# Effect of Implementing Fall Prevention Strategies on Nurses' Performance at Neurological Diseases Intensive Care Unit

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**Abstract**

**Background**: In-hospital falls are a significant clinical, legal, and regulatory problem, moreover, is considered one of the nursing-sensitive quality indicators and essential goal of international patient safety goals IPSG. In hospital falls well-thought-out to be any unintentional positional change that results in the person coming to rest on the ground, floor, or other lower surface. Falls are the most frequently reported incidents among hospitalized patients. It is considered a challenge for healthcare workers because information on effective fall reduction is lacking.   **The study aimed** to determine the effect of implementing fall prevention strategies on nurses' performance at Neurological Intensive Care Units. **Subjects and Method**: **Design:** A quasi-experimental design was utilized in this study. **Setting:** The study was conducted at Neurological Intensive Care Units in Neurological Medical Center, in Tanta Main University Hospital. **Subjects**: All nurses (50) nurse from Tanta University Neurological Intensive Care Units. **Tools:** Three tools were used to collect data: Tool I: Nurses' knowledge and socio-demographic characteristics Tool II: Nurses compliance fall prevention tool: (Rounding tool) Tool III: Nurses' performance for prevention of patient fall checklist. **Results:** The main results of this study revealed that there was a significant improvement in the mean scores of the total level of knowledge and practice immediately and one-month post-program implementation in a studied group at P < 0.05. Conclusion: **Conclusion:** The study findings revealed that nurses' performance of intervention for patient fall prevention had improved after the application of the educational program. **Recommendation:** It was recommended that an In-service training program should be conducted continuously for nurses regarding fall prevention strategies and essential presence of nurse's instructor to distribute guideline booklet with knowledge and practices about patient fall prevention.

*Keywords:* In-hospital fall, nurses' knowledge, nurses' performance, fall prevention strategies.

## Introduction

Falls are a serious health care problem and often result in major injuries and even deaths. [1] In addition, patient falls consider a significant challenge and ongoing issue for acute-care hospitals, long-term care facilities, and community health clinics in the United States [2] thus; there is a need for appropriate, effective interventions[1]. Patient' falls measure for hospital compliance with patient safety standards. Many falls lead to serious injuries which increase hospital costs[3]. The international benchmark for patient falls ranges from 2.3 to 7 falls per 1000 patient days. This accounts for approximately 700 000 to 1 000 000 falls per year in the United States. More alarming is the estimate that annually more than 1% (11000) of these falls are fatal. Unassisted falls inevitably lead to more serious injuries than assisted falls, thus causing greater harm to the patient such as serious fractures or sprains, or even fatal injuries [4]. There are many risk factors for falls age, physical status, and medical conditions which lead to weakness [5]. Other factors that most frequently contribute to patient falls are inadequate assessment of patients and communication failures; staff not following procedures and safety measures; deficiency in staff orientation, supervision, leadership, and in the level of the staffing skill mix; and the physical environment surrounding the patient [6]. The most common causes of falls can be dizziness, different medications, medical conditions like Parkinson's, physical conditions like uneven floor, slippery or snowy roads, slippery footwears, poor eyesight, poor lightning, improper placement of the furniture, etc. [7]. Another reason for a patient's fall in the acute care setting is the patients' reluctance to call for assistance that is influenced by a perception that nurses are too busy [8]. Falls have contributed to major injuries, some resulting in death, among patients admitted to acute care hospitals. [9] The effects of falls can be devastating and include physical, emotional, and financial consequences, for which appropriate, effective interventions must be implemented. The researchers further indicated that injuries sustained from falls can result in increased inpatient hospital days, unscheduled surgeries, and sometimes loss of life the cost related to managing patients post-fall is significant [1]. Fall prevention is the main concern among healthcare institutions since providing quality and safe care is their primary goal. As healthcare systems continue to adopt and implement fall prevention strategies, nurses play a critical role in implementing fall prevention procedures in the acute care setting. The

hallmark of most fall prevention strategies is risk identification. Although an abundance of risk identification instruments exists, these assessment tools and risk-factor directed interventions are not consistently applied to explain the continued high incidence of falls among adult patients [7-10]. Many hospitals have standard fall prevention protocols in place including signs, alarms, fall assessments, nonskid socks, and patient instructions about calling for assistance before getting up [11]. Moreover, use of a conventional fall prevention method like the fall risk assessment tool is ineffective in reducing fall rates[12]. Hourly rounding is an essential part of nursing and patient care that addresses patient's needs such as pain, potty (toileting), positioning, and personal belongings/needs[13]. The intentional grounding reduces patient's use of call lights, improves patient satisfaction, and decreases patient falls in various hospital settings. The nurse's role starts from the early prevention to the rehabilitation of falls and further follow-up and evaluation [14]. Nurses are also part of a team, in which there are a variety of other professions such as a doctor [15]. Nurses should implement patient safety and concern when providing nursing care to patients. Nurses must also involve cognitive, affective, and action that promotes patient safety [16]. Nurses need to use evidence to support development activities and translate evidence-based practice into daily nursing practice [17]. That why this study aimed to determine the effect of implementing fall prevention strategies on nurses' performance at Neurological Intensive Care Units.

## Aim of the study

The study aims to determine the effect of implementing fall prevention strategies on nurses' performance at Neurological Intensive Care Units.

## Research hypothesis:

Fall prevention strategies are exhibited to improve nurses' performance regarding fall reduction among neurological patients.

## Subjects and methods

## Research design:

Aquasi-experimental research
The design was being used in the study.

## Setting:

The study was conducted at
Neurological Intensive Care Units in Neurological medical center, at Tanta Main University Hospital.

## Subjects:

The subjects of this study has consisted of all critical care nurses N= (50) of both sex, who worked and direct caring for neurological patients in neurological intensive care unit in the previously mentioned setting, regardless of their age, sex, years of experience, level of education and residence.

**Tools of data collection:**

Three tools were used for data collection of this study as follows: **Tool (I)** Nurses' knowledge and socio-demographic characteristics: this tool was developed by the researcher after reviewing relevant literature[133,134] that collected socio-demographic data of nurses and nurses knowledge, it was written in both simple Arabic and English language for assessing nurses' knowledge. It has consisted of two parts as follows: this tool was included two parts: **Part I:** Socio-demographic characteristics of nurses as age, sex, marital status, years of experience, level of education, and previous education program and workshops about fall prevention

**Part II:** Nurses' knowledge regarding falls in neurological disorder patients, covered the following: a risk factor of fall that includes: individual factors, health factors, environmental factors, and other factors, fall prevention strategies, and risks of falls on the neurological patient. This part consisted of 36 closed-ended questions, it included five categories in the form of a multiple-choice question (MCQ) and true, false question; it was covered the following item;-

Nurses knowledge regarding definitions, types related to fall and fall prevention, the risk factor of fall, consequences of fall, and their

knowledge regarding fall prevention strategies Scoring system of the nurses' knowledge questionnaire: the response incorrect and no response was be scored (0) and a correct answer was be scored (1) for each area of knowledge. The score was summed up and converted into total score percent. Grades of total knowledge according to the following category: High level >75%, Middle 60-75%, and low level <60%

**Tool (II):** Nurses compliance fall prevention tool (Rounding tool) It was being assessed by the researcher using Modified Scripps Mercy Hospital Rounding Tool (Rounding tool) it was adapted from Gutierrez and Smith, (2008)[17], it was being used to determine the nurses' compliance with fall prevention protocol (FPP) for patients identified as a high risk for falls. Scoring system of the nurse's compliance fall prevention tool; the degree of compliance with the FPP was graded according to the scores obtained on the tool as high, moderate, or low compliance. Compliance with each item as outlined in the rounding tool is calculated the lowest score that was obtained [16] indicates more compliance, the highest score that was obtained [18], indicates non-compliance.

**Tool (III):** Nurses' performance for prevention of patient fall checklist. The

researcher has used this tool to evaluate the nurses' level of performance regarding prevention of patient fall by using a new 34-item fall prevention checklist based on the existing fall prevention strategies that covered the following items: fall risk assessment, fall protection, fall elimination, staff orientation and training, safe environment, fall administration strategies, communicate with the care team and pharmacist about high-risk medication, medication review strategy. These strategies were adopted from Morgan and Bjorkelo ([19,20]),it was focused on the nursing staff's performance and compliance to each intervention to determine whether all prevention interventions were in place before accepting care of the patient and the incidence of falls was tracked daily. Scoring system of nurses' performance regarding prevention strategy each category of prevention strategy ranked as scored (0)when not done, scored(1) when need improvement, scored (2) when completely done. Total scoring considered satisfactory practice level is ≥75% and Unsatisfactory as practice level>75%

**Method:**

- Official permission was obtained from the responsible authorities to carry out the study.

- Consent obtained from every nurse included in the study after explanation of the aim of the study and assuring them regarding;

- Confidentiality and anonymity of the collected data are maintained by the use of code number instead of name and the right of withdrawal is reserved.

- Privacy of the studied nurses was be maintained. Ethical committee approval obtained in -4-2020

- Three tools were used in this study:

- A tool I and tool III was being developed by the researcher to evaluate the nurses' knowledge, performance, and nurses' compliance with fall prevention protocol, and translated into Arabic, But tool II was adopted from Gutierrez and Smith, (2008) [135].

- Content validity: the developed tools were tested for content validity for clarity and applicability by five experts in the Medical-Surgical nursing staff and staff of neurological medicine, Modifications were carried out accordingly.

- Reliability statistics: Alpha Cronbach's test was used to test tool I reliability and the reliability factor was =0.831.

- Alpha Cronbach's test was used to test tool II reliability and the reliability factor was =0.815.

- A pilot study was be conducted on 10% of the studied nurses to test the

applicability of the tools and to determine any obstacles that may be encountered during the period of data collection and needed modification was be done.

- Data collection: data were collected over 7 months, started from June to December 2020.Nurses' were interviewed by the researcher in the nursing room in the Neurological medical center, in Tanta Main University Hospital

- The study was conducted according to the following phases:

**Assessment phase: (preparation phase):**

The initial interview was done for the nurses, explain the aim of the study, obtaining official approval to participate in the study, obtain basic data through a pre-test questionnaire using tools I and III Grouping nurses as 5 groups (10 nurses at each group) according to their monthly roster. researcher prepare five sessions that were needed for the teachings strategies. Pre-test distributed for all staff before beginning the program .Assessment of the nurses' socio-demographic data using the tool I (part I) was collected from the nurses. Assessment nurses' knowledge was carried out using Tool I (part 2); the researcher assesses nurses' knowledge pre-implementation of the educational program. Assessment nurses' practice was carried out using Tool (II) and tool (III);

the researcher assesses nurses' practice pre-implementation of an educational program.

**Planning phase:**

This phase was formulated based on data from the assessment phase, literature review, priorities, goals, and expected outcome criteria were taken into consideration when planning patients' care.

The selection of teaching-learning strategies methods was governed by studying the subject themselves and the content of the program

Teaching methods were lecture, group discussion between the researcher and the nurses, and demonstration were used as a teaching method and it was translated into the Arabic language for nurses. Teaching aids used for the attainment of program objectives were: lab top, videos, and power-point prepared by the researcher based on literature review.  A colored booklet was developed to be given to the nurses.

**Implementation phase:**

An educational program about fall prevention nursing intervention was developed and implemented by the researcher to all nurses in the nursing room in the center. Each interview lasted for about 30-50 minutes to complete the tool I. The time needed to complete the checklist (tool II) varies from 15-60 minutes depending upon the time of the different procedures inside the department.

Educational sessions were given to all nurses included in the study and it was implemented over four sessions. Nurses were divided into small groups each one ranges from 2-5. The content of the sessions was divided into two theoretical and two practical sessions. Sessions for nurses were carried out during the morning and afternoon shifts.

**Evaluation Phase:**

Each nurse was evaluated using a tool I,II, and III to determine the effect of implementing fall prevention strategies on nurses' level of knowledge and their performance.

**Limitations:**

1-There was no policy or procedure used to assess patient risk for falls.

2- No available material as flyers, fall ID band, and /or fall sign.

3- Not found and data regarding calculating fall incidents or any counting for fall risk among neurological patients at the intensive care unit.

**Results**

Table (1): Illustrate percentage distribution of the studied nurses according to their Socio-demographic characteristics. The results revealed that more than half (52%) of studied nurses had a Bachelor degree in nursing and, majority of them (96%) were females and more than half of them(62%) were married the mean of their age group were mean of age (33.45±5.78) years and

(46%) of them the mean of their years of experience was years of experience in the neurological care unit, it was noticed that less than (46%) were 5-10 years with a mean ±SD of years of experience (12.32±4.9) years. Moreover, it was observed majority (96%) of nurses did not attend any training courses before caring out the program.

Table (2): This table Clarifies the distribution of the mean nurses' knowledge score of studied group pre, immediately post, and one-month post-program implementation regarding fall prevention program regarding the following items: fall in neurological disorder patient, risk factors of fall, fall prevention strategies, there was a statistically significant difference present among three phases of the study as P= (<0.001*) also as cleared that mean nurse' knowledge score during pre-intervention phase were (2.52±0.,74,3.44±0.62, 2.8, and 3.2±0.7 ) respectively then Enhanced immediately post-intervention to be (5.88±0.45,8.19±0.83,9.07±0.6) respectively and while in follow up phase the mean score was (5.6±0.64,7.8±0.58,8.92±0.83) respectively.

Figure (1): This figure Percentage distribution of the studied nurses' total knowledge scores pre, immediately post, and one-month post-program implementation it was observed that that near fifty of the studied nurses (46%) had a moderate level of knowledge before the

implementation of the educational program compared to the more than three quarter (76%) and near three quarter (74%) had high knowledge level immediately post and one-month post-program implementation.

Figure (2): This figure demonstrates the percentage distribution of the studied nurses' according to their compliance level, It was noticed that pre-intervention (70%) of them had unsatisfactory compliance levels compared with (12%) and (14%) respectively while in post-intervention and in follow up phase majority of them(88% and (86% respectively in post-intervention phase and follow up phase their compliance level heightened and become satisfactory.

Table (3):  illustrate the Correlation between the Total performance of the studied nurses and their total knowledge   score and total compliance among three phases of the study it was observed that it was found that apositive correlation between total knowledge, total performance, and total compliance through three phases of the study as in pre-intervention phase r= (0.806, 0.425)and immediate post-intervention (r=0.482, 0.433)and during follow up phase r= (0.375, 0.230).

**Table 1:**Percentage distribution of the studied nurses according to their Socio-demographic characteristics.

| Characteristics | The studied nurses (n=50) | % |
|---|---|---|
| Age | N | % |
| 21-30 | 14 | 28 |
| 31-40 | 22 | 44 |
| 41-50 | 8 | 16 |
| 51-60 | 6 | 12 |
| Mean±SD | 33.45±5.78 | |
| Sex | | |
| Male | 2 | 4 |
| Female | 48 | 96 |
| Marital status | | |
| Single | 8 | 16 |
| Married | 31 | 62 |
| Divorced | 7 | 14 |
| Widow | 4 | 8 |
| Educational level | | |
| Diploma | 0 | 0 |
| Technician | 22 | 44 |
| Bachelor | 26 | 52 |
| Postgraduate | 2 | 4 |
| Years of experience at Icu >1year 1-5 year 5-10year >10year | 0 19 23 8 | 0 38 46 16 |
| Mean±SD | 12.32±4.9 | |
| previous education programworkshops about fallpreventionin the neurological unit | Yes 2 No 48 | 4 96 |
| | | |

**Table 2:** Percentage distribution of the mean nurses' knowledge score of studied group

| Items of knowledge | Pre | | Post immediately post | | Follow after one month | | Chi-square | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pre &post | | post &follow | |
| | N | % | N | % | N | % | X2 | P-value | X2 | P-value |
| Falls in neurological disorder patients | 18 | 36 | 42 | 84 | 40 | 80 | 24.00 | <0.001* | 0.27 | 0.60 |
| | 32 | 64 | 8 | 16 | 10 | 20 | | | | |
| | Mean±SD | | | | | | | | | |
| | 2.52±0.74 | | 5.88±0.45 | | 5.6±0.64 | | | | | |
| Risk factor of fall | 17 | 34 | 41 | 82 | 39 | 78 | 23.64 | <0.001* | 0.25 | 0.61 |
| | 33 | 66 | 9 | 18 | 11 | 22 | | | | |
| | Mean±SD | | | | | | | | | |
| | 3.44±0.62 | | 8.19±0.83 | | 7.8±0.58 | | | | | |
| Fall prevention strategies | 14 | 28 | 44 | 88 | 43 | 86 | 36.94 | <0.001* | 0.08 | 0.76 |
| | 36 | 72 | 6 | 12 | 7 | 14 | | | | |
| | Mean±SD | | | | | | | | | |
| | 2.85±0.55 | | 8.74±0.75 | | 8.62±0.94 | | | | | |
| Intervention to prevent fall | 15 | 30 | 45 | 90 | 44 | 88 | 37.50 | <0.001* | 0.10 | 0.74 |
| | 35 | 70 | 5 | 10 | 6 | 12 | | | | |
| | Mean±SD | | | | | | | | | |
| | 3.2±0.7 | | 9.07±0.6 | | 8.92±0.83 | | | | | |
| Items of knowledge | Pre | | Post immediately post | | Follow after one month | | Chi-square | | | |
| | | | | | | | Pre &post | | post &follow | |
| | N | % | N | % | N | % | X2 | P-value | X2 | P-value |
| Falls in neurological disorder patients | 18 | 36 | 42 | 84 | 40 | 80 | 24.00 | <0.001* | 0.27 | 0.60 |
| | 32 | 64 | 8 | 16 | 10 | 20 | | | | |
| | Mean±SD | | | | | | | | | |
| | 2.52±0.74 | | 5.88±0.45 | | 5.6±0.64 | | | | | |
| Risk factor of fall | 17 | 34 | 41 | 82 | 39 | 78 | 23.64 | <0.001* | 0.25 | 0.61 |
| | 33 | 66 | 9 | 18 | 11 | 22 | | | | |
| | Mean±SD | | | | | | | | | |
| | 3.44±0.62 | | 8.19±0.83 | | 7.8±0.58 | | | | | |
| Fall prevention strategies | 14 | 28 | 44 | 88 | 43 | 86 | 36.94 | <0.001* | 0.08 | 0.76 |
| | 36 | 72 | 6 | 12 | 7 | 14 | | | | |
| | Mean±SD | | | | | | | | | |
| | 2.85±0.55 | | 8.74±0.75 | | 8.62±0.94 | | | | | |
| Intervention to prevent fall | 15 | 30 | 45 | 90 | 44 | 88 | 37.50 | <0.001* | 0.10 | 0.74 |
| | 35 | 70 | 5 | 10 | 6 | 12 | | | | |
| | Mean±SD | | | | | | | | | |
| | 3.2±0.7 | | 9.07±0.6 | | 8.92±0.83 | | | | | |

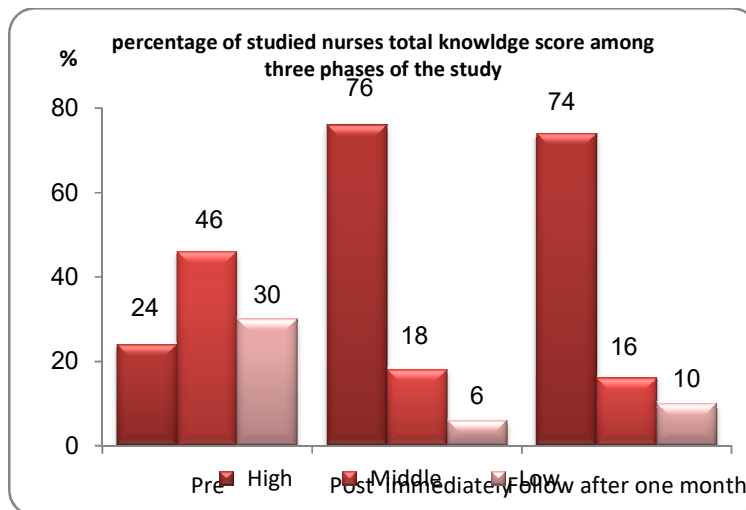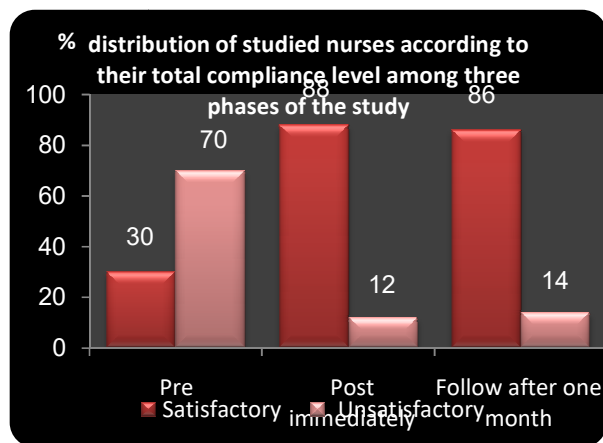Fig (1): Percentage distribution of the studied nurses' total knowledge scores



Fig (2): the percentage distribution of the studied nurses' according to their compliance level



| Total perfor mance | Total knowledge | | | | | |
|---|---|---|---|---|---|---|
| | Pre | | Post immediately post | | Follow up post-one- month | |
| | r | P-value | r | P-value | r | P-value |
| Total perfor mance | 0.80 6 | <0.001* | 0.48 2 | <0.001 * | 0.375 | 0.002* |
| Total compl iance | 0.42 5 | <0.001* | 0.43 3 | <0.001 * | 0.230 | 0.004* |

Table 3: Correlation between the Total performance of the studied nurses and their total knowledge   score and total compliance

**Discussion:**

Patient falls are the most common adverse event in the intensive care unit, occurring from accidental events when derived from extrinsic factors, such as environmental considerations or anticipated physiologic falls when derived from intrinsic physiologic factors, such as confusion and unanticipated physiologic falls when derived from unexpected intrinsic events, such as a new onset syncopal event or a major intrinsic event such as stroke, resulting in devastating physical, psychological and financial consequences and without a doubt. It is considered one of the biggest risks of hospital care and results in severe complications. Therefore, the emphasis on fall assessment and prevention is a key priority[20]. Concerning socio-demographic characteristics of the studied nurses, the present study delineated the dominance of females; this high proportion of female nurses is most probably attributes to the fact that the study of BSN in the Egyptian universities was exclusive for females only till a few years ago, so the profession of nursing in Egypt was mostly feminine. Especially in the age group reflecting young adulthood most of them (96%) range from (31-40) years old. In this regard, this finding is justified by graduate nurses who were appointed to work in the neurological center because young and adulthood are

considered the healthiest lifetime. It also considered the effective time to learn and modify their practice through training and education to improve the sense of identity and develop successful intimate relations. These findings are merely in agreement with that of Khalifa (2018) [21]andTaha (2014) [22], and This finding also was matched with Faltas (2018) [23] who conducted a quasi-experimental study about the effect of the nursing guideline on Performance of nurses regarding Prevention of Patients' Fall in Intensive Care Units and showed that the majority of the studied nurses were in the young adult. This finding was matched with Kalisch (2011) [24] who conducted a cross-sectional, descriptive design about Do staffing levels predict missed nursing care that showed that the majority of staff were female (90%). Concerning their years of experience, it was noticed that less than half (46%) of the studied group were 5-10 years. This result was in agreement with Eunjoo Lee, (2018). [25]Who conducted a descriptive study about Use of the Nursing Outcomes Classification for Falls and Fall Prevention by nurses in South Korea and showed that most nurses had about 4 to 7 years of experience.

Regarding training courses the findings of the present study clarified that the majority of the studied nurses didn't receive any training courses, this result can be

explained by the lack of administrative support, increasing workload in a clinical area, and lack of motivation This finding was matched with Souza [26], who conducted a descriptive study about nursing competence in the prevention of fall who conducted cleared that about two-third 60% of the nurses did not have the training. Concerning educational level, the result of the current study showed that near half of the studied nurses had nursing bachelor, few nurses had a master degree, less than half had technician, no had diploma, This finding is contradicted with Taha (2014) [22] who said that the majority of the educational level of the studied sample was secondary school graduates followed by technical school graduates and finally baccalaureate degree graduates. Also In contrast according to Khalifa (2018) [21] who said that about half of nurse participants had technical nursing diploma degrees. This finding is contradicted with Taha (2014) [22] who said that the majority of the educational level of the studied sample was secondary school graduates followed by technical school graduates and finally baccalaureate degree graduates. And also Octavini (2015)[27] find that majority of nurses had a diploma.

Concerning the acquisition of knowledge, the result of the current study revealed that the nurses' had a poor level of knowledge about fall prevention before program implementation. This might be related to lack of availability of manual booklets, nurses abandon reading, work overload and most of the nurses did not attend training programs about management for patient fall prevention This may be attributed to lack of orientation program before work as well lacks nursing care conference during work, invariability of procedure, and books especially in this area which help nurses to get the required knowledge whenever they need.

These results were matched with several studies conducted by Laing (2014) [28] and Soones (2014) [29] knowledge among nurses about fall prevention was generally at a low level. In contrast, previous studies conducted by Prabowo(2014) [30]and Johnson (2014) [31] revealed that falls knowledge among nurses was at a high level.

Additionally, implementation of the educational program led to significant improvements in nurses' knowledge with a good level of knowledge immediately and one-month post-program implementation in the studied group. This improvement might be related to the majority of nurses who are enthusiastic to learn and have a highly expressed need to learn more about patient fall prevention. Also, this finding shows that the educational program had a good impact on improving nurses' knowledge, which could be due to the

concise presentation of each session using simple language, clear educational methods, instructional media, and the availability of researchers in the field for more clarification, and frequent repetition to fix the knowledge.

These results were congruent with several studies regarding Indonesian nurses" fall-knowledge have been conducted in Indonesia Prabowo(2014)[32],Susanti(2015)[32]and Oktaviani[28]. A descriptive correlation study conducted by Prabowo (2014) [30] revealed that nurses fall-knowledge at a high level, and similar with a study conducted by Susanti (2015) [32] revealed that nurses fall-knowledge at a high level after receiving an educational program rather than before the implementation of the program. The moderate level of nurse fall-knowledge among nurses in Surakarta was found in the study conducted by Oktaviani (2015) [27] element of the intervention which was effective in improving the nurses' practice, providing the nurse with a colored booklet, using audiovisual aids, proper communication, and demonstration. This is on the same line with the study done by Merom(2015) [33] entitled" Prevalence and correlates of participation in fall prevention exercise/physical activity by older adults "who stated that the significant improvement in nurses' knowledge after

using learning programs strengthen their skills and update their knowledge and improve quality of care provided to the hospital clients.

Concerning nurses' compliance, the current study indicated that the percentage distribution of the studied nurses' according to their compliance level it was noticed that one quarter had satisfactory compliance level pre-program implementation, which enhanced to the majority of the studied group immediately post and one-month post-program implementation. This finding was about Nurses' compliance with a fall risk assessment from twelve journals systematic review, five studies were conducted inwards, one study in an emergency room and six studies did not specifically mention the place. From all of these studies, the nurses are getting better in compliance with fall risk assessment the systematic review done by Purwadinata (2014)[34] showed a minority of the nurses had bad compliance, less than half had adequate compliance, and about had good compliance. The nurses who had bad compliance were related to their knowledge of a risk of falling.

The study was done by Dwi (2014)[35] and the study conducted in Santo Barromeus Hospital in Bandung done by Setyarini[36] concluded that more than half of the nurses had good compliance with writing

assessment results on the whiteboard at the nurse station and had bad compliance.

This finding was matched with Evaluis (2015) [37] fifty of the nurses had good compliance with fall risk assessment, and more than two-thirds of the nurses implemented fall prevention in patients. A study was done by Schwendiman(2006) [38] showed that a management program for risk of falling, which includes fall risk assessment, could lower fall incidence by 15.3% in one year observation period. Study done by Ariyati (2016) [39] showed about half had good compliance with fall risk assessment and less than half had not.

 Regarding the acquisition of skill performance, the current study shows that most of the studied nurses had unsatisfactory practice before the application of the nursing educational program. This may be attributed to the poor knowledge level, shortage of nursing staff, increasing work overload, lack of nurses' evaluation against the standards of nursing practice by the nursing supervisor and head nurses for detecting the strength and weaknesses point to work on it and refusal of some nurses to improve their practice.

On the other hand, most studied nurses had satisfactory practice level immediately and one-month post-program implementation than a pre-program implementation with significant improvement.

This improvement may be attributed to a combination of the theoretical part and the practical training element of the intervention which was effective in improving the nurses' practice, providing the nurse with a colored booklet, using audiovisual aids, proper communication, and demonstration.

Related to the nurses' practices at the pre-implementation of the program the nursing practice before the program was unsatisfied. On other hand, the practice of nurses' post-program regarding fall prevention immediately after and one month after the program was satisfied. The improvement of nurses' practice is a result of implementing an educational program as well.

Comparison between total level of nurses' practice regarding applying patients' fall prevention in intensive care units pre, immediate, and post 3 months guidelines implementation was clear. shows that there was a significant improvement in general practice from unsatisfactory to satisfactory level post guidelines as regards to pre-post 3 months; from (32%) to (90%), (86%) respectively. Comparison between the total satisfactory level of nurses' practice regarding applying patients' fall prevention in neurological care units pre, immediate and post 3 months guidelines, there is a statistically significant difference between

the total satisfactory level of nurses' practice in all items of practice as it improved post implementing program.

Regarding nurses' performance for fall elimination, staff orientation, Communicate with the care team, pharmacist the result of the present study showed that the studied group had a highly significant improvement immediately and one-month post-program implementation.

Regarding nurses' performance for fall risk assessment, the findings of the present study clarified that; nurses had unsatisfactory practice regarding patient assessment pre-program implementation, physical assessment is an integral part of nursing and a key learning outcome in nurse education programs.

This finding agreement with Sinuraya[40](2015)who conducted a study about fall prevention practices for the hospitalized elderly consists of a fall risk assessment, interventions to prevent falls, and post-fall analysis and management. The scores of each domain are categorized into three levels; high, moderate, and low. The study findings revealed that the average score of nurses' fall prevention practices was high level (M=12.63, SD= 2.37)), including a fall risk assessment and interventions to prevent falls. However, the level of nurse's" fall prevention practices for hospitalized elderly regarding the post-

fall analysis and management was at a low level.

In addition, comparison between the total level of nurses' practice regarding applying patients' fall prevention in intensive care units pre, immediate, and post 3 months guidelines implementation. shows that there were significant improvements in general practice from unsatisfactory to satisfactory level post guidelines as regards to pre-post 3 months; from (56%) to (86.8%) respectively ($X2 = 20.269$ at $P<0.001$).

Regarding Comparison between the total satisfactory level of nurses' practice regarding applying patients' fall prevention in intensive care units pre, immediate and post 3 months guidelines implementation, there is a statistically significant difference between the total satisfactory level of nurses' practice in all items of practice as it improved post implementing guidelines. The findings in this study were similar to a study conducted by Thirumalai, A Menzel, (2010)[41]. The researcher argued that the high level of nurses" fall prevention practices of fall risk assessment and interventions to prevent falls was because the nurse participants were registered nurse (RNs ) and licensed practical nurses (LPN) Thirumalaiand Menzel(2010)[41].

 Similarly, almost all the nurses in this study are RNs and LPNs. According to

Potter (2011)[42], an LPN is a nurse who has finished a practical nursing program and passed a licensure examination and an RNs is a nurse who possesses a significant total education. After completing the professional education program, In conclusion, the respondents are licensed and have passed the Examination for Registered Nurses. The questions regarding falls are included in the patient safety section of the examination for RNs Silvestri(2014) [43] and LPNs Silvestri(2010)[44].

In addition, according to Williams (2011)[45]education programs and fall awareness were found effective in fall reduction in an acute care setting. The background knowledge regarding falls derived from their undergrad nursing study, from both theory and practice courses, provided a basis for them to construct or integrate and apply the background knowledge of fall risk assessment and interventions to prevent falls and allocate care for hospitalized elderly.

Regarding, correlation between total knowledge, total performance, and their total compliance score pre, immediately post, and one-month post-program implementation. It was found that a positive correlation relationship between the total knowledge score, total performance, and total compliance score of

the studied nurses .these results may be attributed to the effect of the application of the educational program and gaining of knowledge that leads to a more comprehensive understanding for the nurses about fall, its risks and the importance of maintaining patients safety which impacted their behavior patterns and positively affected their performance and their compliance these findings was in agreement with Oktaviani (2015) [27], who found a correlation positive relationship between the nurses''' knowledge and nurses''' compliance to the implementation of the standard operating procedures nurses' patient fall risk prevention. Also, a study conducted by Susanti (2015) [32] and Prabowo and Khoiriyati(2014)[30]they found a correlation positive relationship between nurses' knowledge and compliance to implementation of the standard operating procedure the risk of a fall injury.

**Conclusion and recommendation** Based on the findings of the current study, it can be concluded that: Application of nursing educational program was effective on nurses' performance regarding fall prevention among neurological patients for patient fall prevention and played a vital role in upgrading and improvement of staff nurses' knowledge and their compliance. Based on these findings it was recommended that provision of a

continuous in-service educational program and regular demonstration should be provided for nursing staff to keep them updating with evidence-based practices and improving their performance and compliance regarding fall prevention.

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