacists and other providers to prevent similar hazards and advance patient safety.<sup>4</sup> These definitions of ADE, potential adverse drug event (PADE), and adverse drug reaction (ADR) provide the following insights regarding adverse events and medication use:

- MEs are considered preventable while ADRs are generally not.
- If an error occurs but is interrupted by someone in the process, it might not result in an adverse event. These potential untoward events are often referred to as near misses.



 Capturing information regarding near misses could yield vital information regarding system performance.

### IDENTIFYING RISK

Two approaches to the problem of human fallibility are possible: the individual and the system approach. The individual approach emphasize on the errors of individuals, accusing them for forgetfulness, sloppiness, or moral weakness. The system approach concentrates on the conditions under which individuals work and try to build defenses to avert errors or mitigate their effects. Healthcare professionals are human and can make mistakes. Reporting an error is often regarded as a professional failure or negligence and is followed by sanction or penalization of the individuals involved. Medications are inherently toxic, and there is a risk to taking them and, perhaps, not taking them. Each time a practitioner prescribes a product, a treatment risk vs benefit must be assessed. If a patient takes prescribed medications in a different method than prescribed or if over-the-counter products and alternative agents are added, there are additional risks. Side effects and tragic rare reactions are also difficult to anticipate. This results in healthcare workers worrying constantly about the ever-present reality of error. Regrettably, in many organizations, the response to error targets the people rather than the system involved in the production of an error.<sup>3,5</sup> Reason has identified that there are a variety of defenses put into systems to provide the following functions:

- · Create understanding or awareness of threats
- · Give guidance on how to operate safely
- Provide alarms and warnings when risk or danger is evident
- Place barriers between hazards and individuals or other systems
- Restore system to a safe state when circumstances are not normal
- · Contain or eliminated hazards if the barrier is not adequate
- Establish methods of escape and rescue should hazard containment fail.

# TARGETING MEDICATION SAFETY AT THE MICROSYSTEM LEVEL

Nelson and colleagues suggest that understanding and nurturing clinical microsystems (Table 1) may create an opportunity for leverage toward the goal of a safety and a more effective healthcare system.<sup>6</sup>

# Collaboration across the Medication Use Process

Collaboration is essential to diminish patient risk in the medication use process. Healthcare providers within the organization need to understand and identify how these components function and who is involved in making these steps safe. Clear consideration of the critical safety issues at each one of these steps is of particular significance because the primary goal of adverse event identification is adverse event prevention. Each step can be considered a risk point and provides opportunities for internal checks and balances. At each step in the medication use process, it is often assumed physicians, nurses, pharmacists, and other healthcare providers in the association play a role in the patient evaluation.<sup>7</sup>

medication selection, concurrent medications, medication dosage selection, and medication administration methods suitable for the condition to be treated. The current system of prescribing, dispensing, administering, and monitoring, however, often places the accountability on the individual to avoid making the mistake.<sup>8,9</sup> Because this expectation seems unreasonable, organizations should focus on efforts to improve the medication use safety by using a systems-based approach that identifies:

- Errors that occur most often
- Possible root causes of errors
- Error preclusion strategies to make it harder for the same or similar errors to occur
- If an organization has a system that makes it harder to commit an error, it will be more difficult for errors to go on undetected and for harm to come to patients.

# System Failures in the Medication Use Process

Varieties of systems failures have been identified in hospitals that have studied factors associated with adverse events.<sup>3</sup> These system failures are listed below:

- Deficiencies in medication knowledge, including prescribing of incorrect medications, doses, forms, frequency, or routes of administration
- Failure to verify the identity or dose of medication administered, often due to look-alike packaging or similarities between medication names
- Inaccessibility of patient information including laboratory test results, current medications, and information on the patient's current condition
- Incorrect recording of orders, often due to illegibility of the physician's handwriting
- Failure to note known medication sensitivities
- Inefficient order tracking, making it difficult to determine when a medication has been given, missed/discontinued, or changed
- Poor communication between services, including amid nurses and pharmacists
- Improper use of administration devices
- Lack of consistent dosing schedules or disregard of existing standards
- Lack of consistent system for medication distribution
- · Lack of consistent procedure across units
- Errors in the preparation of intravenous medications (when performed in the patient care area)
- Poor information transfer when patients are moved from one patient care area to another
- Inadequate or fictional system for resolving conflicts related to medication orders
- Lack in staffing or work assignments leading to excessive workloads and inconsistent availability of staff or inadequate management
- Lack of feedback and follow-up information on observed untoward drug events.

### **CLASSIFICATION OF MEDICATION ERRORS**

The best way to understand how medication errors happen and how to prevent them is to consider their classification, which can be Table 1: Scope of ten success characteristics, underlying principles, and safety impact

Scope of success characteristic	Underlying principle	Safety impact
Leadership		
Maintain constancy of purpose	Leader balances setting and reaching collective goals by empowering individual autonomy and responsibility	Define safety vision
Establish clear goals/prospects		Identify constraints for safety improvement
Foster positive culture		Allocate resources for plan improvement, imple- mentation, monitoring, and evaluation
Advocacy within macroorganization		Build input of microsystem to plan development
Formal, informal, on-the-spot		<ul><li>Align quality and safety goals</li><li>Provide update to Board of Trustees</li></ul>
Organizational support		
Recognition, resources, information	Larger organization finds ways to connect and facilitate the work of microsystem, including harmonization and handoffs between microsystems	<ul> <li>Work with clinical microsystems to identify patient safety issues and make related local changes</li> </ul>
Enhance and legitimize work of microsystem		<ul> <li>Put the obligatory resources and tools into the hands of individuals without making it superficial</li> </ul>
Selective hiring	Human resource value chain that links microsystem's vision with real people for hiring, orienting, uninterrupted educating, retraining, and providing incentives	Assess current safety culture
<ul> <li>Integration into culture and roles</li> </ul>		<ul> <li>Identify gap between current culture and</li> </ul>
Allying work with training compe- tencies		Safety vision
<ul> <li>High expectations for performance, continuing education, professional growth, networking</li> </ul>		Plan cultural interventions
Education and training		Conduct periodic assessments of culture
Ongoing education	Team approaches to training create learning that is combined and focused on quality, safety, and integrated into work flow	Develop patient safety curriculum
Organizational learning		<ul> <li>Provide training and education of key clinical and management leadership</li> </ul>
<ul> <li>Work roles and competencies aligned</li> </ul>		<ul> <li>Develop a core of people with patient safety skills who can work amid microsystem as a resource</li> </ul>
Best use of people and resources		
Interdependence of care team		
• Trust	Multidisciplinary team provides care and every person is respected for individual vital role	<ul> <li>Build people's dispensary for sick animals (PDSA) into debriefings</li> </ul>
Collaboration		<ul> <li>Use daily huddles for after action reviewers (AARs) and revel identifying errors</li> </ul>
Willingness to help others		
<ul> <li>Appreciation of complimentary roles</li> </ul>		
<ul> <li>Recognition of inputs to shared purpose</li> </ul>		
Patient focus		
• Caring	The patient is the common focal point; that is why we are all here	Launch patient and family partnerships
Listening		Support disclosure and truth about medical error
Educating		
Kesponse to special requests		
• innovating		Contd



Contd		
Scope of success characteristic	Underlying principle	Safety impact
Delivering smooth service flow		
Relationship with community resources		
Community and market focus		
<ul> <li>Partnership with community for resource exchange</li> </ul>	Resource exchange and information sharing to ensure that patient needs are met	Analyze safety issues in community and partner with external groups to reduce risk to population
Outreach		
<ul> <li>Innovation and excellence</li> </ul>		
Performance patterns		
Patient outcomes	Outcomes are routinely measured, with feed- back to microsystems leading to change based on data	Develop key safety measures
Cost avoidance		Create the "Professional case" for safety
Streamlined delivery		
Data feedback		
Positive competition		
Open dialog about performance		
Process improvement		
Learning and redesign focus	Studying, measuring, and improving care are essential elements of daily work	<ul> <li>Identify patient safety priorities based on the assessment of key safety measures</li> </ul>
Continued care monitoring		<ul> <li>Address the work that will be required at the microsystem level</li> </ul>
Benchmarking		Establish patient safety "demonstration sites"
Tests of change		Transfer the learning
Staff authorized to innovate		
Information and IT		
Information is key	Information is a connector designed to sup- port work of the unit for the right information at the right time	Improve error-reporting system
<ul> <li>Technology links information and care</li> </ul>		<ul> <li>Establish safety concepts into information flow (e.g. checklists, reminder systems, etc.)</li> </ul>
Communication and channels		

contextual, modal, or psychological. Contextual classification deals with the specific time, place, medicines, and people concerned. Modal classification examines the ways in which errors occur (e.g. by omission, replication, or substitution). However, classification based on psychological theory is to be chosen, as it explains events rather than merely relating them. Its demerit is that it concentrates on human rather than systems' sources of errors. These classifications have been discussed in detail elsewhere (Flowchart 1).<sup>10,11</sup>

Mistakes can be divided into (i) knowledge-based errors and (ii) rule-based errors. Failures of skill can be divided into (iii) action-based errors ("slips," including technical errors) and (iv) memory-based errors ("lapses"). Knowledge-based errors can be related to any type of knowledge, general, specific, or expert. It is a general knowledge that penicillin's can cause sensitivity reactions; knowing that your patient is sensitive to penicillin is a specific knowledge; knowing that cofluampicil contains penicillins is an expert knowledge. Negligence or ignorance of any of these facts could lead to a knowledge-based error. Rule-based errors can further be categorized as (a) the misapplication of a good rule or the failure to apply a good rule and (b) the application of a bad rule. An action-based error is defined as "the performance of an action that was not what was intended." A slip of the pen, when a doctor intends to write diltiazem but writes diazepam, is an example. Technical errors form a subset of action-based errors. They have been distinct as occurring when "an outcome fails to occur or the wrong outcome is produced because the execution of an action was imperfect." An example is the addition of the wrong amount of drug to an infusion bottle. Memory-based errors occur when something is forgotten; for example, giving penicillin, knowing the patient to be allergic, but forgetting.<sup>12–14</sup>

### Prescription and Dispensing Irregularities Worldwide at a Glance

Medication errors are common in general practice and in hospitals. Both errors in the act of writing (prescription errors) and prescribing mistakes due to erroneous medical decisions can result in harm to patients.<sup>15</sup> It can be due to prescribing faults irrational, unsuitable, and prescription errors (vain prescribing, under prescribing, overprescribing; writing the prescription).<sup>16</sup> Doctors in US incorrectly prescribe antibiotics in nearly one-third of cases. A study finds that more than half of the US population receives prescription annually and estimates "inappropriate" prescriptions in doctor's office setting at up to 30%.<sup>17</sup> The National Health Service (NHS) makes hundreds of millions of prescribing mistakes and mix-ups which result in 22,300 deaths a year in UK,





according to a major report commissioned by the government.<sup>18</sup> NHS medication errors elevate fears that thousands could be dying because of 237 million errors every year, and some 237 million errors are made annually. Error rates varied from 7.1% to 90.5% for prescribing and from 9.4% to 80% for administration in the middle east.<sup>19</sup> However, UAE bans handwritten medical prescriptions due to 7,000 deaths worldwide resulting from illegible handwriting.<sup>20</sup> Prescription errors in least developed countries (LDC) need no further discussions, as only 13% drug in Bangladesh is sold under prescription; a study says that 96.83% percent of the pharmacist recommended medicine taking inadequate history.<sup>21</sup>

### FAILURE TO GIVE PRESCRIPTION ORDERS

The use of verbal orders, electronic order transmission via xerox machine, the use of global prescription orders such as resuming all previous orders provides many chances for miscommunication. Whenever possible, verbal orders should be avoided. Only specific personnel (e.g. physicians, pharmacists, and nurses) should be allowed to dictate and receive verbal medication orders and only in approved conditions. When used, verbal orders should be articulated slowly and distinctly. Difficult medication names and instructions should be spelled out. Ambiguity should be clarified (drug names can be wrongly changed due to look-alike or sound-alike drugs listed in Table 2). An individual receiving the order should transcribe the order and then immediately read the information back to the prescriber. In the in-patient or long-term care setting, the prescriber should countersign and verify the verbal order as soon as possible. Many healthcare organizations now

Table 2: Examples of	look-alike and	sound-alike	drugs
----------------------	----------------	-------------	-------

L	.ist 1	List 2			
Adriamycin	Achromycin	Methotrexate	Metolazone		
Albuterol	Atenolol	Myleran	Mylicon		
Alupent	lupent Atrovent		Nifedipine		
Amikin	Amicar	Orinase	Ornade		
Apresoline	Priscoline	Pediapred	PediaProfen		
Brevital	Bretylol	Penicillin	Penicillamine		
Carafate	Cafergot	Percodan	Percocet		
Cefoxitin	Cefotaxime	Phenobarbital	Pentobarbital		

use facsimile transmissions for prescription order transmission. Streaked, blackened, or faded areas and phone line noise appearing as random markings are often present on facsimile transmissions. Vigilant inspection of the copy is necessary to evaluate if extraneous markings interfere with the actual order. Recording of prescription orders in this manner still can contain illegible, ambiguous, or improper abbreviations. Failure to write a prescription order can also provide many chances for error. When medications are held or resumed or patient care is transferred to another location or provider, it is imperious that a complete review of medications occurs. Simply stating resume all, hold all, or continue all previous medications is not an acceptable practice.<sup>22-24</sup> However, clinical care has become progressively dependent on computerized physician order entry (CPOE) systems. No study has reported the adverse effect of CPOE on physicians' ability to handwrite prescriptions. The unintended shutdown of a long-running CPOE system might result in physicians failing to handwrite flawless prescriptions in the digital era. The contingency plans for computer catastrophes at healthcare facilities might include the preparation of stand-alone e-prescribing software so that the service delay could be kept to the slightest. However, supervision on prescribing should remain an essential part of medical education.<sup>25</sup>

### ERROR POTENTIAL IN THE PRESCRIBING PHASE

The three most common forms of prescribing errors include dosing errors, prescribing medications to which the patient had an allergic history, and errors involving the prescribing of inappropriate dosage forms. In the examples listed, timely access and use of information is essential to avoid adverse drug events (ADEs). Although not a panacea, use of a computerized medication order entry system can significantly contribute to the prevention of medication errors.<sup>26</sup> The type of healthcare information that is best suited for computerization includes:

- General information storage (e.g. patient or medication information, retrieval)
- Repetitive functions (e.g. dosage guidelines, medication names, sensitivity information)
- Complex processes that depend on reproducible results
- Items where legibility is important



- Items that require timely attention
- Items where accuracy is vital.

### **Guidelines for Prescribers**

The following guidelines are recommended for prescribers when writing directions for drug use on their prescription orders:

- The name and strength of the drug dispensed will be recorded on the prescription label by the pharmacist unless otherwise directed by the prescriber.
- Whenever possible, specific times of the day for drug administration should be indicated. (For example, take one capsule at 9:00 AM, 1:00 noon, and 10:00 PM is preferable to take one capsule three times daily. Likewise, take one tablet two hours after meals is preferable to take one tablet after meals).
- The use of potentially puzzling abbreviations, i.e., qid, qod, qd, etc., is discouraged.
- Vague instructions such as take as necessary or take as directed which are confusing to the patient are to be avoided.
- If dosing at specific intervals around-the-clock is therapeutically significant, this should specifically be stated on the prescription by indicating appropriate times for drug administration.
- The symptom, indication, or the intended effect for which the drug is being used should be included in the instructions whenever possible. (For example, take one tablet at 8:00 am and 8:00 pm for high blood pressure or take one teaspoonful at 9:00 AM, 11:00 AM, 4:00 PM, and 7:00 PM for cough.)
- The metric system of weights and measures should be cast-off.
- The prescription order should indicate whether or not the prescription should be renewed, and if so, the number of times and the period of time such as renewal are authorized. Proclamation such as Refill prn or Refill ad lib are discouraged.
- Either single or multidrug prescription forms may be used when appropriately designed and pursuant to the desires of local medical and pharmaceutical societies.
- When institutional prescription blanks are used, the prescriber should print his/her name, telephone number, and registration number on the prescription blank.

### **Guidelines for Pharmacists**

- Pharmacists should include the following information on the prescription label: name, address, and telephone number of pharmacies; name of prescriber; name, strength, and quantity of drug dispensed (unless otherwise directed by the prescriber); directions for use; prescription number; date on which prescription is dispensed; full name of the patient and any other information required by law.
- Instructions to the patient regarding directions for the use of medication should be concise and precise but readily understandable to the patient. Whenever the pharmacist feels that the prescription order does not meet these criteria, he should attempt to clarify the order with the prescriber in order to prevent confusion. Verbal reinforcement and/or clarification of instructions should be given to the patient by the pharmacist when appropriate.
- For those dosage forms where confusion may develop as to how the medication is to be administered (e.g. oral drops which may be wrongly imparted in the ear or suppositories which may be wrongly administered orally), the pharmacist should clearly

indicate the intended route of administration on the prescription label.

- The pharmacist should include an expiration date on the prescription label when suitable.
- Where special storage conditions are required, the pharmacist should indicate proper instructions for storage on the prescription label.<sup>27–29</sup>

### **E**RROR **P**OTENTIAL IN THE **D**ISPENSING **P**HASE

An example of the former type was a study in a UK hospital in which the researchers used semistructured interviews of pharmacy staff about self-reported dispensing errors. The most common causes mentioned were being busy (21%), being short-staffed (12%), being subject to time constraints (11%), fatigue of healthcare providers (11%), interruptions during dispensing (9.4%), and look-alike/ sound-alike medicines (8.5%).<sup>30</sup> The dispensing process has both mechanical and judgmental components. As a result, preclusion of dispensing errors will require a wide-spread approach including evaluation of:

- Work environment: Workload, interruptions, physical location of service, and hours of operation
- Inventory management: Outdated or unused products, lookalikes, sound-alike, clutter, labeling, and procuring of unit of use products
- Information resources: Available references, apprises, consultants, computer, or decision support technology
- Performance evaluation: Evaluation of staff proficiency and practice skill, knowledge and behaviors, and cross-checking redundancies
- Patient involvement: Patient education and review with show and tell techniques

Several precarious steps have been advocated for improving dispensing accuracy:

- Secure or sequester high-risk medications
- · Develop and implement standardized storage procedures
- Reduce distraction potential and advance workflow in dispensing environment
- Use reminders (labels and computer alerts) to prevent look-alike and sound-alike mix-ups
- Keep prescription order, label, medication, and the medication container together throughout dispensing process
- Accomplish a final check on prescription content including verification with original prescription order and label
- Enter a manufacturer identification code into the computer profile and on prescription label
- Accomplish a final check on the prescription label, if possible, using automation such as bar-coding
- Provide patient counseling.<sup>31–33</sup>

# ERROR POTENTIAL IN THE ADMINISTRATION PHASE

A cross-sectional study by Mendes et al. in the Emergency Department of a University Hospital (São Paulo) in 2018 reveals no hand hygiene and use of aseptic technique in more than 70% and 80%, respectively. Upon administration, no hand hygiene and no use of aseptic technique in more than 80% and around 85%, respectively. In more than 30% of observations, there was more than one medication at the same time for the same patient, of which approximately 18% were compatible, more than 55% and 25% were incompatible and were not tested, according to the Micromedex database, respectively.<sup>34</sup> However, the administration phase serves as a last final check on processing the entire medication order itself and includes:

- Evaluating the written order for appropriateness and completeness
- Ensuring appropriate indication for use
- Evaluating and interpreting the use of terminology and order method (abbreviation, units of measure, and use of verbal orders)
- Dosing calculation or verification
- · Identification of the patient
- Timing of treatment in context of other therapies
- · Preparation and possibly dispensing of medication
- Correct use of medication devices
- Patient education
- Documentation of treatment.

### MEDICATION ERROR-PREVENTION STRATEGIES

- Elimination of handwritten medical records and physician orders/computerized provider-order entry systems
- Institute fail-safe tracking of medications and laboratory tests to confirm that patients receive correct medications and tests on time
- Automated dispensing cabinets
- Implement bar-coding
- Establish protocols and guidelines that outline standardized practices
- Provide all medications in unit dose packaging and ready for patient administration
- Standardize medication procedures such as protocols for the use of hazardous medications, medication terminology, and medication names
- Make it difficult for someone to do something wrong by error proofing
- Medication reconciliation
- Make relevant patient information available at the point of patient care
- Advance the patient's knowledge about treatment.<sup>3,35</sup>

### **R**ECOMMENDATIONS FOR **P**RESCRIBING IMPROVEMENTS

Many opportunities exist to improve the safety of the medication use process. The prescribing phase of the medication use process, however, encompasses the majority of medication errors that result in preventable ADEs. The knowledge that ADEs can be prevented compels organizations to identify the factors or system failures that contribute to the errors in the prescribing phase. Such factors identified in the prescribing phase include:

- · Accessibility of medication information at the time of prescribing
- Access to patient information at the time of prescribing
- Accessibility of dosing information at the time of prescribing
- Accessibility of sensitivity information at the time of prescribing

- Accuracy or extensiveness of order by the prescriber
- Legibility of handwriting
- Use of abbreviations
- Use of decimals in expressions of weight and measure
- Use of varied units of measure
- Medication name look-alikes or sound-alikes.

### CHANGING SYSTEMS WITHIN ORGANIZATIONS

The following items have routinely been identified as a top 10 list for improvement in the literature:

- Improving the knowledge about medications (availability, access, and timeliness)
- Dose/identity tracking of medications (process understanding of distribution)
- Available patient information (availability, access, accuracy, and timeliness)
- Order transcription (elimination of process)
- Allergy defense (hard stop capabilities and access to patient information)
- Medication order tracking (streamlining and effective communication of patient needs)
- Communication (patient information, system performance, and medication use)
- Device use (standardization and competency regarding use)
- Standardization of medication dose and distribution.

# STEPS FOR CONDUCTING A ROOT-CAUSE ANALYSIS

There are several key features for healthcare organizations to consider conducting a root-cause analysis:

- Identify a multidisciplinary team to assess the error, failure, or adverse event of interest
- Establish a way to communicate findings and data elements required to conduct the analysis
- Create a plan with target dates, responsibilities, and measurement/data collection strategies required for the investigation
- Define all elements of the process and issues clearly
- Brainstorm all possible causes or potential causes
- · Identify interrelationships of causes or potential causes
- · Sort, analyze, and prioritize cause list
- Determine which processes and systems are part of the investigation
- Determine special and common causes
- Begin the design and implementation of the change while engaging in the root-cause analysis
- Repeat each of the steps listed previously as appropriate
- Focus on being thorough (ask why) and credible (be consistent, dig deep, and leave no stone unturned!)
- Target system improvement, particularly the larger systems
- Redesign to eliminate root cause(s)
- Measure and assess new design.

# BARRIERS ASSOCIATED WITH SAFETY

There are many reasons why organizations struggle with improving safety within their organization. Often, traditional methods such as



medication error or ADE reporting are cumbersome. Organizations have not adequately defined the process, the scope of collection, and members of the healthcare team do not understand why there is a need to collect and discuss the data. Many involved in the reporting end of the process never hear about the information gleaned from the analysis. Additionally, data collection and discussion about medication errors or adverse events are often fragmented. Pharmacy might collect and discuss some of the data, while nursing may be responsible for other parts and risk management or quality analyst may get involved for other issues. As a result, frustration occurs due to a lack of communication, integration, and input. Documentation systems are also cumbersome and often do not fit in well with other day-to-day care responsibilities. What occurs with all these events reported? Panic that individuals will be blamed for the error and that punitive action will be taken which limits individual participation in the process. Having a plan and an organizational understanding of the aim regarding safety improvement is essential. Many parts of the healthcare team contribute to the use of medications within the organization. All members within the organization must be aware of the importance of medication use safety, mindful of the potential for error and their role in averting it, and what the organization has in place to assure that safety is a priority. Assimilation of all data and the associated knowledge regarding medication use are needed. The integration of existing data, including ADR, medication error, pharmacy/nursing interventions, and medication interaction data into one organization-wide database is a key to an effective ADE quality management program. The overall impact of the database could be measured by examining the impact that the reduced incidence of ADEs has on health outcomes: clinical, economic, patient satisfaction, and health status outcomes. Specific goals for adverse event improvement activities generally include:

- Increase documentation
- Aggregate data effectively
- Organizational education and training regarding prevention and detection
- Use data to improve the medication use system
- Minimize patient risk
- Maximize health outcomes
- Create an open and authentic environment where there is a focus on system improvement and reporting
- Remove focus on individual and punitive process
- Meet regulatory standards.

Many groups have identified methods to improve the safety of the medication use process. National and local groups have strategies to share and stories to tell. It is important to learn and replicate best practice and build on the success of others.<sup>36-40</sup>

# Sources of Learning about Patient Safety

- The Agency for Healthcare Research and Quality (AHRQ)
- The American Hospital Association (AHA)
- Anesthesia Patient Safety Foundation (APSF)
- Annenberg Patient Safety Conferences
- Institute for Healthcare Improvement (IHI)
- Institute for Safe Medication Practices (ISMP)
- Joint Commission on Accreditation of
- Healthcare Organizations (Joint Commission, JCAHO)

- Leapfrog Group
- Malcolm Baldrige National Quality Program
- Massachusetts Coalition for the Prevention of MEs
- Minnesota Hospital and Healthcare Partnership (MHHP)
- National Academy for State Health Policy (NASHP)
- National Coalition on Health Care (NCHC)
- National Committee for Quality Assurance (NCQA)
- National Patient Safety Foundation (NPSF)
- National Quality Forum (NQF)
- United States Pharmacopeial Convention (USP).

### ROLE OF PATIENTS IN MEDICATION ERRORS

This area is relatively underresearched and there remains several unanswered questions. Little is known about how patients understand drug-related problems or how they make attributions of adverse effects. Some research propose that patients' cognitive models of ADRs bear a close relationship to models of illness perception. Recent National Institute for Health and Care Excellence (NICE) guidelines recommend that professionals should ask patients if they have any concerns about their medicines, and this approach is likely to yield information conducive to the identification of medication errors.<sup>41,42</sup>

### CONCLUSION

The path to safer medication use and improvements in patient safety is not about a destination. This is a journey that must involve iterative learning. There are no absolute solutions and mystical pronouncements that will tell the profession of pharmacy what to do to fix the system. The problems it faces will not be solved by the level of thinking that created them. The profession is forced to consider new approaches, new knowledge, and to consider ways of thinking, acting, and being that are outside our traditional approaches. Ultimately, the judge of the quality of work, the services delivered, and the outcome of care is an increasingly well-informed patient, as well as their payors and regulators from the public and private sectors. Focus more on patient needs and wants and less on how we do it around here.

### REFERENCES

- Rodziewicz TL, Hipskind JE. Medical Error Prevention. Treasure Island (FL): StatPearls Publishing; 2018 Jan. URL: https://www.ncbi.nlm.nih. gov/books/NBK499956/.
- 2. Steinwachs DM, Hughes RG. Health Services Research: Scope and Significance. In: Hughes RG. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Apr.
- Smith KE, Enright SM. Providing a Framework for Ensuring Medication Use Safety. Providing a Framework for Ensuring Medication Use Safety. Remington: The Science And Practice of Pharmacy. In: Remington Joseph P, Beringer P. Philadelphia: Lippincott Williams & Wilkins; 2006.
- Wolf ZR, Hughes GR. Error Reporting and Disclosure. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. In: Hughes RG. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Apr.
- 5. Pietra LL, Calligaris L, et al. Medical errors and clinical risk management: state of the art. Acta Otorhinolaryngol Ital 2005 Dec;25(6):339–346.
- 6. Nelson EC, Batalden PM, et al. Jt Comm J Qual Improv 2002;28:472.
- Kohn LT, Corrigan JM, et al. Creating Safety Systems in Health Care Organizations. To Err is Human: Building a Safer Health System.

Institute of Medicine (US) Committee on Quality of Health Care in America. Washington (DC): National Academies Press (US); 2000.

- 8. Hughes RG, Blegen MA. Medication Administration Safety. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. In: Hughes RG. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Apr.
- 9. Thomas JE, Petersen LA. Measuring Errors and Adverse Events in Health Care. J Gen Intern Med 2003 Jan;18(1):61–67. DOI: [10.1046/j.1525-1497.2003.20147.x].
- 10. Reason JT. Human Error. New York: Cambridge University Press; 1990.
- Ferner RE, Aronson JK. Clarification of terminology in medication errors: definitions and classification. Drug Saf 2006;29(11):1011–1022. DOI: 10.2165/00002018-200629110-00001.
- 12. Norman DA. Categorization of action slips. Psychol Rev 1981;88:1–15. DOI: 10.1037/0033-295X.88.1.1.
- Runciman WB, Sellen A, et al. The Australian incident monitoring study. Errors, incidents and accidents in anaesthetic practice. Anaesth Intensive Care 1993;21:506–519. DOI: 10.1177/0310057X9302100506.
- Ferner RE, Langford NJ, et al. Random and systematic medication errors in routine clinical practice: a multicentre study of infusions, using acetylcysteine as an example. Br J Clin Pharmacol 2001;52: 573–577. DOI: 10.1046/j.0306-5251.2001.01490.x.
- Giampaolo PV, Pietro M. Medication errors: prescribing faults and prescription errors. Br J Clin Pharmacol 2009 Jun;67(6):624–628. DOI: [10.1111/j.1365-2125.2009.03425.x].
- Aronson JK. Medication errors: what they are, how they happen, and how to avoid them. QJM 1 August 2009;102(8):513–521. DOI: 10.1093/ qjmed/hcp052.
- 17. Jessica G. Doctors in US incorrectly prescribe antibiotics in nearly a third of cases. The Guardian May, 03 2016.
- 18. The Independent NHS medication errors contribute to as many as 22,000 deaths a year, major report shows 23 February 2018.
- 19. Zayed A, Sharon C, et al. Medication errors in the Middle East countries: A systematic review of the literature. Eur J Clin Pharmacol April 2013;69(4):995–1008.
- Khaleej Times UAE bans handwritten medical prescriptions 7,000 deaths worldwide result from illegible handwriting. March 6, 2018.
- Shuvasis S, Tawhid MH. Evaluation of medicines dispensing pattern of private pharmacies in Rajshahi, Bangladesh. BMC Health Serv Res 2017;17:136. DOI: 10.1186/s12913-017-2072-z.
- Wakefield DS, Ward MM. Complexity of medication-related verbal orders. Am J Med Qual 2008 Jan-Feb;23(1):7–17. DOI: 10.1177/1062860607310922.
- 23. Dahl FC, Davis NM. A survey of hospital policies on verbal orders. Hosp Pharm 1990 May;25(5):443–447.
- 24. Simonian AI. Medication order communication using fax and document-imaging technologies. Am J Health Syst Pharm 2008 Mar 15;65(6):570–573. DOI: 10.2146/ajhp070461..
- 25. Hsu CC, Chou CL, et al. Physicians Failed to Write Flawless Prescriptions When Computerized Physician Order Entry System Crashed. Clin Ther 2015 May 1;37(5):1076.el–1080.e1. DOI: 10.1016/ j.clinthera.2015.03.003.

- Timothy SL. Prescribing Errors Involving Medication Dosage Forms. J Gen Intern Med 2002 Aug;17(8):579–587. DOI: 10.1046/j.1525-1497.2002.11056.x.
- 27. SA Health. Pharmacist legal obligations when handling, dispensing and supplying drugs of dependence. © 2012 SA Health (Govt. of South Australia). ABN 97 643 356 590. Last Modified: 23 Nov 2018.
- NABP. Report of the Task Force on Uniform Prescription Labeling Requirements. National Association of Boards of Pharmacy • (P) 847/391-4406 • (F) 847/391-4502.
- 29. Website. Texas State Board of Pharmacy. (Tab 30) Operation Standards. Prescription dispensing and delivery. URL: https://www.pharmacy.texas.gov/files\_pdf/BN/Aug13/Tab\_30.pdf.
- Cheung K, Marcel LB. De Smet AGMP. Medication errors: the importance of safe dispensing. Br J Clin Pharmacol 2009 Jun;67(6):676–680. DOI: 10.1111/j.1365-2125.2009.03428.x.
- Flanagan ME, Ramanujam R. The effect of provider- and workflowfocused strategies for guideline implementation on provider acceptance. Implement Sci 2009;4:71. DOI: 10.1186/1748-5908-4-71.
- 32. https://www.pharmacist.com/sites/default/files/files/Lecture4-DispensingErrors.ppt.
- 33. https://slideplayer.com/slide/4754902/.
- Mendes JR, Lopes MCBT, et al. Types and frequency of errors in the preparation and administration of drugs. Einstein (Sao Paulo) 2018;16(3):eAO4146. DOI: 10.1590/s1679-45082018ao4146.
- 35. Weant KA, Bailey AM, et al. Strategies for reducing medication errors in the emergency department. Open Access Emerg Med 2014;6:45–55. DOI: 10.2147/OAEM.S64174.
- McLeod M, Barber N, et al. Facilitators and Barriers to Safe Medication Administration to Hospital Inpatients: A Mixed Methods Study of Nurses' Medication Administration Processes and Systems (the MAPS Study). PLoS One 2015;10(6):e0128958. DOI: 10.1371/journal. pone.0128958.
- Alduais AM, Mogali S, et al. Barriers and strategies of reporting medical errors in public hospitals in Riyadh city: A survey-study. IOSR Journal of Nursing and Health Science Sep.–Oct. 2014;3(5):72–85.
- Handler SM, Perera S, et al. Identifying modifiable barriers to medication error reporting in the nursing home setting. J Am Med Dir Assoc 2007;8(9):568–574. DOI: 10.1016/j.jamda.2007.06.009.
- Hartnell N, MacKinnon N, et al. Identifying, understanding and overcoming barriers to medication error reporting in hospitals: a focus group study. BMJ Qual Saf 2012;21:361–368. DOI: 10.1136/ bmjqs-2011-000299.
- Haw C, Stubbs J, et al. Barriers to the reporting of medication administration errors and near misses: an interview study of nurses at a psychiatric hospital. J Psychiatr Ment Health Nurs 2014;21(9): 797–805. DOI: 10.1111/jpm.12143.
- Koohestani, H Reza, Baghcheghi N. Barriers to the Reporting of Medication Administration Errors among Nursing Students [online]. Australian Journal of Advanced Nursing Sept/Nov 2009;27(1): 66–74.
- 42. Britten N. Medication errors: the role of the patient. Br J Clin Pharmacol 2009 Jun;67(6):646–650. DOI: 10.1111/j.1365-2125.2009.03421.x.



# Effectiveness of "Code White": Joint Association of Administrator and Clinicians for Delivering Effective Treatment in Stroke Patients

Ashwini Jogade<sup>1</sup>, Pradyummna Oak<sup>2</sup>, Rajendra Patankar<sup>3</sup>, Deepak Patkar<sup>4</sup>

### Abstract

Stroke is the sudden death of brain cells due to lack of oxygen caused by blockage of blood flow or rupture of an artery to the brain. The common symptoms include sudden loss of speech, weakness, or paralysis of one side of the body. Other symptoms could include black-out, sudden loss of vision, problems with balance and coordination, and difficulty in swallowing. It could be a cause of mortality and morbidity, if not treated in time. The field of stroke medicine has changed considerably in recent years with the development of hyperacute treatments such as thrombolysis, mechanical thrombectomy, and measures of secondary prevention. There are challenges in the diagnosis and management process due to the complex need and urgency of the patient treatment. The management of Nanavati Super Speciality Hospital using the assembly line technique proactively took a project of prompt and comprehensive management of stroke patients; in fact, a special emergency response code—"Code White"—was created to handle patients with stroke during emergency. The doctors, staff and administrative staff were sensitized and trained, and simulation exercises done for quick diagnosis, effective delivery of treatment, and to expedite the procedure. The doctors also prepared skits to train the resident doctors and the nursing staff. This article will review the measures taken, effectiveness of multidisciplinary approach of Code White in the treatment of patients with stroke.

Keywords: Mechanical thrombectomy, Stroke, Thrombolysis.

International Journal of Research Foundation of Hospital and Healthcare Administration (2019): 10.5005/jp-journals-10035-1107

### INTRODUCTION

A 6-month-long study was conducted in purview of assessing the effectiveness of (a) effect of sensitization, training, multidisciplinary coordinated approach in stroke patients within the golden hour<sup>1</sup> and (b) the effect of generation of Code White wherein an alert was made on the arrival of stroke patient. The code was activated in the Accident and Emergency (A and E) Department, MRI Department, and critical care unit (CCU) with the objective of treating the patient within the golden hour for best clinical outcomes. In Code White the patient with stroke symptoms were assessed immediately by clinicians, and the patient was transferred to the MRI section for investigations and transferred to (a) CCU for thrombolysis or (b) CCU/Cath lab for mechanical thrombectomy. In the entire exercise, the administrator takes an active role to combat the hindrances of administrative issues, viz. clearance for MRI, CCU admission, logistics, coordinating with relatives, pharmacy, and finance, and expedite the proceedings for effective management of patient as per stroke protocol. The assembly line technique was used to improve operational efficiency at various levels.

Nanavati Super Speciality Hospital is a 350-bed tertiary care hospital with its vision "To create a patient-centric tertiary healthcare organization focused on non-intrusive quality care utilizing leading edge technology with a human touch" and mission to achieve professional excellence in delivering quality care, push Frontiers of care through research and education, adhere to national and global standards in healthcare, ensure care with integrity and ethics, provide quality healthcare to all sections of society."

The Nanavati team are passionate about delivering the highest standards of healthcare to their patients; in their quest for continual improvement, the management introduced emergency response team—Code White—in order to deliver the effective treatment to stroke patients within the stipulated time as per stroke protocol of <sup>1</sup>Department of Hospital Medical Administration, Nanavati Super Speciality Hospital, Mumbai, Maharashtra, India

<sup>2</sup>Department of Neurology, Nanavati Super Speciality Hospital, Mumbai, Maharashtra, India

<sup>3</sup>Accident and Emergency Centre, Nanavati Super Speciality Hospital, Mumbai, Maharashtra, India

<sup>4</sup>MRI Section (Radiology), Nanavati Super Speciality Hospital, Mumbai, Maharashtra, India

**Corresponding Author:** Ashwini Jogade, Department of Hospital Medical Administration, Nanavati Super Speciality Hospital, Mumbai, Maharashtra, India, Phone: +91 98331318139, e-mail: ashwini.jogade@ nanavatihospital.org

How to cite this article: Jogade A, Oak P, Patankar R, *et al.* Effectiveness of "Code White": Joint Association of Administrator and Clinicians for Delivering Effective Treatment in Stroke Patients. Int J Res Foundation Hosp Healthc Adm 2019;7(1):49–52.

Source of support: Nil Conflict of interest: None

AHA, with the conjoint team work of clinicians and administrators to reduce the adverse effects of delayed treatment in stroke patients and achieve client delight.

Nanavati Hospital is planning to start the "Tele-stroke" program for live discussion over stroke treatment delivery method and help patients.

### BACKGROUND

The study was done in a tertiary care hospital in Mumbai.

Duration of study = 6 months Sample size = as per incidence Benchmark set by hospital:

© The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons. org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

- In IV thrombolysis: door to needle TAT: 60 minutes
- In mechanical thrombectomy: onset of symptoms to mechanical thrombectomy—24 hours; for study purpose and expedition of the procedure in mechanical thrombectomy the benchmark was kept 6 hours.<sup>2</sup>

### MATERIALS AND METHODS

- This is a retrospective study of patients who were administered treatment of stroke in 6 months from December 2017 to May 2018 (Code White was started in November 17) in Nanavati Super Speciality Hospital.
- Stroke patients were treated for IV thrombolysis/mechanical thrombectomy in the months of December 2017 to May 2018; these patients were chosen for the study as per the incidence hence the sample size is the actual number of stroke patients.
- Patients were admitted to the hospital and diagnosed stroke.
- Pharmacological intervention included IV thrombolytic drugs; the turnaround time (TAT) was measured as time of entry into accident and emergency till time of administration of thrombolytic drugs in the critical care unit after correct diagnosis and stabilization of patients.
- Mechanical thrombectomy was done in cases as per clinical judgement by the physician in Cath lab after correct diagnosis and stabilization of patient.

### Аім

50

To study the average time taken for a stroke patient: thrombolysis and mechanical thrombectomy

- Door to needle TAT (turnaround time)
- Onset of symptoms to mechanical thrombectomy TAT.

The hospital took reference of "American Heart Association (AHA)/American Stroke Association (ASA) 2018 Guidelines for the Early Management of Patients with Acute Ischemic Stroke"

The following are key points to remember from the American Heart Association (AHA)/American Stroke Association (ASA) 2018 guidelines for the early management of patients with acute ischemic stroke:<sup>2</sup>

- These 2018 guidelines are an update to the 2013 guidelines, which were published prior to the six positive "early window" mechanical thrombectomy trials that showed a clear advantage of "extended window" mechanical thrombectomy for patients with large vessel occlusion who could be treated out to 16–24 hours.
- The benefits of intravenous (IV) tissue plasminogen activator (tPA) are time-dependent, and treatment for eligible patients should be started as quickly as possible (even for patients who may be candidates for mechanical thrombectomy).
- IV tPA should be administered to all eligible acute stroke patients within 3 hours of last known normal and to a more selective group of eligible acute stroke patients (based on ECASS III exclusion criteria) within 4.5 hours of last known normal. Centers should attempt to achieve door-to-needle times of <60 minutes in  $\geq$ 50% of stroke patients treated with IV tPA.<sup>2,3</sup>

Intravenous thrombolytic therapy is strongly time dependent.<sup>1</sup>

The therapeutic outcome of thrombolytic therapy is best if done immediately after the onset of symptoms as per guidelines.

Hence as an endeavor, it was decided to monitor the average time taken for the management of patient of stroke:

- Thrombolysis at NSSH—TAT of door to MRI
- Mechanical thrombectomy—TAT of onset of symptoms to mechanical thrombectomy.

### **Inclusion Criteria**

- Retrospective cases were identified as per incidence and based on the primary clinical diagnosis as "stroke."
- All the stroke cases were included irrespective of the age, gender, and past clinical history of the patients.

### **Exclusion Criteria**

Patients who have any neurodeficit but were not primarily diagnosed as stroke were excluded from the study.

### DISCUSSION

### Door to Needle TAT in IV Thrombolysis

- 33% of the patients were thrombolysed within the benchmark of 60 minutes (1 hour) TAT (door to needle).
- 67% cases took more than 60 minutes to be thrombolysed, but out of these 67%,61% cases were thrombolysed within 3 hours of onset of symptoms of stroke—which is as per AHA guidelines (Flowchart 1).

The mean time for door-to-needle TAT is 52 minutes.

### TAT of Onset of Symptoms to Mechanical Thrombectomy

- For 88% of patients, mechanical thrombectomy was done within the benchmark of 24 hours of onset of symptoms (Fig. 1);
- 12% of the cases took more than 24 hours for the procedure because patients came to hospital after a significant delay (patient presented late, after 24 hours of onset, case of posterior circulation stroke).

### CONCLUSION

The emergency code introduced—Code White—for stroke management is very successful. The joint efforts of administrators with clinicians have contributed to the intravenous thrombolytic therapy in 93% cases within the recommended time from onset of symptoms; a further 33% were thrombolysed within 1 hour the benchmark set by hospital. The joint efforts are definitely a victory in mechanical thrombectomy as in all cases the procedure was carried out within 6 hours from the entry of the patient to hospital. This study is more commendable as no patient deserving the treatment was found devoid of the treatment in spite of many constraints.

The joint efforts of administrators and clinicians can contribute to future endeavors with persistent zeal and efforts in many arenas as well.





### Recommendations

NSSH has undertaken a special program for the management of stroke patients. NSSH has discussed protocols with a renowned state university too for exchange of ideas.

NSSH should continue sensitization, training of emergency medical officers, residents and staff for quick diagnosis of stroke symptoms and further treatment.

Hospital administrators should think of innovative measures of joint collaboration in comprehensive care of patients and strive toward client delight.

The hospital should continue to use the assembly line technique to improvise processes in other vital areas toward comprehensive patient care.

### LIMITATIONS OF THE STUDY

- Lack of awareness of symptoms of stroke. The main limitation
  of the study was the lack of awareness of symptoms of stroke in
  patients due to which there could be dropouts thereby reducing
  the sample size.
- The cost of the treatment is a major challenge, and every time stroke is indeed an emergency, making it difficult for the relatives to arrange finance.
- Delayed diagnosis and eligibility of candidates, sometimes because of misleading history/interpretation.

• Infrastructural barrier: distance between the accident and emergency, MRI Department and CCU.

### CHALLENGES IN THE MANAGEMENT OF STROKE

- The main challenge in effective management of stroke is to increase the awareness of symptoms of stroke among the general population so as to identify and effectively diagnose such cases in order to clinically manage the patient to improve outcome.
- There should be efforts to create awareness for identification of symptoms, timely transfer to healthcare organization to receive timely treatment and improve the quality of life of stoke patients.

### ACKNOWLEDGMENTS

Sincere thanks to Dr Pradyumma Oak—Head and Consultant Neurologist who initiated this entire program, Dr Abdul Ansari— Director Critical Care Services, Dr Ravi Charan—In charge of Accident and Emergency, Dr Deepak Patkar who is also HOD of Radiology, all our Intensivists, and extended thanks to the entire medical, nursing, administrative staff of Nanavati Super Speciality Hospital.

51



### REFERENCES

- 1. Saver J, Smith E, Fonarow G, et al. The "Golden Hour" and acute brain ischemia. Stroke 2010;41(7):1431–1439. DOI: 10.1161/STROKEAHA.110.583815.
- 2. Powers WJ, Rabinstein AA, Ackerson T, et al. 2018 guidelines for the early nanagement of patients with acute ischemic stroke: a guideline

for healthcare professionals from the American Heart Association/ American Stroke Association. Stroke 2018;49(3):e46–e110. DOI: 10.1161/STR.00000000000158.

 Cheng NT, Kim AS. Intravenous thrombolysis for acute ischemic stroke within 3 hours vs between 3 and 4.5 hours of symptom onset. Neurohospitalist 2015;5(3):101–109. DOI: 10.1177/1941874415583116.



# Haemovigilance Programme of India

Haemovigilance Programme of India was launched on 10th December, 2012 at the national level in 90 medical institutions across the country by National Institute of Biologicals (NIB), NOIDA, Ministry of Health and Family Welfare, Government of India as the National Coordinating Center (NCC). The objective of this programme is to track Adverse Reactions associated with Blood Transfusion and Blood Donation. Reporting under this programme is voluntary in nature. There is no fee for enrolling or reporting under this programme.

### How to Enroll Your Centre under HvPI

### Who can enrol?

Head/Incharge of Transfusion Medicine Department / Blood Bank

### How to enrol?

- Head/Incharge of Transfusion Medicine Department/Blood Bank provides the necessary details to the National Coordinating Center (NCC)-Haemovigilance Programme of India (HvPI) by sending the duly filled Enrolment Form either to NCC at National Institute of Biologicals, Ministry of Health and Family Welfare, Plot No. A-32, Sector-62, Institutional Area, NOIDA-201 309 (U.P.) or via Email to NCC at haemovigilance@nib.gov.in
- 2) After verification, NCC issues the User Id and Password to the Head/Incharge of Transfusion Medicine Department/Blood Bank to access the (a) Haemo Vigil Software (b) Donor-Vigil Software for onward Submission of Transfusion Reactions Reports and Adverse Blood Donor Reaction Reports to NCC.

Download Enrolment Form from the site: http://nib.gov.in/Annexure7.pdf

### How to Report?

### Reporting of Adverse Transfusion Reactions via Haemo-Vigil Software & Adverse Blood Donor Reactions in donation via Donor-Vigil Software.

- a) Centres enrolled under HvPI receives unique user Id and password from NCC-HvPI, NIB.
- b) User Id and Password is same for both the Softwares i.e. Haemo-Vigil (to report adverse transfusion reactions) and Donor-Vigil (to report adverse donor reactions).
- c) Software(s) link is available at NIB website i.e. www.nib.gov.in under the tab of Haemovigilance Programme of India.
- d) The adverse reaction reports can be uplinked and submitted online via the above mentioned software(s) to NCC-HvPI, NIB.

Mail - Radhe Shyam Singh - Outl × S National Institute of Biologicals × +	- a ×
← → C ③ Not secure   nib.gov.in	९ 🖈 🖰 :
भारत सरकार   Government of India	Skip to main Content Font: A+ A- search Website In - Hindi



### National Institute of Biologicals (राष्टीय जैविक संस्थान)

Ministry of Health & Family Welfare, Government of India स्वास्थ्य एवं परिवार कल्याण मंत्रालय,भारत संरकार



Home	About Us	Services	Careers	Directory	Tech. Expertise	Conta	act Us	Sitemap	Help	
Director's P	Profile					all	B	Man	date	
Governance	e		DP		001	P	The last	Fun	tions	
Right to In	formation	- Co		1		1 te	- /	Staf	f Position	
Infrastruct	ure	1	B. Z.		La Col			Emp	loyee Corner	
Participatio	on	010	2992					Bud	get & Finance D	ivision
Laboratorie	25	00		2 /		10	1	Qua	ity Policy	
CDL Notific	ation		J-Ca	2 pt		411	1 7	QHS	E Policy	
Govt. Analy	st	e e	and and	Pr. Sanada Singa Barrana Mari			10	Nati	onal Health Pol	icy 2017
Monograph	IS			8			1	LQM	S Workshop	
Guidance D	ocument				Play Pause		avera	New	sletter	
Inventory I	Module	Nation	al Institute of Bio	logicals (NIB) had	been set up in 1992 as an a	apex auto	nomous Inst	titute Dru	J Survey Report	:
Tenders		for pro	moting and prote	cting human healt	n through various activities as	signed to	it.	Swa	chhta Pakhwad	a-2018
Notice to B	idders on E-Tender	ing The m diagno	andate of the In stics, Vaccines ar	stitute includes end Biotherapeutics	nsuring provision of quality l , including therapeutic mono	biological clonal ar	drugs i.e In tibodies use	vitro Link	s	
Bid Awards	1	patient testing	s suffering from with R&D interfa	cancer and autoin ce for application	mune diseases by undertakin of science. One of the main fu	ng high e Inctions o	nd science b f the Institut	ased		
Collaborati	on	per by differen	r-laws 3.5.8, is t nt institutions in I	o undertake reserved and abroad for	arch, establish linkages and or furtherance of its mandate.	exchang	e personnel	with	Notificat	ions !!
Proficiency	Testing	Others (i) dev	subjects forming p eloping and valida	part of its mandate ating standards for	are quality control testing;	ic and k	an abreact	Re with for	vised condition	5
Haemovigil India	ance Programme o	of worldw (iii) pro	vide scientific rese oviding training fa	arch and technolo cilities in quality co	gical developments; photol of biological;		cep aureast	1. 5	era Panels	
Drugs Surv	ey -AKS Software	(iv) ass (v) imp	sessing from time plementing and co	to time the availal o-ordinating activiti	bility of qualified manpower; a es of Haemovigilance Program	nd nme of In	dia.	2.1	ational Reference	Standards
Suppliers L	og	Sam	ple Receipt & Re	eport Dispatch	National Reference Standa	ards Se	ra Panel			
Annual Rep	ort	Manu	ufacturing and (	QC Protocols				-		
Publication	s						more	>>		

# 1800-180-2588