An implementation study on Hazard Identification and Risk Assessment (HIRA) technique in the Critical Care Unit of a Tertiary Care Hospital

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Abstract

In the studied hospital an increased number of adverse events were noted in the critical care unit (CCU) department of the tertiary care hospital in the last three months. Hence, a risk management technique, Hazard Identification and Risk Assessment (HIRA) is applied to identify the hazards and to reduce the risk of the identified hazards by administering suitable mitigation and the control programs. The study was carried out for three months i.e from May 2019 to July 2019 and all the staff's responses of the CCU department were captured to prepare the list of the perceived hazards. Moreover, the risk matrix is prepared for the identified hazards by the responses of the CCU staff captured under the categories probability and severity. The findings of the study conclude that the risk associated with hazards H12 (Hindrance in the movement of patients, staff and utilities due to obstructed corridors), H2 (Malfunctioning of Life-saving equipment or patient monitoring Biomedical Equipment) and H3 (The broken cable of equipment results in power leakage, short circuit and the trip of electricity supply in the department). The suitable interventions for these can be increased frequency of safety rounds, widening of the corridors and restricting access to the patient movement areas, and buffer stock for the life-saving devices.

Keywords: *Hazard, Risk Assessment, HIRA Plan, Hospital, Risk Reduction*

Introduction

In the various healthcare systems, clinical threats have attracted the attention of authorities and regulating bodies. In the United States itself around 3. 7 per cent of the hospital patients are at the risk of adverse events in their stay at the hospital.(1) However, the clinical risk can be defined as the "probability of a patient being subject to an adverse event (i.e., an unintended injury or complication that results in disability at the time of discharge, death or prolonged hospital stay) caused by health care management rather than by the patient's underlying disease process".(2) Moreover, the adverse events can be understood as those incidents in which a patient is unintentionally harmed by medical treatment. (3) However, as per the earlier studies, the adverse events affects around 10 per cent of hospital patients and around 50 per cent of them are preventable.(4) Different areas of the hospitals have different susceptibility towards adverse events. Among all the areas the Intensive care units (ICU's) are one of the areas with the highest probabilities for adverse events.(5) For instance, in the United States of America, only around 10 per cent of the patients admitted in the intensive care units suffer from nosocomial infections, moreover, the rate is 21-25 infections per 1000 ICU days.(6) Intensive care units also have a significant number of workplace violence and patient falls.(7) This study attempts to check the status of implementation of all clinical and non-clinical risk measures with the application of hazard identification and Risk assessment (HIRA) in the Critical Care Unit department of a tertiary care hospital of Delhi in India.

Literature Review

Risk can be defined as potential losses and rewards resulting from exposure to a hazard or as a result of the risk event. Similarly, hazards can be explained as something which can lead to an undesired outcome in the process of meeting an objective.(8) HIRA can

be understood as a process which starts with the identification of hazards and then assigning risk values to the identified hazards with the help of risk assessment techniques to take precautionary measures to minimize the impact of the identified hazards. The HIRA technique has been applied in the past in Thermal Power Plants [9], Construction based organizations ([10]), and iron ore pelletizing organizations [11]. The results were satisfactory and the risk ratings were reduced to as low as reasonably practicable (ALARP) levels. There is another version of HIRA which is called as HIRAC " Hazard Identification Risk Assessment and Control."[11] However, in the healthcare organizations, the application of HIRA is limited as some of the studies have carried out risk management initiatives in the hospital operation theatre areas[12] and for the home healthcare nurses working in the metro cities of India.[13]However, the objectives of the HIRA technique can be summarized as:

1. To carry out a systematic, crucial appraisal of all capacity hazards involving personnel, plant, services and operation methods

2. Identify the prevailing safeguards to be had to manipulate the dangers due to the hazards

3. Suggest additional control measures to reduce the hazard to an applicable level.

4. Prepare a Risk Register to assist in continuously monitoring the dangers, locate any changes and make certain the controls are effective.

Methods

The study design is cross-sectional and descriptive. The study setting is the critical care unit of a tertiary care hospital in the Delhi City of India. The study period is of three months ie from May 2019 to July 2019. The data collection technique is unstructured interview technique. The Sampling frame is the medical and paramedical staff working in the 12-bed critical care unit data that includes a survey research design. The exclusion criteria were the staff who have worked for more than one month in the department as a duration less than that will limit their ability to identify the perceived hazards. The staffs were interviewed to identify the hazards in the second stage of the HIRA procedure. Moreover, in the next phase of the study, the identified hazards were ranked by the CCU staff in terms of their probability of occurrence and severity of impact on human beings in the CCU area, impact on hospital property and lastly impact on the business as a whole as depicted in figure 1, See figure 1.

Analysis

The demographic data of the participants revealed that around 36 per cent of the respondents were male and the majority were females with 64 per cent. In terms of age distribution, the majority of the staff were in the age group 20-30 years with 40 per cent, followed by the age group 40 years and above with 35 per cent. The occupation data revealed that around 57 per cent of the respondents were nursing staff, 12 per cent were medical practitioners, 18 per cent of the respondents were housekeeping staff and lastly, 13 per cent of the respondents were technicians, see table 1.

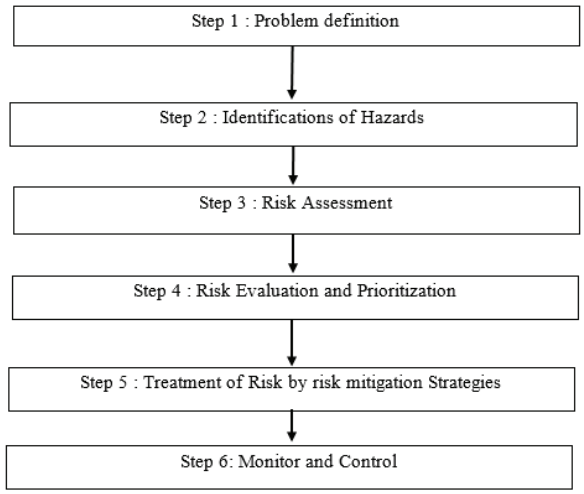

Table 1: Demographic Profile of the respondents.

Gender (Percentage)	
Male	36%
Male	64%
Age (years)	
0-20	0
20-30	40%
31-40	25%
40 & above	35%
Occupation (Percentage)	
Medical Professionals	12 %
Nursing	57 %
Housekeeping Staff	18 %
Technicians	13 %

In the interview content analysis the identified hazards were majorly associated with the following process categories :

1.Major spill management

2.Biomedical Equipment Safety

3.Declaration of patient death to patient attendant or relatives

4.Facility Management

5.Patient safety

6.Infection Control

7.Medication safety

As highlighted in figure 1, in the third stage the risk assessment is carried out by multiplying the probability of the occurrence with the severity of impact in the categories such as the impact on humans, impact on property and lastly impact on business. The scoring was done in a scale of 1-3, where 1 = low probability, 2 = medium probability and 3 = high probability. Similarly for severity impact 1 = low impact, 2= medium impact and 3= high impact. The summarized ratings based on the mode method is mentioned in table 2, See Table 2

Table-2: Risk Matrix With probability and severity impact on Human, Property and Business

Hazard Number	Hazard Description	Probability	Impact On Human	Impact On Property	Impact on Business
H1	A chemical spill inwards and CCU resulting into slip and fall of patient, employees and visitor	3	2	2	1
H2	Malfunctioning of Life-saving equipment or patient monitoring Biomedical Equipment	3	3	3	2
H3	The broken cable of equipment results in power leakage, short circuit and trip of electricity supply in the department	3	3	3	2
H4	Workplace violence by a patient attendant or patient relatives	3	2	3	2
H5	Patient fall from bed	3	3	1	3
H6	Patient fall or slip in the toilet due to the absence of handrails in the toilet or wet surface	3	3	1	3
H7	Patient fall during mobilization inwards	3	3	1	3
H8	High-risk medication errors	2	3	1	3
H9	Lookalike sound-alike medication errors while giving medications to patients	2	3	1	3
H10	The higher dose of narcotics leads to severe injury or critical illness to the patient.	2	3	1	3
H11	Hospital-Acquired infections to patients or the staff due to lack of signages or avoid the use of PPE while visiting patients in the Isolation room.	2	3	1	3
H12	Hindrance in the movement of patients, staff and utilities due to obstructed corridors	3	3	3	3

Results

The results are summarized in all the three categories of impact on human beings, impact on property and impact on business. The findings from the perspective of impact on humans highlight that the hazards, H2 (Malfunctioning of Life-saving equipment or patient monitoring Biomedical Equipment), H3 (The broken cable of equipment results in power leakage, short circuit and trip of electricity supply in the department), H5 (Patient fall from bed), H6 (Patient fall or slip in the toilet due to the absence of handrails in the toilet or wet surface), H7 (Patient fall during mobilization inwards), H12 (Hindrance in the movement of patients, staff and utilities due to obstructed corridors) fell into high priority category denoted by red colour in figure 2 and needs to be addressed first, see figure 2.

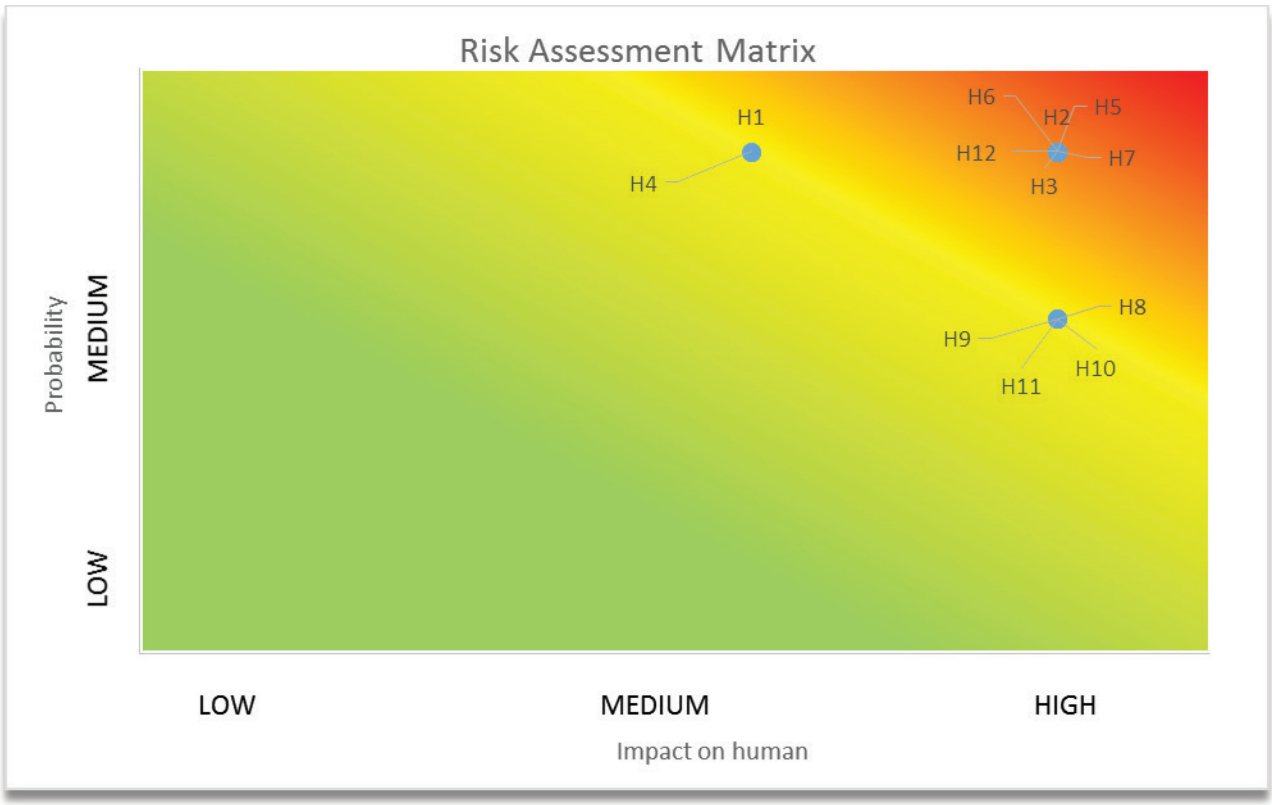

Figure 2: Risk Assessment of Different Hazard Categories and its impact on Human

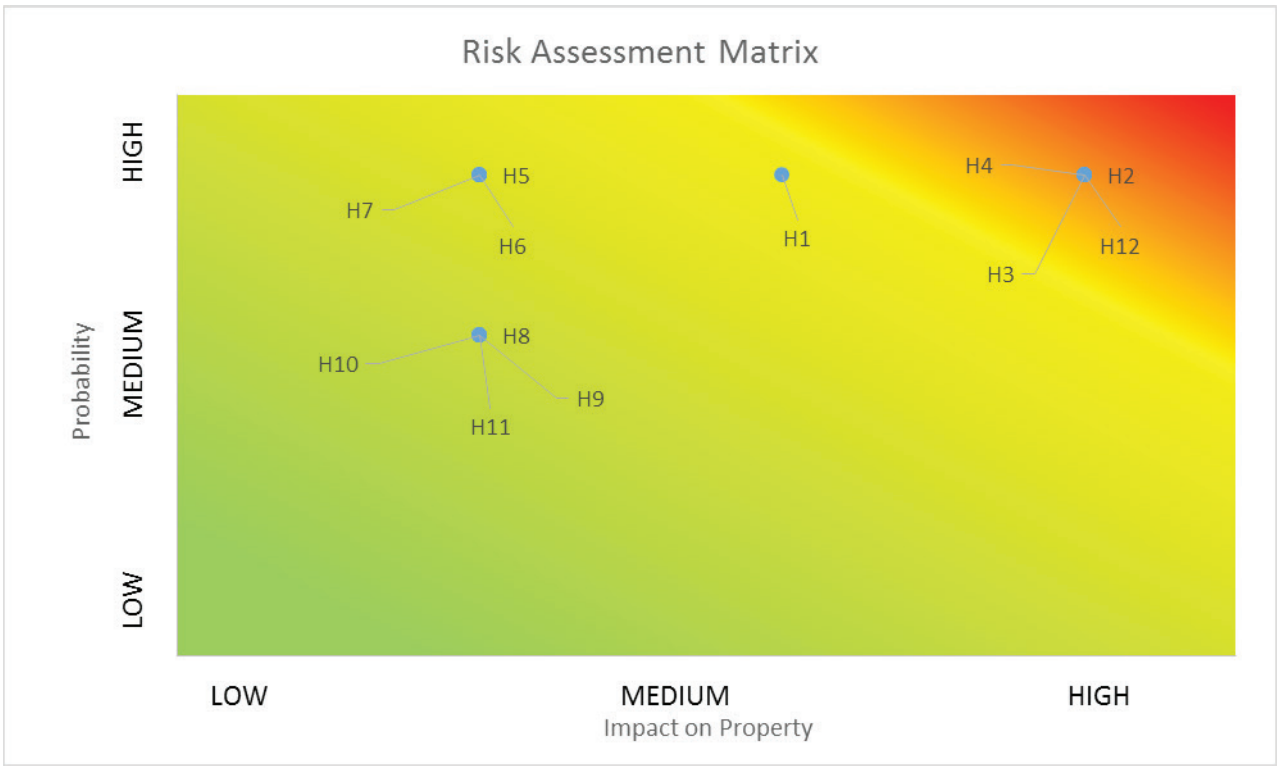

Figure 3: Risk Assessment of Different Process Categories and their impact on Property

Similarly, the findings from the perspective of impact on the property revealed that the hazards such as H2 (Malfunctioning of Life-saving equipment or patient monitoring Biomedical Equipment), H3 (The broken cable of equipment results in power leakage, short circuit and the trip of electricity supply in the department), H12 (Hindrance in the movement of patients, staff and utilities due to obstructed corridors), and H4 (Workplace violence by a patient

attendant or patient relatives) fell into the red zone denoting priority should be given to these hazards for addressal.

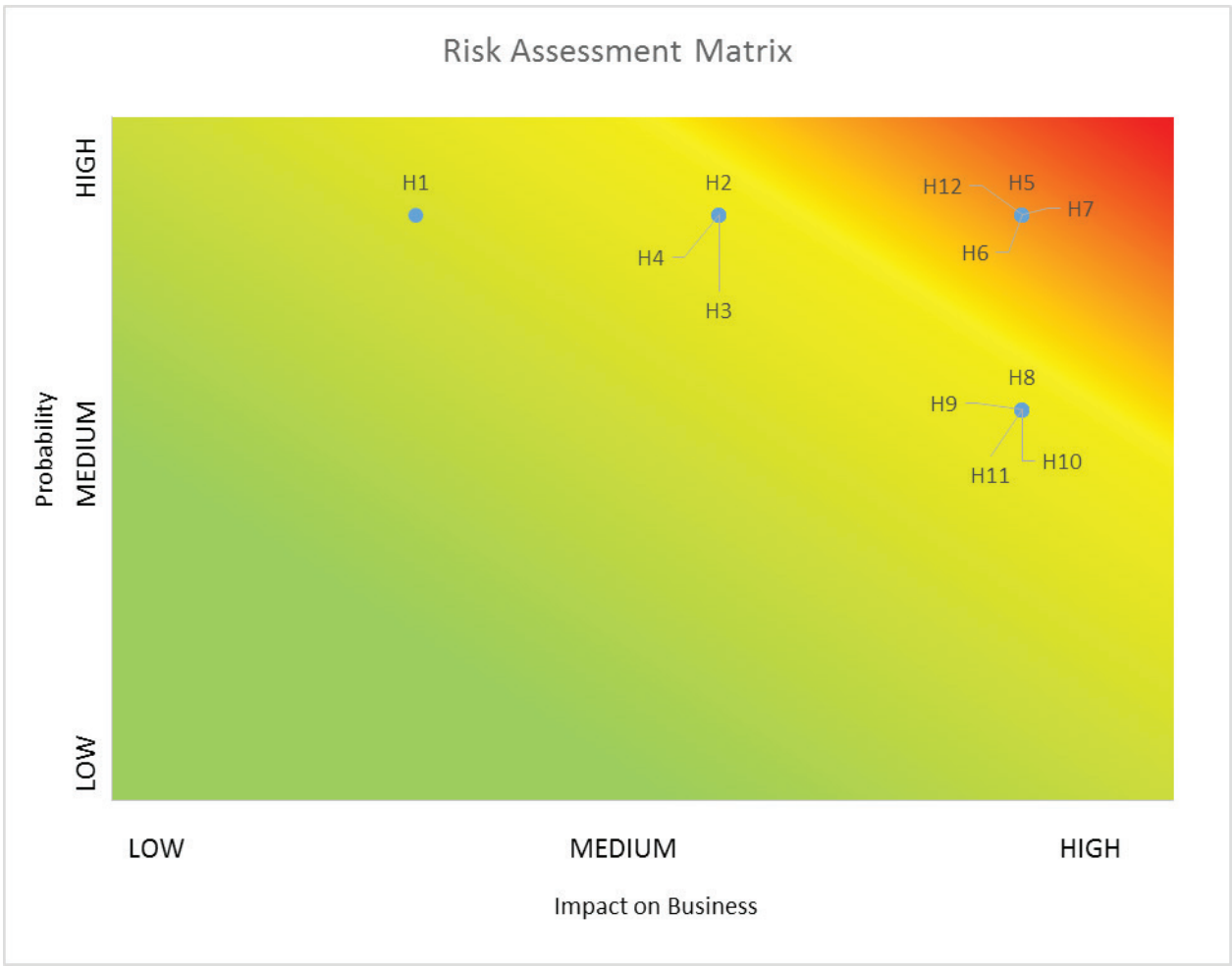

Figure 3: Risk Assessment of Different Process Categories and its impact on Business

Lastly, In the category of impact on business the hazards such as H12 (Hindrance in the movement of patients, staff and utilities due to obstructed corridors), H6 (Patient fall during mobilization inwards), H7 (Patient fall or slip in the toilet due to the absence of handrails in the toilet or wet surface) and H5 (Patient fall from bed) were the one with high probability and having a high impact on the business. Hence these should be taken on priority for risk mitigation.

Discussion

The findings of the study revealed that H12 (Hindrance in the movement of patients, staff and utilities due to obstructed corridors) had a high impact from both the perspectives of impact on property and impact on business. This finding is consistent with earlier studies where hindrance with the fire doors is accepted as a significant barrier for patient movements. [14] Furthermore, hazards such as H2 (Malfunctioning of Life-saving equipment or patient monitoring Biomedical Equipment) and H3 (The broken cable of equipment results in power leakage, short circuit and the trip of electricity supply in the department) were the common priority hazards in the category of impact on humans and impact on the property. This finding is also similar with the earlier study which has highlighted that the patients in the intensive care units are at the higher risk of adverse events as they utilize more biomedical equipment in comparison to the patient admitted in the wards.[15] However, the control measures for risk mitigation for the three categories are discussed as below mentioned.

Control Measures to mitigate the risk of Human-

- Physical Audit of the condition of all biomedical

equipment cables and all default cables to be removed and discarded.

· Periodic maintenance of biomedical equipment and its peripherals.

· Biomedical engineers training in electrical safety and importance of checked and dressed cables with emphasis on safe work practices

· Patient assessment using the Morse Fall Scale. Bedside rails, Identification band of fall risk. Patient call bell for assistance.

· Handrails in staircase & toilet.

· Assistance to the patient while immobilization inward or ICU.

· Wet floor signage to alert patient walking in corridors.

· Continuous training of HK staff to use the wet floor signage.

· Identification of fall risk patients.

· Response to patient call bell.

· Administration: putting rules, policy and signages for awareness.

· Redesign: Making the utilities maintained and safer.

Control Measures to mitigate the risk impact on the property-

· Physical Audit of the condition of all biomedical equipment cables and all default cables to be removed and discarded.

· Periodic maintenance of biomedical equipment and its peripherals.

· Regular conduct of the patient family meeting and its record-keeping.

· Consent of patient relatives in treatment planning.

· Effective communication by all health care workers.

· Elimination of hazard completely from the workplace.

· Redesign the process of handling death cases

· Continuous training of all health care workers ineffective communication and priority with a sequence of activity to be done for the smooth handling of deceased patient relatives.

· All corridors and evacuation corridors must be obstruction-free, for free movement of patient, employee, fire safety & evacuation teams.

· Administration: putting rules, policy and signage's for awareness.

· Continuous training on evacuation corridors in the hospital building and the importance of clear passage during situations such as fire, electricity shut down etc.

Control Measures to mitigate the Risk Impact on Business-

· Patient assessment using the Morse Fall Scale. Bedside rails, Identification band of fall risk. Patient call bell for assistance.

· Handrails in staircase & toilet.

· Assistance to the patient while immobilization inward or ICU.

· Wet floor signage to alert patient walking in corridors.

· Continuous training of HK staff to use the wet floor signage.

· Identification of fall risk patients.

· Response to patient call bell.

· Administration: putting rules, policy and signage's for awareness.

· Redesign: Making the utilities maintained and safer.

· Barrier nursing, hand washing by all health workers, adherence to care bundles, sterilized linen, stringent facility upkeep, 1:1 nursing ratio.

· Adherence to medication safety policy and controls.

· Maker checker process before administrating high-risk medications.

· Medication safety audit.

· Elimination of hazard completely from the workplace.

· Adherence to medication safety policy and controls.

· Maker checker process before administrating high-risk medications.

· Medication safety audit.

· Training on infection control practices.

· Doctor, nursing & pharmacy staff training on medication safety and management of high-risk medications.

Other control measures

· Careful handling of chemical containers. In case of a major spill of hazardous material, use a major spill kit to control the hazards of slip and falls.

· Activate code grey: Major spill.

· Training in handling major spill code grey. And safe handling of hazmat containers.

· Administration: putting rules, policy and signage's for awareness.

· Personal protective equipment shall be used during a major spill of hazardous material.

Conclusion

This study concludes that the HIRA (Hazard Identification and Risk assessment) technique is an effective strategy to identify the hazards related to the complex healthcare providing areas of the hospitals. Moreover, in the studied hospital the hazards such as H12 (Hindrance in the movement of patients, staff and utilities due to obstructed corridors), H2 (Malfunctioning of Life-saving equipment or patient monitoring Biomedical Equipment) and H3 (The broken cable of equipment results in power leakage, short circuit and the trip of electricity supply in the department) needs to be addressed on priority. The suitable interventions for these can be increased frequency of safety rounds, widening of the corridors and restricting access to the patient movement areas, and buffer stock for the life-saving devices.

Limitations: The study was carried out for three months due to shortage of time, hence the after-effects of the intervention couldn't be captured.

Ethical Clearance- IEC of Symbiosis International (Deemed University)

Source of funding- NIL

Conflict of Interest-None

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