

## Fall Reduction Intervention for Hospitalized Pediatric Patients at Risk for falls

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**Abstract:** Background: Falls represent a major public health problem around world. In hospital setting, falls continue to be number one adverse event with approximately 3-20% of inpatients falling at least once during their hospitalization. Fall measurements have been identified as important to patient outcomes by several organizations based on fact that falls most frequently reported adverse patient event in inpatient setting. Aim of this study to identify effect of risk reduction interventions for hospitalized pediatric patient, implement intervention, establish documentation guidelines, to provide a safe therapeutic environment. Subjects and Method; Design: This study was quasi-experimental study (Pre-/Post-test). Setting: study setting was pediatrics wards of Menoufia University Hospitals at Shebin El Kom and Mansheat Sultan; and Shebin El Kom Teaching Hospital, Menoufia Governorate - Egypt. Sample: a). A convenience sample of a total number of 60 pediatric patients. They was selected according to following inclusion Criteria: all patients male and female with age 3-18 years already admitted to pediatrics wards, at Menoufia University hospitals and their caregivers, Exclusion criteria were those falls of visitors or patient falls from other units not included in study, such as outpatient and neonatal intensive care units, B). A purposive sample of 40 nurses were selected who take-care of 60 pediatric patients. Tools for Data collection: 1. Humpty Dumpty Falls Scale to assesses pediatric inpatients' risk for falls. 2. Interviewing Questionnaire for Nurses, 3. Interviewing Questionnaire for children' caregivers, and observational checklist for nurses practice. Results: By using Humpty Dumpty Falls Scale 31.7% were identified as low risk, and 68.3% were identified as high risk fall of hospitalized pediatric patients. present study revealed that 40% of high risk falls of pediatric patients their age from 3years to less than 8 years compared to 30 % of low risk fall at same age. As regards to gender, it was clarified that 38.3% pediatric patients of high risk fall score represent male patients compared to 15% of female. Considering Children Caregivers' knowledge regarding; serious symptoms that may occur after his / her fall represents 60 % at posttest. present study showed that most of studied pediatric nurses their knowledge was improved in posttest (satisfactory) than in pretest (wrong answer) in pretest regarding "Meaning of Fall". Most of nurse's practices were satisfactory after followed General Strategies for Falls Prevention for High Risk Pediatric Patients in post-test than in pretest. Conclusions: implementation of fall reduction intervention for hospitalized pediatric patients at risk for falls had significantly improve nurses knowledge and practice and improve children caregivers knowledge in-order to manage fall correctly and reduce fall occurrence. Recommendations: Implementation of risk assessment tool would allow all hospitalized children to be properly assessed for fall risk, and document of fall assessment tool into electronic medical record would allow nurse to implement fall reduction intervention for high risk children.

**Keywords:** Fall Reduction Intervention-Pediatric Patients -Risk for falls

### Introduction

Falls considered a major public health problem around world. It presents an overwhelming clinical problem in both community and hospitalized patients [1]. In hospital setting, falls continue to

be number one adverse event with approximately 3-20% of inpatients falling at least once during their hospitalization. Of those, 30 to 51% of falls in hospitals result in some injury. Of these, 6 to 44% experience similar

types of injury; fracture, subdural hematomas, or excessive bleeding that may lead to death [2]. consequences may include not only serious physical injuries ([1, 2, 3] but also psychological effects such as; anxiety, depression and loss of confidence (Scott et al., 2007) [4] and financial aspects as “the greater disability, longer duration stay in hospital and increased costs was identified. According research study [5], patients who fell were hospitalized for 12 days longer and had charges U.S. \$4233 higher than controls. One fall without serious injury costs hospitals an additional \$3,500, while patients with more than 2 falls without serious injury have increased costs of \$16,500. Falls with serious injury costliest with additional costs to hospitals of \$27,000.

Falling a normal part of way a child develops. All children at risk for falls; this can be ascertained by simple observation. Across lifespan, we see how children explore world differently, learning to walk, climb, run, jump and explore physical environment. Fortunately, most falls of little consequence and most children fall many times in their lives without incurring damage, other than a few cuts and bruises. All same, some falls beyond both resilience of human body and capacity of contact surface to absorb energy transferred [6]. Falls thus an important cause of childhood injuries, including those resulting in permanent disability or death. Falls of this degree of seriousness not randomly distributed, either globally or within single countries [7].

Accidental falls in pediatric population occurred at a 2:1 rate over adults. Children younger than 10 years had more accidental falls than adolescents, while adolescents had more physiological falls compared to younger age groups. Unanticipated

physical/physiological falls can be caused by conditions such as an undiagnosed seizure disorder or a pathological fracture. Patients with a diagnosis of epilepsy were at highest risk for falls in Graf’s facility; seizures resulting in falls increased likelihood of concussion and other injuries [8].

Inpatient falls remain a challenging safety and quality issue in acute care hospitals. Falls considered preventable and classified as an adverse event. For these reasons, injury resulting from a fall deemed a “never event” [9]. Among children under 15 years, non-fatal falls were 13<sup>th</sup> leading cause of disability-adjusted life years lost. In most countries, falls most common type of childhood injury seen in emergency departments, accounting for between 25% and 52% of assessments [10, 11].

Falls have been defined by World Health Organization as “an event which results in a person coming to rest inadvertently on ground or floor or other lower level” [7]. In WHO database of injuries, fall-related deaths and non-fatal injuries exclude those due to assault and intentional self-harm. Injuries and deaths resulting from falls from animals, burning buildings and vehicles, as well as falls into water and machinery, also not coded as falls. Evidence-based tools will be used in assisting nurse to assess each patient for risk of falls [12].

Whereas, [13] defined patient fall as an unplanned descent to floor (or extension of floor, e.g., trash can or other equipment) with or without injury to patient, and occurs on an eligible reporting nursing unit. All types of falls to be included whether they result from physiological reasons (fainting) or environmental reasons (slippery floor). Include assisted falls, such as when a staff member attempts to minimize impact of fall.

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Safety in hospitals a continuous focus and concern for healthcare providers, especially for those of pediatric patients, because pediatric patients exposed to many tests, medications, and a new and unfamiliar environment. hospitalization of children provides an opportunity to reinforce parent/caregiver information and education concerning normal psychological and motor development of small children, which related to falls risks and other hazards both inside and outside hospital [14, 15].

Determination of risk factors leading to increased incidence of falls, and, hence, recognition of patients at increased risk, mandatory for a successful fall-prevention program. According to one review, over 400 potential medical and environmental risk factors associated with increased incidence of falls occurring at home or outdoors [15]. Although study have shown that a few readily assessable risk factors may predict a large proportion of patients prone to falls [16] accordingly developed assessment tools require calculation of a score derived from a questionnaire, a task that seldom performed. Moreover, risk factors and their scores vary and need to be validated, depending on location and type of patients. Even within hospital, substantial differences between medical, surgical, and other wards expected [17-18].

Falls in pediatric nursing considered riskiest and most frequent emergency

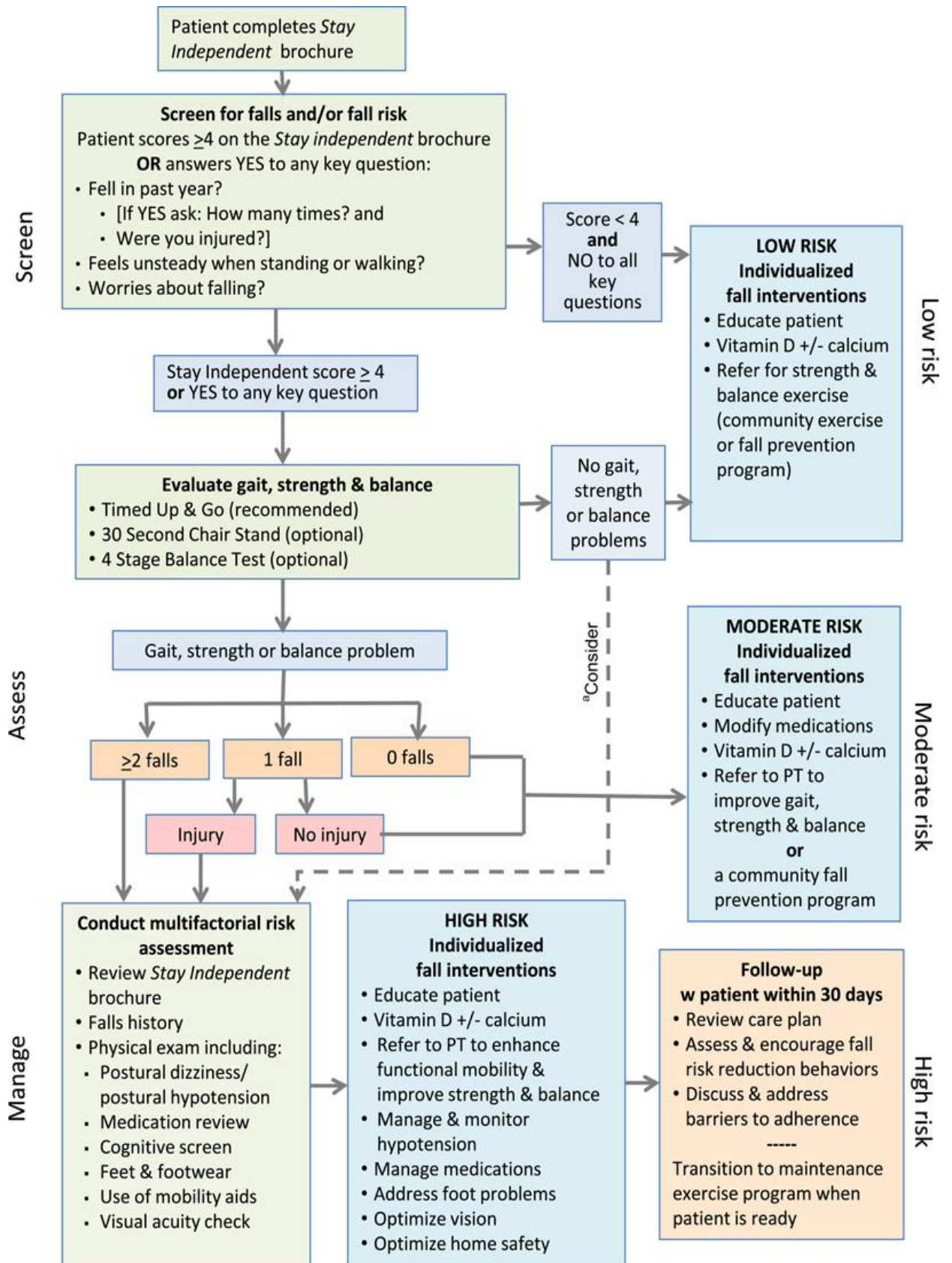
incident. From second half of nineties, in connection with implementation of quality systems and continuous monitoring of quality of nursing care, principle of providing adequate safety has been enforced. issue of falls one of most discussed areas with regard to quality and safety of care, both in context of outpatient care, and inpatients [19].

Screening for risk of falling should be a standard part of nursing procedure, and every medical facility should produce a protocol allowing assessment of risk of injury to patients as a result of falls [20].

In nursing practice, it necessary to identify patients at risk of falling and to implement effective programs aimed at preventing falls. Although validated assessment scales exist in professional literature for assessment of risk of falling in adult population [21, 22] they not suitable for use on children [23]. set national safety targets for prevention of falls in hospitalized children, its directive states that all hospitalized children to be assessed for risk of falling [24].

Many interventions to prevent falls and fall-related injuries have been tested. However, they require multidisciplinary support for program adoption and reliable implementation for specific at-risk and vulnerable subpopulations, and those at risk for injury [2, 25].

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**figure (1).** Algorithm for fall risk assessment & interventions. Adopted From Centers for Disease Control and Prevention. November 11, 2014.) Available

at: [http://www.cdc.gov/homeandrecreationalafety/pdf/steady/algorithm\\_fall\\_risk\\_assessment.pdf](http://www.cdc.gov/homeandrecreationalafety/pdf/steady/algorithm_fall_risk_assessment.pdf). [26].

### Significance of study

All children a vulnerable population in hospital to be at risk for fall. Currently, there a lack of evidence to support nursing and other health care practitioners in effective practices for children regarding falls prevention. This lack of evidence creates potential risk for a population of individuals who may not be able to describe their current health status to their care provider [15, 27, 28]. While, there considerable literature on fall-reduction programs in adult population, little attention has been given to pediatric patients. A falls prevention program for hospitalized children should be innovative and include risk-reduction strategies, particularly education for patient, family, and nurses. hospitalization of children provides an opportunity to reinforce parent/caregiver information and education concerning normal psychological and motor development of small children, which related to falls risks and other hazards both inside and outside hospital [29]. This research paper primarily concerned with reduction in risks of falls for inpatients pediatric and adolescent.

### Aim of study

Aim of this study to identify effect of risk reduction interventions for hospitalized pediatric patient, implement intervention, establish documentation guidelines, to provide a safe therapeutic environment.

### Research Hypothesis

1. Pediatric Patients who will be assessed by Humpty Dumpty Falls Scale fall risk will be identified as his/or her high or low risk for fall.

2. Participants (nurses and caregivers) who will receive fall risk reduction intervention will have improved their knowledge on fall prevention strategies post intervention than pre intervention.
3. Participants (nurses) who will receive fall risk reduction intervention will have improved their practice on fall prevention strategies post intervention than pre intervention.

### Subjects and Method

**Design:** This study was quasi-experimental study (Pre-/Post-test/or pre-intervention/Post intervention).

**Setting:-** study setting was conducted at pediatrics wards of Menoufia University Hospitals at Shebin El Kom and Mansheat Sultan; and Shebin El Kom Teaching Hospital, Menoufia Governorate- Egypt. Patient data were collected from five in-patient units; medical, surgical, neurology, pediatric intensive care and cardiac intensive care units.

**Sample:-** two types of sample were chosen.

1. **Pediatric patient's sample:-** A convenience sample of 60 pediatric patients' who had fell in hospital with their caregivers (mothers). pediatric patients' were selected according to following inclusion Criteria:-

All pediatric patients male and female with age 3-18 years already admitted to pediatrics wards, at Menoufia University hospital for treatment and had fell in hospital. Exclusion criteria were those falls of visitors or patient falls from other units not included in study, such as outpatient and neonatal intensive care units.

**2. Nurses Sample:-** A purposive sample of 40 nurses; professional nurse, a staff nurse, and directors were selected to review of 60 pediatric patients were selected and included in sample.

**Tools for Data collection:**

**I. The Humpty Dumpty Falls Scale (HDFS) that was adopted from Hill-Rodriguez et al., (2009): [ 30 ]**

This Falls Scale a special screening tool developed for assessment of risk of falling in children. It contains seven dimensions that assess age, gender, diagnosis, cognitive disorders, environmental factors, response to surgery, sedation and /anesthesia, and medications. Individual items evaluated on a scale of one to four. tool designed as a primary and secondary health care for children aged 3 to 18 years [31]. Internal consistency was 0.64 [ 30 ]. tool derives from factors examined: Changes in mental status or dizziness, History of previous falls at home or in hospital, Age more than three years old, Mobility problems in walking or moving, Parental or primary care giver Involvement in care, Safety actions in place. When children assessed for their risk of falls, all children identified with a potential fall risk and basic precautions implemented at low-risk category. high-risk safety protocol consists of Humpty Dumpty signage placed in visible locations (sticker on shirt or gown, crib, or bed and chart). signage notifies all healthcare professionals that child at risk for falling and ensures that falls safety protocol implemented and all precautions taken. Other fall-prevention components include medication administration review, increased assessment time frames, and placing patients closer to nurse's station as well as providing one-to-

one care when indicated.

**Scoring system**

Score	Level of Children Caregiver's Knowledge
3	Satisfactory
2	Unsatisfactory
1	Wrong

Individual items evaluated on a scale of one to four. range of scores 7–23 (minimum score of 7 and maximum score of 23). score of 12 was used as “cut point” for high risk for falls.

- The low-risk was identified with scores 7–11,
- The high-risk was identified with scores of 12 and above.

**II. Structured Interviewing Questionnaire for Nurses** for assessing following:

- Part 1. Socio-demographic characteristics of nurses as regard age, sex, education level and experiences.
- Part 2. Nurses' knowledge by using close and open-ended questions based on relevant literature review. It covered following items; Meaning of Fall, Causes of Fall, Identification of fall hazards, serious symptoms that may occur to child after his / her fall and Reduction of fall among children in hospital.

**Scoring system for nurse's knowledge:-**

Score	Level of nurse's knowledge
3	Satisfactory
2	Unsatisfactory
1	Wrong

**III. Observational Checklist for Nurse's Practices toward General Strategies for Falls Prevention** in low and high Risk Pediatric Patients.

**Scoring system for nurse's practices:-**

Score	Level of nurse's practices
2	Satisfactory
1	Unsatisfactory

**IV. Interviewing Questionnaire for Children Caregivers** for assessing following:

- Part 1. Socio-demographic characteristics of children Caregivers as regard age, and education level.
- Part 2. Children Caregiver's knowledge based on relevant literature review. It covered following items; Meaning of Fall, Causes of Fall, Identification of fall hazards, serious symptoms that may occur to child after his / her fall and Reduction of fall among children in hospital.

**Scoring system for Children Caregiver's Knowledge:-**

**Method**

- Approval; official permission for conducting study was obtained from hospital directors. An exploratory phase was conducted before starting study to determine feasibility of accomplishing this study.
- Study Period: Data were collected started from January 2016, to end of October 2016.
- Ethical Consideration: During initial interview, purpose of study and procedures were explained to all participants; nurses, pediatric patient and their caregivers (mothers) and oral consent were obtained from them. They were assured that all information would be confidential to assure confidentiality of participants. Participants were assured that their participation in study was voluntary and that they could withdraw from

study at any time and can refusing to participate in study.

**Tools Developments**

- A. Validity of tools: - Tools were checked by a panel of five experts in pediatric medicine and pediatric nursing, Menoufia University. corrections were done accordingly based on their response.
- B. Reliability of tool: - Reliability of tools was done by test-retest for measuring internal consistency with a period of two-week interval. Cronbach's alpha for observation checklist tool was 0.9 indicate good reliability. test and retest reliability of Humpty Dumpty Falls Scale" was 0.88 indicate good reliability.
- C. Pilot: study was performed to test practicality and applicability of three tools to detect obstacles and problems that may be encountered during data collection. It also helped to estimate time needed to fill in tools. It was conducted on 6 pediatric patients, 4 nurses and 6 children caregivers. Then, pilot sample was not included in total sample.

**Procedures and Data Collection:-**

- Patients who met study inclusion criteria were interviewed by researcher using prepared tools.
- Each patient was interviewed individually after a simple conversation followed by a description of objectives intervention, which were established in a simple Arabic statements according to their age and understanding.
- Patients were interviewed using structured questionnaires to collect data about socio demographic data, medical history and medications use. interview period was 25- 30 minutes in length.

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- Risk assessment for patients who fell; fall recorded on Kardex; awareness posters; staff education and feedback
- All participants (nurses and children caregivers) were interviewed using structured questionnaires to collect data about socio demographic data and their knowledge. interview period was 30 minutes in length to conduct pre-test.

#### **Fall Risk Intervention:-**

- Nurses and caregivers' education: includes fall prevention strategies.
- Interventions for high-risk patients: including those with a history of falling, and those with a low platelet count, receive a series of interventions designed to reduce risk for falls and fall-related injuries, as outlined below:-
  - Precautions to reduce risk for falls: These precautions include putting patient in a room close to nurses' station, using a chair and/or bed alarm, conducting toileting and comfort rounds every hour, having patient wear yellow nonskid socks, and using visual identifiers, such as yellow wrist bands, to indicate patient's heightened risk for a fall and/or fall-related injury. Also, because pain medication can increase risk for a fall, patients receive assistance with toileting before administration of any high-risk pain medication.

#### **• The intervention Sessions:**

Time allocated for intervention was three and half hours, sequenced through 7 sessions “two sessions / week”.

- Session I: problem of falls
- Session II: Falls risk assessment and Information about Fall Risk Scale.

- Session III: Fall Risk Reduction Interventions
- Session IV: Documentation
- Session V: Post Fall Follow-up
- Session VI: Reporting Patient Falls
- Session VII: Education and Competency of Staff
- Evaluation of intervention was accomplished by using questionnaire to assess nurses/ children' caregivers' knowledge.
- Interventions to prevent injury from a fall: These strategies were evaluated after intervention by observation checklist to assess nurse's strategic practice for fall prevention.

**Limitations:-** Limitations include documentation of falls was limited or none to self-reporting documentation that was collected as part of an established incident reporting system. event reporting system does not always capture pertinent data related to fall. In addition, falls related to normal growth and development may be under reported or not reported.

**Statistical Analysis:** Data were tabulated, analyzed and percentage distribution was determined. A computerized statistical analysis was done. Test of significance were applied (Chi square and t- test) to test significance of differences. P-value less than 0.05 and 0.001 were considered as statistically significant.

#### **Results**

**figure (2)** shows distribution of fall risk degree among hospitalized children according to Humpty Dumpty Falls Scale. It was clear that approximately two thirds of children (68.3%) were high risk for falling.

**Table (1)** clarifies distribution of



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characteristic associated with fall of hospitalized children. It revealed that most of children (30% and 40%) in low and high risk for falling were in age group 3<8 years respectively. Concerning diagnosis, It was obvious that children with high risk to fall had more serious diagnosis than children with low risk to fall (Children with neurological diagnosis (21.7% vs. 0.0%), children with alteration in oxygenation (respiratory, dehydration, anemia, anorexia, syncope /dizziness etc.) (13.3% vs. 0.0 %) and Children with psych behavioral disorders were (3.3% vs. 0.0%). In relation to cognitive impairments, 13.3% of children with high risk to fall were not aware or forgets of limitation, compared to 0.0% in children with low risk to fall. Also, majority (28.3%) of children with high risk had history of falls or infant toddler placed in bed, as well as, 40% of children with high risk response to surgery/sedation/Anesthesia within 24 hours. Besides, 11.7% of children with high risk to fall had multiple usage of sedatives (excluding ICU patients sedated / paralyzed hypnotics barbiturate/ laxative and diuretics), 18.3 % were use one of medications that mentioned before and 38.3% of them were used other medication compared to (0.0%, 6.7%, 25%) in low risk children respectively. For these reasons , there were highly statistical significant differences at 1% level of significance between children who had high risk and low risk for falling in relation to diagnosis , cognitive impairments, environment factors, and response to surgery/sedation or Anesthesia.

**figure 3.** Illustrates distribution of biosocial characteristics of studied nurses; mean age of nurses was  $26.03 \pm 6.03$ . Also, most of nurses (%80) were females. Regarding educational level, majority of them

(42.5%) had completed their university education. Meanwhile, more than half (60%) had less than 5 years of experience.

**Table (2)** shows distribution of nurse's knowledge about fall on Pre and Posttest. It was obvious that nurse's knowledge about fall improved on posttest. Satisfactory answered regarding meaning of fall were 2.5% on pretest compared to 85% on posttest. Regarding causes of fall were 2.5% on pretest compared to 90% on posttest. While, knowledge of nurses about identification of fall hazards were 10% compared to 80% , serious symptoms that may occur to child after his / her fall (7.5% Vs. 85%) on pretest and posttest respectively . Also, nurse's knowledge about methods of reduction of falling episodes among children in hospital was 2.5% on pretest compared to 85% on posttest. For this reason there were highly statistical significant differences between nurses' Knowledge about children' fall on pre and posttest at 1% level of significance.

**figure 4.** Represents biosocial characteristics of children's caregiver; majority (56.7%) of caregiver's ages were in age group 30 years or more. Also, 85% were females. On other hand, most of studied sample (43.3%) had completed their Secondary School education and 48.3 % they were housewives.

**Table 3.** Shows comparison between children' caregivers ' knowledge about children' fall on pre and posttest. It was obvious that approximately all children' caregivers have unsatisfactory or wrong answers about children's' fall questions on pre intervention. On other hand, children' caregivers had improved in their knowledge on posttest. Therefore, there were statistical significant differences between children

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caregivers' knowledge about children's fall on pre and posttest at 1% level of significance.

**Table 4.** Clarifies nurse's practices toward general strategies for falls prevention in low risk pediatric patients; majority of nurses had more satisfactory practices toward falls prevention in low risk pediatric patients on posttest than on pretest. Regarding applying fall risk assessment utilizing fall risk assessment tool all of nurses not utilized it on pretest compared to 77.5 % on posttest, while, concerning applying fall risk assessment initially at admission or when needed based on changes in patient status were 90% on posttest. Nurse's practices toward keep hand contact with infants, young children, developmentally delayed or cognitively impaired children on treatment tables or scales improved after intervention were 17.5 % on pretest compared to 80% on posttest. On other hand, educate patient and his/her family and visitors regarding falls risk and prevention activities were improved after intervention (15% Vs. 90 %), place bed or crib in lowest position with wheels locked (20% Vs. 92.5 %), place side rails in an upright position as needed (17.5 % Vs. 87.5%), ensure patients wear non-slip footwear while ambulating (20 % Vs. 85%), maintain direct surveillance of children in bathtub/shower (15% Vs. 82.5 %) and assess for adequate lighting and leave nightlights on (40 % Vs. 87.5%) on pretest and posttest respectively. For this reasons, there were highly statistical significant differences at 1% levels of statistical significance.

**Table 5.** Represents nurse's practices toward general strategies for falls prevention in high risk pediatric patients. nurses had more satisfactory practices towards fall prevention in high risk pediatric patients on posttest than pretest. All nurses didn't apply risk score for falling on pretest compared to 77.5 % had satisfactory practices on posttest. Also, they did not identify all patients deemed at risk for falling during nursing shift reports compared to 70% after intervention. Nurses practices improved toward Check patient minimum every hour, accompany patients with ambulation, move patient to a room with best visual access to nursing station, and encourage family to stay with patient, remove all unused equipment out of room and use protective barriers to close off spaces and gaps in bed on posttest than pretest. For this reasons, there were highly statistical significant differences at 1% levels of statistical significance.

**Table 6.** clarifies Nurses and children caregiver knowledge total mean score & SD. total mean knowledge of nurses on pretest was  $8.58 \pm 1.28$  compared to  $12.30 \pm 1.76$ . Moreover, total mean knowledge of children caregiver was  $6.28 \pm 1.78$  and  $8.73 \pm 1.45$  on pretest and posttest respectively.

**Figure 5.** Represents total mean score & SD for nurses practices on pre and posttest. Total Mean score & SD for nurse's practices was  $20.80 \pm 3.17$  on pretest compared to  $31.00 \pm 3.44$  on posttest. There were highly significant differences between pretest and posttest.

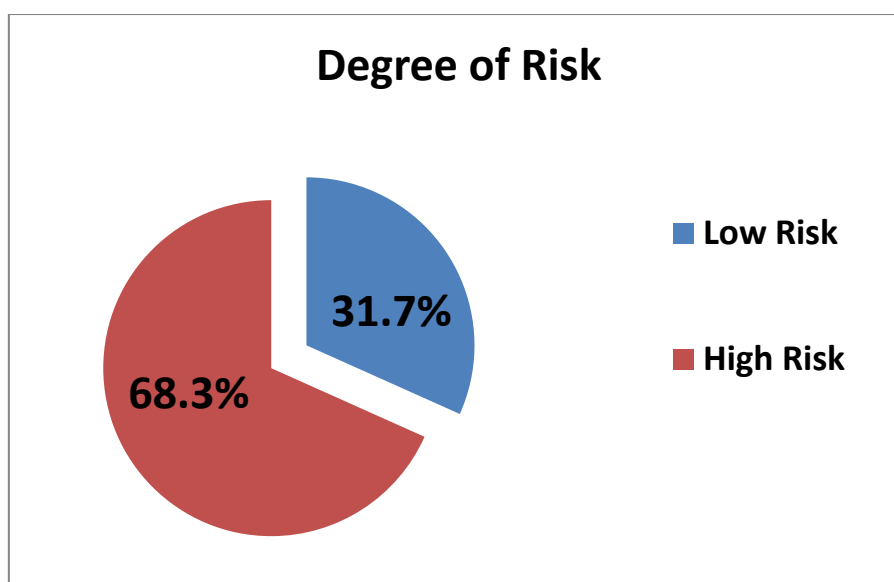
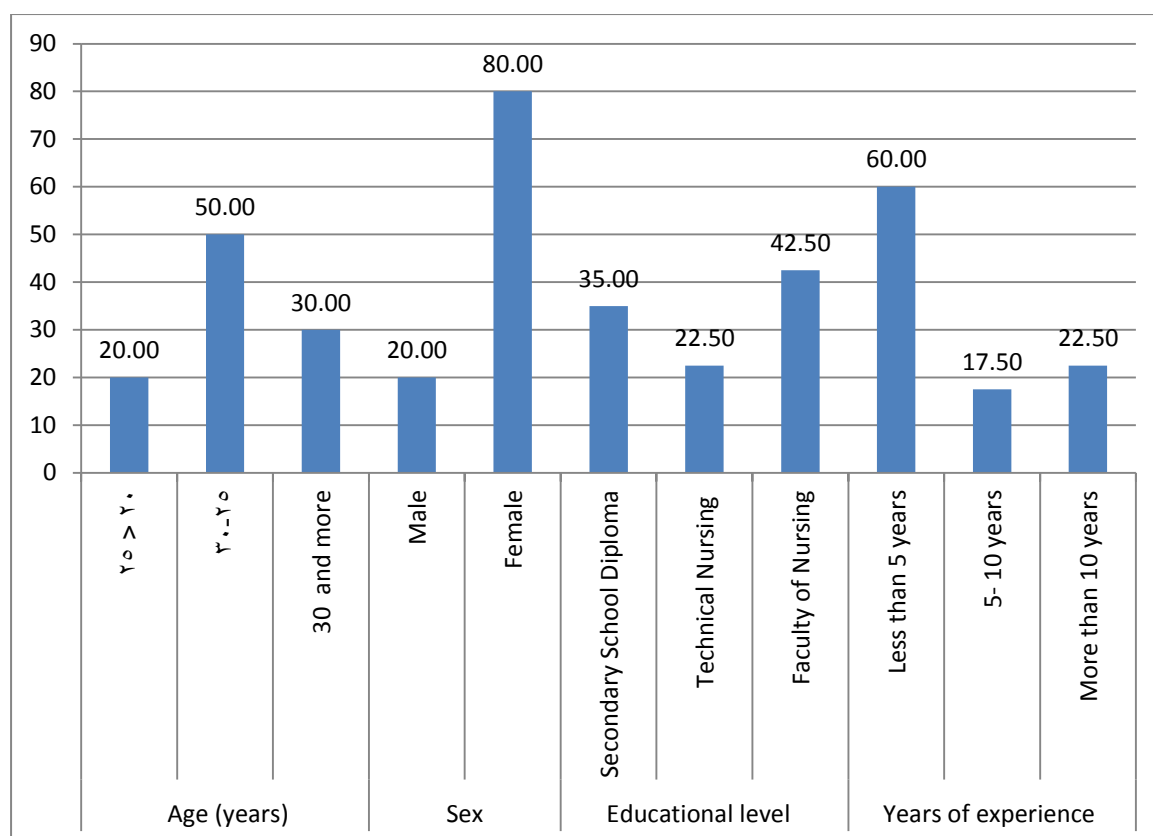


figure 2. Distribution of Fall Risk Degree among Hospitalized Children according to Humpty Dumpty Falls Scale

Table 1. Distribution of Characteristic Associated with Fall of Hospitalized Children

Characteristics Associated with Fall of Hospitalized Children	Low Risk 7 -11		High Risk 12 and above		$\chi^2$	P- Value
	No.	%	No.	%		
<b>Age of child</b>					3.25	0.36
- 3 <8 years	18	30	24	40		
- 8 <13 years	2	3.3	10	16.7		
- Above 13 years	3	5.0	3	5.0		
<b>Gender</b>					0.39	0.53
Male	9	15	23	38.3		
Female	10	16.7	18	30.0		
<b>Diagnosis</b>					16.10	<0.001
- Neurological diagnosis	0	0.0	13	21.7		
- Alteration in oxygenation	0	0.0	8	13.3		
- psych behavioral disorders	0	0.0	2	3.3		
- others Diagnosis	19	31.7	18	30		
<b>Cognitive Impairments</b>					10.11	<0.001
- Not aware of limitation	0	0.0	8	13.3		
- Forgets limitations	0	0.0	8	13.3		
- Oriented to own ability	19	31.7	25	41.67		
<b>Environment Factors</b>					17.91	<0.001
- History of falls or infant toddler placed in bed	0	0.0	17	28.3		
- Patient uses assistive devices or infant toddler in crib or furniture lighting (tripled room)	0	0.0	3	5.0		
- Patient placed in bed	3	5.0	9	15.0		
- Outpatient area	16	26.7	12	20.0		
<b>Response to surgery/sedation/ Anesthesia</b>					13.50	<0.001
- within 24 hours	2	3.3	24	40		
- within 48 hours	1	1.7	3	5.0		
- More than 48 hours/none	16	26.7	14	23.3		
<b>Medication Usage</b>					4.49	0.11
- Multiple usage of sedatives (excluding ICU patients sedated / paralyzed hypnotics barbiturate/ and diuretics)	0	0.0	7	11.7		
- One of medications listed above	4	6.7	11	18.3		
- Other medications/None	15	25	23	38.3		

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**figure 3. Distribution of Biosocial Characteristics of Studied Nurses**

**Table 2. Distribution of Nurses Knowledge about fall on Pre and Post test**

Nurses Knowledge about Fall	Pre-test N=40		Post-test N=40		$\chi^2$	P
	No.	%	No.	%		
<b>Meaning of Fall</b>						
- Satisfactory Answer	1	2.5	34	85	55.8	<0.001
- Unsatisfactory Answer	33	82.5	4	10		
- Wrong Answer	6	15	2	5		
<b>Causes of Fall</b>						
- Satisfactory Answer	1	2.5	36	90	61.75	<0.001
- Unsatisfactory Answer	35	87.5	4	10		
- Wrong Answer	4	10	0	0.0		
<b>Identification of fall hazards</b>						
- Satisfactory Answer	4	10	32	80	39.77	<0.001
- Unsatisfactory Answer	26	65	5	12.5		
- Wrong Answer	10	25	3	7.5		
<b>Serious symptoms that may occur to child after fall</b>						
- Satisfactory Answer	3	7.5	34	85	49.37	<0.001
- Unsatisfactory Answer	33	82.5	4	10		
- Wrong Answer	4	10	2	5		
<b>Reduction of fall among children in hospital</b>						
- Satisfactory Answer	1	2.5	34	85	55.45	<0.001
- Unsatisfactory Answer	30	75	4	10		
- Wrong Answer	9	22.5	2	5		

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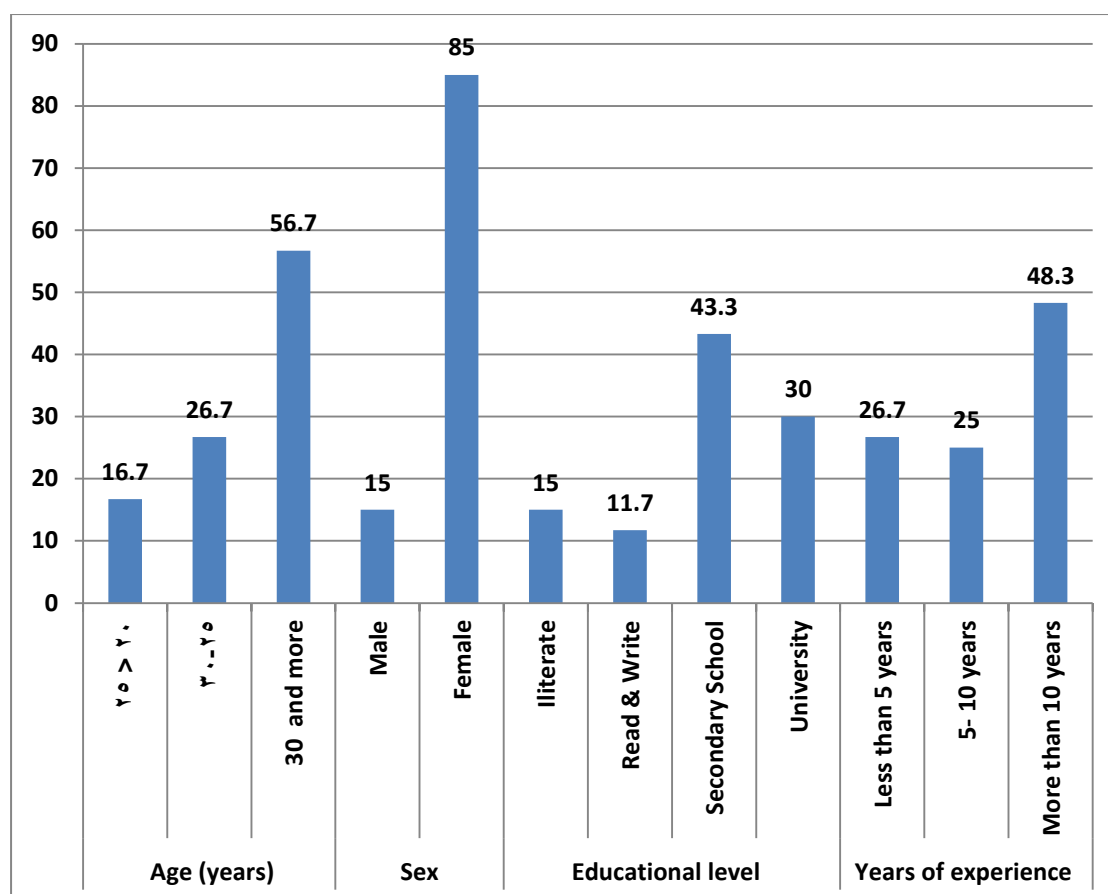


figure 4. Distribution of Biosocial Characteristics of children caregivers

Table 3. Distribution of Children Caregivers' Knowledge about Fall on Pre and Post test

Children Caregivers' Knowledge about Fall	Pre-test N= 60		Post-test N = 60		$\chi^2$	P
	No	%	No	%		
<b>Meaning of Fall</b>						
- Satisfactory Answer	8	13.3	41	68.3	46.69	<0.001
- Unsatisfactory Answer	30	50	19	31.7		
- Wrong Answer	22	36.7	0	0.0		
<b>Causes of Fall</b>						
- Satisfactory Answer	0	0.0	36	60	61.77	<0.001
- Unsatisfactory Answer	37	61.7	24	40		
- Wrong Answer	23	38.3	0	0.0		
<b>Serious symptoms that may occur after his / her fall</b>						
- Satisfactory Answer	0	0.0	36	60	52.48	<0.001
- Unsatisfactory Answer	40	66.7	19	31.7		
- Wrong Answer	20	33.3	5	8.3		
<b>Reduction of fall among children</b>						
- Satisfactory Answer	0	0.0	32	53.3	46.84	<0.001
- Unsatisfactory Answer	37	61.7	23	38.3		
- Wrong Answer	23	38.3	5	8.3		

Table 4. Nurses Practices toward General Strategies for Falls Prevention in Low Risk Pediatric Patients

**Fall Reduction Intervention for Hospitalized Pediatric Patients at Risk for falls**

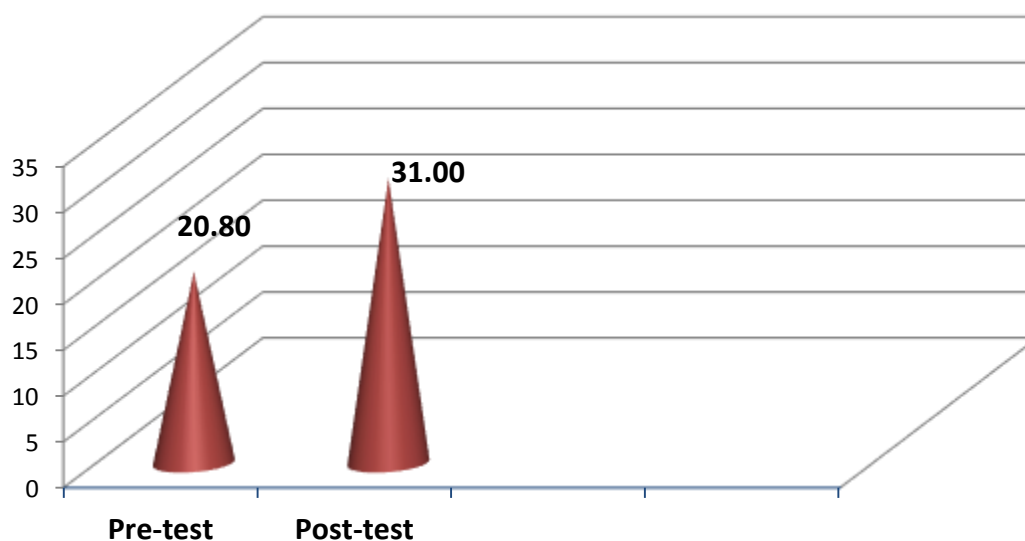
Nurses Practices for Falls Prevention in Low Risk Pediatric Patients	Pre-test N = 40				Post-test N = 40				$\chi^2$	P
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory			
	No.	%	No.	%	No.	%	No.	%		
- Apply fall risk assessment utilizing fall risk assessment tool	0	0.0	40	100	31	77.5	9	22.5	50.61	<0.001
- Apply fall risk assessment initially at admission or when needed based on changes in patient status	0	0.0	40	100	36	90	4	10	65.46	<0.001
- Keep hand contact with infants, young children, developmentally delayed or cognitively impaired children on treatment tables or scales	7	17.5	33	82.5	32	80	8	20	31.27	<0.001
- Educate patient and his/her family and visitors regarding falls risk and prevention activities	6	15	34	85	36	90	4	10	45.11	<0.001
- Place bed or crib in lowest position with wheels locked	8	20	32	80	37	92.5	3	7.5	42.72	<0.001
- Place side rails in an upright position as needed	7	17.5	33	82.5	35	87.5	5	12.5	39.30	<0.001
- Ensure patients wear non-slip footwear while ambulating	8	20	32	80	34	85	6	15	33.89	<0.001
- Maintain direct surveillance of children in bathtub/shower	6	15	34	85	33	82.5	7	17.5	36.47	<0.001
- Assess for adequate lighting, leave nightlights on	16	40	24	60	35	87.5	5	12.5	19.53	<0.001

**Table 5. Nurses Practices toward General Strategies for Falls Prevention in High Risk Pediatric Patients**

Nurses Practices for Falls Prevention in High Risk Pediatric Patients	Pre-test N = 40				Post-test N = 40				$\chi^2$	P
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory			
	No.	%	No.	%	No.	%	No.	%		
- Apply fall risk score	0	0.0	40	100	31	77.5	9	22.5	50.61	<0.001
- identify all patients deemed at risk for falling during nursing shift reports	0	0.0	40	100	28	70	12	30	43.08	<0.001
- Check patient minimum every hour	4	10	36	90	24	60	16	40	21.98	<0.001
- Accompany patients with ambulation	8	20	32	80	27	67.5	13	32.5	48.34	<0.001
- Move patient to a room with best visual access to nursing station	16	40	24	60	36	90	4	10	21.98	<0.001
- Encourage family to stay with patient	27	67.5	13	32.5	36	90	4	10	6.05	<0.05
- Remove all unused equipment out of room	17	42.5	23	57.5	35	87.5	5	12.5	9.03	<0.001
- Protective barriers to close off spaces, gaps in bed	9	22.5	31	77.5	32	80	8	20	26.47	<0.001

**Table 6. Nurses and Children Caregivers' Knowledge Total Mean score & SD**

Total Mean knowledge	Pre- test Total Mean Score & SD	Post- test Total Mean Score & SD	t- test	P -value
Total Mean knowledge of nurses	8.58 ±1.28	12.30 ±1.76	-18.84	<0.001
Total Mean knowledge of children caregiver	6.28 ±1.78	8.73 ±1.45	-8.28	<0.001



**figure 4. Total Mean Score & SD for Nurses Practices**

Pre- test Total Mean Score & SD= 20.80±3.17

Post- test Total Mean Score & SD= 31.00±3.44

t- test = -13.78 , P -value<0.001

**Discussion**

Risk factors and pediatric fall risk assessment scales were very essential, a four pediatric fall risk tools had reported of preliminary testing supporting their application in hospital setting. They include; GRAF PIF, CHAMPS, Humpty Dumpty Fall Prevention and Cummings Pediatric Fall Assessment Scale. Only two tools of risk assessment scales; CHAMPS and Humpty Dumpty Fall Prevention had validity testing published in peer review journals [30, 32].

The CHAMPS Pediatric Risk Assessment Tool; that comprised of change in (a) mental status, (b) history of falls, (c) age less than 36 months and (d) mobility

impairment [32]. Whereas Humpty Dumpty Scale comprised of six categories including (a) age, (b) gender, (c) diagnosis, (d) cognitive impairment, (e) environmental factors, and (f) response to surgery/sedation/anesthesia and medication usage [30]. Based on factors identified in a screening tool, that was adopted and integrated into electronic medical record. Staff was actively engaged in developing definitions, selecting tools, and identifying next steps toward a comprehensive fall reduction program for their patients. As a result, they have embraced changes and advocated

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successfully for endorsement by organization [6].

Preventing injuries needs better screening tools that developed to assess risk of a fall; nurses should monitor pediatric patients frequently, complete a fall risk screen for documentation, strive for improvement of screens in practice, and document risk scores assessment, and implement preventive fall measures. These activities should include reassessment and notation of changes in physiologic, motor, sensory, or cognitive status. These activities by nurses might lead to critical improvements in fall prevention screening tools [30].

The aim of this study to identify effect of risk reduction interventions for hospitalized pediatric patient, implement action to prevent injury, establish documentation guidelines, to provide a safe therapeutic environment.

#### **Fall Risk Score:**

Descriptive statistics of present study analyzed 60 hospitalized pediatric patients falls. Of those falls; 31.3% were not identified as high risk, by using a Humpty Dumpty Falls Scale (HDFS) score of less than 12 as an indicator of low risk of fall. Also present study revealed that 68.3% were identified as high risk fall of hospitalized pediatric patients according to Humpty Dumpty Falls Scale score of 12+ as an indicator of high risk (figure 1). This study was approximately similar to [30] who studied " Humpty Dumpty Falls Scale: A Case-Control Study". They reported that a matched case-control design; a review of 153 pediatric cases that fell and 153 controls that did not fall were pair-matched by age, gender, and diagnosis. High-risk patients fell almost twice as often as low-risk patients (odds ratio 1.87, confidence interval = 1.01, 3.53,  $p = .03$ ). That means 35% were not identified as high risk, using an HDFS score of 12+ as an indicator of high risk. odds ratio (OR) of association between a

high risk score and a fall was 1.15 (CI; 0.39, 3.15,  $p > 0.76$ ). Thus, sensitivity was 65%, HDFS. This consistency may be due to similarity in population selected for study.

#### **Characteristics Associated with Fall of Hospitalized Children**

The present study revealed that approximately half of high risk fall of hospitalized pediatric patients their age from 3 years to less than 8 years. This result was similar to previous studies [30, 32, 33] age was a factor for inpatient pediatric falls. Younger children had highest incident of falls during their hospitalization. Also present study results support previous findings [15, 33] that younger children and adolescents comprised majority of reported falls in hospital setting. Since largest percentage of children who were less than 8 years of age fell, this further supports a developmental component to a fall assessment scale. One could conclude that child's maturing cognitive and motor development plays a major factor in hospital falls risk. Although, in this study, just less than half of high risk fall and low risk fall of pediatric falls could be related to falls oriented to own ability of motor and cognitive impairment and subsequent vulnerability to fall.

In relationship to gender, present study results provided further evidence that gender a risk factor for pediatric falls in hospital; Table (1) clarified that 23 of 60 hospitalized pediatric male patients 38.3% had high risk fall score compared to 9 of hospitalized pediatric female patients 15%. This result was consistent with [ 15, 32,33]. They reported that males appear to be at greater risk for inpatient falls. This gender difference risk may be explained by this research setting's admission rates that higher for males versus female. Also they added that there a higher frequency of falls in general pediatrics population with children who have a medical diagnosis



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compared to children admitted with a surgical diagnosis. However, comparisons with other studies impossible. This due to different sample populations studied and to inconsistent diagnostic categories used by researchers [30, 33]. However, when sampling categorizing similar as seen in this study and that of [15] similar findings reported. These similar findings between present study results and those later authors were attributed to similarities in categorization of fall risk score.

Regarding medication use, present study results provided further evidence that multiple usage of sedating medication including anticonvulsants represents less than half of high risk fall score of hospitalized pediatric patients. This result was consistent with [32, 33]. Use of sedating medication including anticonvulsants and pain medication has been identified as risk factors leading to a fall for hospitalized children [32, 33]. They supports these findings identified as most frequently administered medications associated with pediatric falls. One might conclude that medications have been associated with factors leading to falls, may be due to large trauma pain children experience after a traumatic injury. Also this result was in line with [6] who studied "Development of a Pediatric Fall Risk and Injury Reduction Program". They pointed out that regarding to patient characteristics; they identified circumstances under which these children might be more likely to incur injury, even with anticipated developmental falls, such as those with low platelet counts. They also expressed particular concern regarding number of children who's psychoactive or anti-epileptic medications were withheld for diagnostic examinations. They felt abstinence of such medications, with attendant risk of symptom exacerbation, was an under-appreciated phenomenon in fall risk assessment.

#### **Children Caregivers'**

Considering Children Caregivers' knowledge regarding; serious symptoms that may occur after his / her fall as well as in reduction of fall among children more than half and for all items related to meaning and causes of fall had satisfactory answer in posttest compared to zero percent in pretest. This result was in line with [6] who studied "Development of a Pediatric Fall Risk and Injury Reduction Program". They pointed out that all caregiver including staff and family categorized as presence/supervision, education/knowledge, disciplinary attitudes, and psychosocial stability; they shared stories of permissive caregiver attitudes, disregard for accepted safety standards, and seeming self-absorption. They also expressed fear that staff/patient ratios and differences in limit-setting among staff made them vulnerable to experiencing a patient fall with injury. Also, was consistent with [34] who studied "Risk Factors Related to Caregivers in Hospitalized Children's Falls". They concluded that "The data obtained in our study have shown that caregivers play a key role in fall events in hospitalized children. Nurses and other health workers should consider children's caregivers educational level and habits for prevention of hospitalized children falls". Whereas, present study was similar with [35] who studied "Models of Care Delivery for Families of Critically Ill Children: An Integrative Review of International Literature". They reported that "The models of care implemented were associated with positive changes such as reduced parental anxiety and improved communication between parents/caregivers and health professionals. Those results may be attributed to reason that all caregivers of children were in need for knowledge about fall and its consequences on their children's health.

#### **Nurses' Knowledge :**

The present study showed that most of

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studied pediatric nurses was improved their knowledge in posttest (satisfactory) than in pretest (wrong answer) in pretest regarding "Meaning of Fall". These results were in line with [36] who stated that a clear definition of a pediatric fall needed to guide bedside nurses in reporting falls, to accurately identify prevalence of pediatric falls, and to measure reliability, sensitivity, and specificity of pediatric fall risk assessment tools. Results indicate that fall definitions need further refinement to properly classify all potential fall scenarios

Also present study showed a statistical significantly improvement for nurse's knowledge in posttest than pretest to gain satisfactory answer on; causes of fall, serious symptoms that may occur to child after his/her fall and Reduction of fall among children in hospital. This result was in line with [6] who studied "Development of a Pediatric Fall Risk and Injury Reduction Program". They pointed out that all nursing practice and leadership as anticipated, staff have embraced adoption of definitions and Humpty Dumpty Fall Scale because they participated in selection process. Also present study results were in line with [37] who studied "Development, implementation, and evaluation of a comprehensive fall risk program". They reported that staff engagement may be one method to contribute to growing body of knowledge in this area. A comprehensive pediatric fall prevention program developed with staff participation, and with tool and fall risk interventions embedded in electronic medical record has recently shown promising results. They added that nurse educator oriented all pediatric health care providers and ancillary staff regarding implementation of all elements of fall reduction program and documentation in shared electronic health record. This education now included in new employee training and will be reviewed during

annual competency verification.

### **Nurses Practices toward General Strategies for Falls Prevention in Fall Risk of Pediatric Patients**

Promoting patient safety a priority for all nurses. While most patient safety issues require comprehensive interdisciplinary approaches, responsibility for prevention of patient falls driven by nurse sensitive indicators. According to Joint Commission established a National Patient Safety Goal for assessment of patients at risk for falling which later required implementation and evaluation of a fall risk prevention program [38]. The present study results were in line with later author' recommendations that revealed that most of pediatric studied nurses followed General Strategies for Falls Prevention in High Risk Pediatric Patients "from all nurses had Unsatisfactory in pre-test to most of them had Satisfactory in post-test in following items; Identify patients at risk for falling , Move patient to a room with best visual access to nursing station, Remove all unused equipment out of room, Protective barriers to close off spaces, gaps in bed. Also present study result was consistent with [37] who pointed out that "Ongoing monitoring and data collection important because nurses, support staff, and families work with program. director of professional practice monitors program metrics monthly and reports 100% compliance in documentation of fall risk using Humpty Dumpty Fall Scale. This a new initiative, so outcomes have yet to be evaluated". They added that "although studies have indicated that pediatric fall risk assessment tools do not meet generally accepted standards of precision and accuracy, it would seem unethical to abandon all currently available instruments until a better one developed. This process may be of interest to nurses to initiate and sustain improvements in quality and safety in care of pediatric patients". present study result proves effect of fall reduction intervention on

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nurse's knowledge and practice that should be included in new employee training specially in pediatrics ' wards.

### **Conclusions:**

The implementation of fall reduction intervention for hospitalized pediatric patients at risk for falls had significantly improve nurses knowledge and practice and improve caregivers of children knowledge in-order to manage fall correctly and reduce fall occurrence.

### **Recommendations**

- Implementation of risk assessment tool would allow all hospitalized children to be properly assessed for fall risk and critically successful for pediatric fall prevention program.
- Incorporation and documentation of fall assessment tool into electronic medical record would allow nurse to quickly identify children at greatest risk for fall so they can implement appropriate fall precaution measures and help nurses and other clinicians/caregivers who involved in child's care.
- The implementation of fall reduction intervention for hospitalized pediatric patients at risk for falls into different settings would enhance identification of high-risk children and implementation of fall prevention measures.

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