

THE RELATIONSHIP BETWEEN IATROGENIC EVENTS OF HOSPITALIZED GERIATRIC PATIENTS AND NURSES' KNOWLEDGE

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Abstract

Background: Iatrogenesis is unintended injury result of medical management rather than the disease process among hospitalized geriatric patients. Geriatric nurses should have the necessary knowledge about these iatrogenic events. **Aim:** determine the relationship between iatrogenic events of hospitalized geriatric patients and nurses' knowledge. **Settings:** The study was done at the inpatient unit of the orthopedic surgeries and traumatology department of El Hadara University Hospital and the surgical department of the Main University Hospital which is affiliated to Alexandria Governorate, Egypt. **Subject:** 100 hospitalized geriatric patients and 80 nurses who give direct care to them were included. **Tools:** Five tools were used for data collection as follow; Hospitalized Geriatric Patients' Socio-demographic Data Structured Interview Schedule, Hospitalized Geriatric Patients' Medical Record, Iatrogenic Events of Geriatric Patients Appraisal Tool, Socio-demographic Data of Geriatric Patient's Nurse Questionnaire, and Nurses' Knowledge of Iatrogenic Events Questionnaire. **Result:** The most prevalent type of iatrogenic events among the study geriatric patients is iatrogenic events related to drug reaction with a mean percent score of 75.75 ± 35.93 . The study nurses who reported poor level of knowledge represented by 52.5% while fair level of knowledge reported by 36.3% and 11.3% reported good level of knowledge with a mean percent of 49.55 ± 18.11 . **Conclusion:** Although there was no significant relation between the level of nurses' knowledge and total score of iatrogenic events among hospitalized geriatric patients, a significant relation was found between nurses' knowledge and nursing-related iatrogenic events. **Recommendations:** Develop training educational program for nurses who care for geriatric patients about iatrogenic events' management.

Keywords: Iatrogenic events, Hospitalized Geriatric patients, Nurse's knowledge

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Introduction

Comorbidity, polypharmacy, and reduced physical and cognitive performance are widespread in old age. Geriatric patients are more likely to require hospitalization. Delivering safe and effective treatment to older people is becoming increasingly important to decrease iatrogenic events. Hospitals must adapt to assure high-quality care for hospitalized geriatric patients (Mickelson & Kirkevold, 2022). Iatrogenic diseases are those in which medical professionals, drugs, diagnostic tools, hospitals, and other institutions act as "pathogens" or "sickening agents". Iatrogenic diseases are the world's fifth biggest cause of death. Adverse drug reactions (ADRs) cause

around 5%-8% of all deaths globally (Peer & Shabir, 2018). Iatrogenesis, which is common in hospitalized geriatric patients, can be caused by a variety of reasons. The most important reason is the aging process, which causes normal physiological and psychological changes. At the same time, hospitals disregard these changes and the senility process in geriatric patients, treating them as if they were any other adult. (Ripardo & Brito, 2019). Age-related structural changes in the body reduce the geriatric patient's ability to adapt to stressors such as infections (Stefanacci, 2022). Geriatric patients are more likely to suffer from a variety of complex illnesses as a result of physiological changes. Insufficient estrogen for example, might cause

urinary incontinence and vaginal prolapse in geriatric females. Prostate enlargement in geriatric men can cause turbulent urine flow and urinary retention (Everitt et al., 2023).

The most often reported iatrogenic occurrences were classified as follows; therapeutic category, diagnostic category, iatrogenic events associated with hospitalization, and nursing related to iatrogenic events (Ripardo & Brito, 2019). Atypical disease manifestation, different physicians, many chronic conditions, and medicinal or surgical treatments all enhance the chance of iatrogenic occurrences (Permpongkosol, 2011).

Iatrogenic drug events in geriatric patients are widespread for a variety of physiological alterations in pharmacodynamics and pharmacokinetics in geriatric patients (Woo et al., 2020). A drug-drug interaction is a clinical condition in which one drug alters the impact of another medicine concurrently or sequentially (Velooso et al., 2019). Nursing related iatrogenic events is associated with the nurse's workload include a patient fall with an injury, and pressure ulcer (Kim et al., 2022). Iatrogenic events may also be linked to geriatric patients' prolonged hospitalization. There are numerous types of iatrogenic events associated with infections, such as urinary tract infection, which is the most common site of infection (Centers for Disease Control and Prevention [CDC], 2022), and pneumonia, the most prevalent form of nosocomial infection. Nosocomial infection is the primary cause of morbidity and mortality in geriatric patients with clinical characteristics such as disorientation, and anorexia (Rasheedy, 2021).

Regarding hospital-related events, geriatric patients may experience stress due to the hospital environment, which increases older adults' losses. For instance, losing independence, muscular strength, and cognitive changes may result from bed rest induced the hospitalization (Martone et al., 2017). Delirium is one of the serious complications that face hospitalized geriatric patients that may be due to the result of multifactors during hospitalization as: usage of physical constraints, malnutrition, and addition of more than three drugs (Vreeswijk,

2022). Polypharmacy in older adults especially with anticholinergic drugs or other antidepressant drugs may increase the risk of delirium (Sandhu et al., 2019), and may occur postoperatively with long hospitalization (Chen et al., 2022).

Diagnostic error is one of the most common iatrogenic occurrences in primary care and during hospitalization for geriatric patients. It may be related to inaccurate or delayed diagnosis (Kawamura et al., 2022). Furthermore, iatrogenic consequences can occur as a result of diagnostic procedures, but this is rare (Miyanaga et al., 2018) Iatrogenic complications may result from medical treatment and technology, such as unexpected mortality or myocardial infarction following valve replacement surgery, and stroke after carotid endarterectomy (Permpongkosol, 2011).

The hospital readmission within 30 days of patient discharge serves as a baseline for monitoring the quality of hospital stays. Readmission in geriatric patients may be owing to comorbidities or bad reactions to medications recommended after release. To avoid iatrogenic readmission, the healthcare team should follow discharge planning protocols, which include geriatric assessments, discharge support plans, and education (Schwab et al., 2018).

Nursing in Egypt has only lately been specialized in geriatrics and gerontology, nurses are less familiar with the challenges that arise as people age, the physiological and psychological changes that occur, and how to manage them (Abdul-Rahman & El Said, 2016). Prevention of iatrogenic events is possible. Up to 50% of these iatrogenic events can be prevented if healthcare members provide ideal management. It is very important to provide good quality care for geriatric patients by maintaining a proper channel of communication between healthcare teams (Permpongkosol, 2011).

From the literature, Nurses' understanding of iatrogenic events among hospitalized geriatric patients, will decrease the patient's hospital stay, decrease the risk of infection, decrease exposure to polypharmacy and loss of independence, increase patient's

satisfaction (Aronson, 2020; Sharkiya, 2023). Therefore the geriatric patient's family will be affected emotionally, economically, and physically (Sommers Roth & Elmaleh, 2023).

Early detection and prevention of iatrogenesis will decrease workload, and increase the feeling of satisfaction, nurses can cope with stress, reserve energy, and increase motivation (El-Hneiti et al., 2019). In today's labor market, one of the most essential criteria influencing an organization's performance is service quality. So, safety insurance and patient satisfaction improve the hospital outcome and hospital reputation which is considered successful internal marketing (Goula et al., 2022).

Aim of the Study This study aimed to determine the relationship between iatrogenic events of hospitalized geriatric patients and nurses' knowledge.

Research question:

What is the relationship between iatrogenic events of hospitalized geriatric patients and nurses' knowledge?

Materials and Method

Materials

Design: This study was conducted using a descriptive correlational research approach.

Settings: This study was done in the inpatient of the orthopedic surgeries and traumatology department of El Hadara University Hospital and the surgical department of the Main University Hospital. Both hospitals are allied to Alexandria Governorate, Egypt.

Subjects: The present study included 180 study subjects of 2 groups; the first group was 100 hospitalized geriatric patients those aged 60 and more who have been admitted to the hospital within the last 24 hours and have agreed to participate in the study. Concerning the second group it was 80 nurses who gave direct care to the study hospitalized geriatric patients, and worked at the selected study setting for at least 6 months. For first group the epi info 7 programs were used to estimate the study sample size based on the following parameters; population size: 282, Confidence level 95%, margin of error 10%, and minimum sample size of 72 geriatric patients. For second group the epi info 7 programs

were used to estimate the study sample size based on the following parameters; population size 99, confidence level 95%, margin of error 5%, with minimum sample size of 79.

Tools: Five tools were employed to collect the study data.

Tool I: Hospitalized Geriatric Patients' Socio-demographic Data Structured Interview Schedule This tool was developed by the researcher to examine the hospitalized geriatric patients' socio-demographic data such as age, sex, social status, income, degree of education, and occupation prior retirement.

Tool II: Hospitalized Geriatric Patients' Medical Record This tool was used to assess the health profile of hospitalized geriatric patients such as; medical diagnosis, current medications, laboratory investigations, length of hospital stay (LOS), receiving blood transfusion, performing surgeries, and diagnostic procedures.

Tool III: Iatrogenic Events of Geriatric Patients Appraisal Tool:

The researcher established this instrument after reviewing related literature (Frances & Roger, 2009; Wirkowski et al., 2014). It was used to assess the iatrogenic events that may occur for geriatric patients during their hospitalization period. The researcher filled on this tool based on geriatric patients' assessment for the presence or absence of iatrogenic events through reviewing the patient's medical records, researcher observation, and patient-reported iatrogenic events. It includes 83 items within four domains as follows:

1- Diagnostic iatrogenic events (10 items)

This domain concerns with iatrogenic events that related to both diagnostic procedures and diagnostic errors.

A- Iatrogenic events related to diagnostic procedures such as infection after arthroscopy, allergic reaction, and inflammation (**5 items**)

B- Iatrogenic events related to diagnostic errors such as delay in identifying a state of delirium post-operatively among geriatric patients, and amputation for any limb (**5 items**)

2- Therapeutic iatrogenic events (39 items) which focus on iatrogenic events that are related to both therapeutic procedures and adverse drug – reactions.

A- Therapeutic procedures (17 items) such as phlebitis in peripheral venous access, bowel perforation, and edema

B- Adverse drug – reaction (22 items) such as hypoglycemia related to insulin therapy, gastritis and itching

3- Nursing related iatrogenic events (13 items) that indicates the iatrogenic events that are related to nursing interventions such as pressure ulcer, fall with fracture, or injury.

4- Hospitalization related iatrogenic events (21 items)

It includes iatrogenic events that may occur due to geriatric patients' presence in the hospital such as nosocomial infection, anxiety or depression, and sleep disturbance.

For each statement of the previous domains, the researcher checked the presence or absence of each iatrogenic event either **Yes**, which was scored as (1), or **No**, which was scored as (0). **The overall score varied from 0 to 83**, the higher the score, the greater the iatrogenic events.

Tool IV: Socio-demographic Data of Geriatric Nurse Questionnaire:

This questionnaire was established by the researcher to assess the socio-demographic data of the study nurses such as age, sex, level of education, social status, years of work experience with geriatric patients, previous attendance of in-service training courses related to gerontology and geriatrics, title of the gerontological course if attended any, and numbers of training hours.

Tool V: Nurses' Knowledge of Iatrogenic Events Questionnaire:

This instrument contained 25 multiple-choice questions designed by the researcher after examining the relevant literature (Frances & Roger, 2009; Eliopulos, 2010). It was used to assess the nurses' knowledge about iatrogenic events among hospitalized geriatric patients and it included 25 questions covering several items such as definition of iatrogenesis, high-risk group, causes of iatrogenesis in geriatric patients, types of

iatrogenic events, and prevention of iatrogenesis. The nurses were asked to select one answer for each question. A score of (1) was assigned to the correct answer, and (Zero) for an incorrect or missed answer, or I do not know. The total score was summed, the higher the score the higher the nurse's level of knowledge. The total nursing knowledge score was calculated and classed as follows:

- A score of 0 to 12 indicates poor knowledge.
- Fair knowledge scores range from 13 to 18.
- Good knowledge score: 19-25.

Method:

- Following the requisite permission of the Research Ethics Committee of the Faculty of Nursing, formal consent from the relevant authority at the Faculty of Nursing Alexandria University has been taken and directed to the responsible authorities of the selected settings. Tools I, III, IV, and V, were prepared. They were presented to jury members specialized in the related fields (Gerontological, Medical Surgical nursing) to assess them for their content validity.
- The reliability of tools III and V were confirmed using Cronbach's Alpha. It was **0,943** for tool III and **0,805** for Tool V
- A pilot study was conducted on 10 geriatric patients and 8 nurses of the total number of study subjects who were selected from the study settings and excluded from the study subjects to evaluate the feasibility and clarity of the study tools.
- Regarding the hospitalized geriatric patients, the researcher interviewed them individually in their rooms immediately after their admission to the hospital the interview took about 20-30 minutes.
- The researcher followed up the study subjects by assessing iatrogenic events by using tool III for hospitalized geriatric patients three times, first on patient admission, second in the middle of the hospitalization period, and third before the patient's discharge.
- The researcher started data collection from all nurses available at work. The period of questionnaire took from 10 to 15 minutes to

fill out data. The researcher interviewed the nurses to fill the questionnaire.

- The researcher started data collection in July 2022 until December 2022

Ethical considerations:

Patients and nurses provided informed written consent after being explained the purpose of the study and their freedom to decline to participate and/or withdraw at any time. The patient's privacy was maintained. Data confidentiality was ensured throughout the study's implementation.

Data were entered into the computer and analysed with IBM SPSS software version 20.0. (Armonk, NY: IBM Crop). Qualitative data were described using numbers and percentages. The Kolmogorov-Smirnov test was performed to confirm the normality of the stated data, which included range (minimum and maximum), mean, standard deviation, and median. The significance of the obtained results was determined at the 5% level.

Results

Table 1 Indicates the most prevalent type of iatrogenic events that occurred among study subjects were related to drug reactions with mean percent score of 75.75 ± 35.93 , followed by iatrogenic events related to hospitalization and therapeutic procedures (71.49 ± 31.95 and 62.35 ± 35.84 respectively). The overall mean percent score of iatrogenic events was 67.09 ± 19.13

Table 2 Presents 1% of the study subject reported no iatrogenic events during their hospitalization, 99% of the geriatric patients reported either having 6 and more iatrogenic events by 64 %, 3 to 6 iatrogenic event by 28%, or 1 to 3 iatrogenic events by 7 %.

Table 3 Presents Relation between total iatrogenic events of hospitalized geriatric patients and their hospital health profile. The table notes that the hospitalized geriatric patients who stayed at the hospital for one month or more suffered from greater iatrogenic events with mean percent 71.62 ± 17.23 However, the difference didn't reach to a significant level $F = 0.836$ $P = 0.437$. According to the performed surgeries, the

studied patient who was undergoing surgery such as orthopedic surgeries suffered from high iatrogenic events with a mean percent of 68.69 ± 19.07 with a statistically significant difference, $t = 2.745$ $p = 0.007$. According to the blood transfusion, the studied patients who received blood suffered from iatrogenic events with a mean percent of 70.41 ± 15.71 although, the difference did not reach significant level $t = 1.455$ $p = 0.149$

Table 4 Presents 52.5% of the studied nurses reported a poor level of knowledge while 36.3% reported fair knowledge and 11.3% reported a good level of knowledge with a mean percent score of 49.55 ± 18.11 . These results indicated a relatively low general level of knowledge among the studied nurses.

Table 5 The table illustrates that the higher mean percent score of knowledge 68.67 ± 9.92 was reported by the studied nurses who completed bachelor's degrees in comparison to the others, and the difference was statistically significant, $F = 25.822$ $P < 0.001$. Moreover, the higher knowledge mean was reported by those who attended gerontological nursing training programs in contrast to the others, the difference was statistically significant, $t = 3.328$ $P = 0.034$.

Table 6 The table indicates although there was no significant relation between the level of nurses' knowledge and iatrogenic events among hospitalized geriatric patients, a significant positive relation was found between total score of nurses' knowledge and nursing-related iatrogenic events. Also, the relation was found to be very weak by Pearson coefficient test ($r = 0.254$ $p = 0.014$).

Discussion

The ageing process has distinct characteristics that predispose geriatric persons to a variety of chronic diseases, which intensify and increase the requirement for hospitalization. Over 65-year-olds account for a sizable proportion of hospitalized patients (Rodziewicz et al., 2024). Geriatric patients may acquire iatrogenic events during their hospitalization. So, nurses should be knowledgeable of these iatrogenic events. As

a result, the current study aims to determine the relationship between iatrogenic events of hospitalized geriatric patients and nurses' knowledge.

Iatrogenic drug effects are more common in geriatric patients than in any other age group (Krishnan & Kasthuri, 2005). The current investigation found that three-quarters of the geriatric patients experienced iatrogenic events associated to drug reaction, such as hematuria, short-term diabetic problems, hypotension or hypertension, and dermatitis (Table1). Many variables may contribute to the following natural physiological changes in pharmacokinetics and pharmacodynamics, polypharmacy during hospitalization, and unanticipated side effects such as intolerance and allergy. Furthermore, healthcare personnel treat geriatric patients the same as any other adult patient, with no regard for senescence. They did not get a comprehensive list of medications that patients were already taking at home. Moreover, several supplies are lacking, the most significant of which are gluco strips to assess the amount of sugar in the blood. Although all lab tests are performed before blood transfusion, vital signs are only performed once. This result is congruent with the findings of Brahma et al. (2013), who discovered that the most vulnerable age groups to adverse drug reactions were older persons due to comorbidities that result in excessive medicine usage. Similarly, this conclusion is consistent with the findings of Lavan and Gallagher (2016), who found that older adults aged 65 and older are more impacted by adverse drug reactions (ADRs), particularly those who had recently been hospitalized.

Nursing caregiving is not without errors or issues, and it has been linked to an increase in the occurrence of unfavorable conditions that could endanger patient lives (Mansoa, 2011). The current study found that the majority of the geriatric patients who have been suffered from nursing-related iatrogenic events such as urinary tract infection, pressure ulcers, and skin inflammation (table1). It could be justified as a nursing staff shortage, job overload, bad working conditions, insufficient

health team communication, the use of inappropriate aseptic technique during urinary catheter insertion, and inappropriate practice with geriatric patients. The study findings are consistent with those of a study conducted by Guerreiro et al. (2022), which revealed the following seven subcategories of nursing iatrogenic events: harmful effects of pharmacological therapy, fractures, falls, and improper use of medical devices (central intravenous catheters and peripheral intravenous catheters), catheter removal, forgetfulness, pressure sores, and inadequate nursing care.

Geriatric patients are more likely than any other age group to experience per and and postoperative problems. It can cause both cardiac and non-cardiac complications. As a result, geriatric patients require a thorough evaluation to decrease the possibility of iatrogenesis and its adverse effects (Baquero & Rich, 2015). The current study found that all geriatric patients undergoing major surgery experienced such as spinal surgeries high iatrogenic events, with a significant statistical difference (table 3). This could be due to improper geriatric patient follow-up. Furthermore, most surgeries were orthopedic surgeries that required a lengthy operation, sedation, and hospitalization. The presence of animals such as cats in the patient room may create an unsanitary atmosphere that could be a cause of infection. In addition, the present study findings could be attributed to a poor postoperative treatment for geriatric patients, such as insufficient health teaching. The current conclusion is consistent with the findings of Freda and Bruce (2010), who discovered that geriatric patients with pituitary tumors have a high mortality rate following surgery due to complications such as blindness and other new neurological abnormalities. After many weeks of surgery, 14.3% of geriatric patients experienced hyponatremia or stroke. In addition to, the current study is consistent with the findings of Hussain et al. (2014), who found that geriatric patients may develop neurocognitive issues following surgery and anesthesia and

postoperative dysfunction syndrome, such as cognitive dysfunction, is common. Similarly, the current study findings are consistent with the findings of Ackland and Pryor (2019), who highlighted that the level of anesthesia may be associated with the likelihood of delirium.

The primary source of stress in the hospital setting for geriatric patients is the length of their hospital stay. It has the potential to harm the patient's health (Ford et al., 2023). The current study found that geriatric patients who stayed for 30 days or longer had a higher frequency of iatrogenic events than others, while the difference was not statistically significant. (table 3). This could be because of all geriatric patients had iatrogenic events even short or long hospital stay, the increased risk of exposure to several diagnostic tests, the use of different drugs, prolonged bed rest, various forms of infections, and social isolation from their families. This finding is in contrast with the findings of Szlejf et al. (2012), who discovered that the incidence of iatrogenesis was substantially linked to longer hospital stay.

Nurses with appropriate training and education, as well as favourable attitudes towards elderly patients, can result in improved patient outcomes such as shorter hospital stays and lower readmission rates. (Elsayed Ibrahim & A Abd Elsalam, 2020). According to the current study, more than half of the nurses surveyed acknowledged a lack of expertise (table 4). This may be because more than half of the studied nurses have nursing diplomas that do not include gerontology in their curriculum and the majority of them did not attend any gerontological nursing training programs. The present finding agrees with the study conducted by **Abudu-Birresborn et al. (2019)**, who reported that nurses graduated with inadequate preparation to care for hospitalized geriatric patients.

To ensure the continuous production of high-quality, secure, and efficient patient services, the nursing field must monitor changes in healthcare environments (Ahluwalia et al., 2017). The current study found that the studied nurses with bachelor's degrees had a higher mean percent score of knowledge, and the difference was

statistically significant. Furthermore, nurses who attended gerontological nursing training programs had a higher mean score, and the difference was statistically significant (table 5). This could be caused by obtaining a bachelor's degree in nursing after completing gerontology and geriatrics courses with practical training for a suitable number of credit hours. The current finding is consistent with the Institute of Medicine (U.S.) (2011) finding that nurses with Bachelor of Science in Nursing (BSN) degrees can meet a wide range of patient's needs. Serve as leaders, promote knowledge that improves patients' conditions, and help professionals provide safe, high-quality patient care.

Moreover, the current study is compatible with that of Mlambo et al. (2021) who showed that Healthcare professionals must refresh their skills on a regular basis, as well as participate in continuing education, which provides for skill renewal and updating in healthcare settings. Similarly, the current study is consistent with the findings of Flaubert et al. (2021). Who indicated that patients and their families are better educated nowadays, and they are more willing to learn more about their medical illnesses and treatments on their own. The present study shows that although there was no significant relation between the overall level of nurses' knowledge and overall iatrogenic events among hospitalized geriatric patients, a significant relationship was found only between nursing-related iatrogenic events and high total score of nurses' knowledge (**Table 6**). This could be attributed to the errors in the clinical processes. For example, even if nurses have the essential knowledge, their practice may be poor due to a variety of issues such as a lack of monitoring by the head nurse throughout nursing practice. Time and resources are limited. Furthermore, due to the restricted number of nurses per department, the ratio of geriatric patients to available nurses to care for them exceeds the recommended standard. This increases the workload on the working nurses, and lowering the quality of care. The current study contradicts the findings of Dahlke et al.

(2021), who discovered that the cause of nursing-related iatrogenic occurrences is a gap in nurses' knowledge, which leads to gaps in care.

Conclusion

Based on the current study's findings, although there was no significant relation between the level of nurses' knowledge and overall iatrogenic events among hospitalized geriatric patients, a significant relation was found between nurses' knowledge and nursing-related iatrogenic events.

Recommendations

In accordance with the findings of the current study, the following recommendations are proposed:

- 1- In-service training educational program should be developed by the healthcare professionals for nurses who care for geriatric patients about the basics of geriatric patient care and iatrogenic events.
- 2- Geriatric patients undergoing surgeries should be assessed by gerontological nurses periodically for early detection and management of iatrogenic events.
- 3- Gerontological nurse should communicate with healthcare authorities about establishing a non-punitive reporting system of iatrogenic events within caring for hospitalized geriatric patients.

Table (1): Distribution of the study geriatric patients according to the occurrence of different types of iatrogenic events

Tool (III): iatrogenic events of hospitalized geriatric patient	The day of the assessment			Rank
	2 nd second assessment	3 rd third assessment	Total 2nd & 3rd	
- Related to Drug Reaction				
Hematuria 28.4%, Hypo/Hyperglycemia 19.4%				
Hypo/Hypertension 17.9%, Dermatitis 8.6%				
Total score				
Min. – Max.	0.0 – 5.0	0.0 – 6.0	0.0 – 7.0	
Mean ± SD.	1.75 ± 1.37	0.76 ± 1.24	2.01 ± 1.72	1
% score (Mean ± SD.)	69.94 ± 39.23	23.34 ± 35.21	75.75 ± 35.93	
t(p)	7.443*(<0.001*)			
- Iatrogenic Events related to Hospitalization				
Total score				
Min. – Max.	0.0 – 7.0	0.0 – 7.0	0.0 – 8.0	
Mean ± SD.	2.46 ± 1.76	2.62 ± 1.67	3.10 ± 1.87	2
% score (Mean ± SD.)	59.42 ± 36.14	60.91 ± 31.94	71.49 ± 31.95	
t(p)	0.540 (0.590)			
-Related to Therapeutic procedures				
Total score				
Continuous pain 33.3%, Edema 28%, phlebitis 18.3%				
Min. – Max.	0.0 – 6.0	0.0 – 6.0	0.0 – 6.0	
Mean ± SD.	1.87 ± 1.30	0.89 ± 1.11	2.03 ± 1.35	3
% score (Mean ± SD.)	59.30 ± 37.96	25.88 ± 30.30	62.35 ± 35.84	
t(p)	8.220*(<0.001*)			
-Nursing Related Iatrogenic Events				
Total score				
Urinary tract infection 48.4%, pressure ulcer 33.3%, Skin inflammation 18.3%, septic wound 2.2%, fall 11.8%				
Min. – Max.	0.0 – 4.0	0.0 – 4.0	0.0 – 5.0	
Mean ± SD.	1.33 ± 1.06	1.40 ± 1.13	1.71 ± 1.21	4
% score (Mean ± SD.)	47.33 ± 35.01	47.48 ± 33.79	57.82 ± 34.04	
t(p)	0.046 (0.963)			
A-Related Diagnostic procedures				
Total score				
Min. – Max.	0.0 – 2.0	0.0 – 1.0	0.0 – 2.0	
Mean ± SD.	0.45 ± 0.63	0.03 ± 0.19	0.45 ± 0.63	5
% score (Mean ± SD.)	33.33 ± 45.21	1.72 ± 9.28	33.33 ± 45.21	
t(p)	3.741*(<0.001*)			
B-Related to Diagnostic Error				
Total score				
Min. – Max.	0.0 – 1.0	0.0 – 1.0	0.0 – 1.0	
Mean ± SD.	0.22 ± 0.44	0.22 ± 0.44	0.44 ± 0.53	5
% score (Mean ± SD.)	16.67 ± 35.36	16.67 ± 35.36	33.33 ± 43.30	
t(p)	0.00 (1.000)			
Overall				
Total score				
Min. – Max.	0.0 – 16.0	0.0 – 15.0	0.0 – 23.0	
Mean ± SD.	6.76 ± 3.63	5.35 ± 3.42	8.10 ± 4.70	
% score (Mean ± SD.)	59.32 ± 22.11	44.40 ± 19.34	67.09 ± 19.13	
t(p)	7.865*(<0.001*)			

t: Paired t-test

p: p value for comparing between the 2nd and 3rd

*: Statistically significant at p ≤ 0.05

Table (2): Distribution of the study geriatric patients according to total number of iatrogenic events during hospitalization

Total iatrogenic events at 2& 3 ass	No.	%
No iatrogenic event	1	1.0
1-3 IEs	7	7.0
3<6 IEs	28	28.0
6+ IEs	64	64.0
Total	100	100.0

IE: Iatrogenic events.

Table (3): Relation between total iatrogenic events of hospitalized geriatric patient and their hospital health profile (n = 100)

Hospital medical record	N	% score Total 2nd & 3rd	Test of sig	p
		Mean ± SD.		
-Length of hospitalization (Days)				
7-<14	28	63.92 ± 19.86	F=0.836	0.437
14-<30	56	67.38 ± 19.32		
≥30	16	71.62 ± 17.23		
-Receiving blood Transfusion				
Yes	41	70.41 ± 15.71	t=1.455	0.149
No	59	64.78 ± 21.01		
Receiving Blood Transfusion Since (Days) (n = 6)				
2-3	27	72.73 ± 15.50	t=1.327	0.192
4+	14	65.93 ± 15.68		
- Diagnostic Procedure				
Yes	95	66.60 ± 19.22	t=1.126	0.263
No	5	76.47 ± 16.27		
- Surgeries				
Yes	91	68.69 ± 19.07	t=2.745*	0.007*
No	9	50.92 ± 10.76		

t: Student t-test F: F for One way ANOVA test
 p: p value for comparison between the studied categories
 *: Statistically significant at p ≤ 0.05

Table (4): Distribution of the studied nurses according to their knowledge regarding hospitalized geriatric patients iatrogenic events (n = 80)

Overall knowledge	No.	%
Poor (0-12)	42	52.5
Fair (13-18)	29	36.3
Good (19-25)	9	11.3
Total Score	(0 – 25)	
Min. – Max.	2.0 – 20.0	
Mean ± SD.	12.39 ± 4.53	
Median	12.0	
% Score		
Min. – Max.	8.0 – 80.0	
Mean ± SD.	49.55 ± 18.11	
Median	48.0	

SD: Standard deviation

Table (5): Relation between overall level of knowledge regarding iatrogenic events of the studied nurses and their socio-demographic characteristics (n = 80)

Socio-demographic characteristics	N	% score of overall Knowledge		Test of Sig.	p
		Mean	± SD.		
Age in years					
<30	11	52.36	± 16.05	F= 1.170	0.327
30-<40	25	45.60	± 19.93		
40-<50	27	53.93	± 18.48		
≥50	17	46.59	± 15.36		
Sex					
Female	73	49.04	± 18.27	t= 0.810	0.420
Male	7	54.86	± 16.61		
Marital status					
Married	61	50.69	± 19.19	F= 1.970	0.126
Widow	9	37.78	± 10.41		
Single	8	50.0	± 12.28		
Divorced	2	66.0	± 2.83		
Educational level					
Diploma	50	41.28	± 14.62	F= 25.822*	<0.001*
Technical	12	55.33	± 17.46		
Bachelor	18	68.67	± 9.92		
Years of Experience					
< 5 years	5	45.60	± 14.59	F= 0.906	0.442
5<10 years	19	55.37	± 16.67		
10<20 years	35	48.46	± 19.45		
20 years and more	21	47.05	± 17.75		
Attendance of Gerontological Nursing Training programs					
Yes	3	62.67	± 6.11	t= 3.328*	0.034*
No	77	49.04	± 18.24		

t: Student t-test

F: F for One way ANOVA test

p: p value for comparison between the studied categories

*: Statistically significant at $p \leq 0.05$

Table (6): Correlation between nurses' knowledge and iatrogenic events of hospitalized geriatric patients

Iatrogenic events of hospitalized geriatric patients (2 nd & 3 rd)	Nurses knowledge	
	r	p
A-Related Diagnostic procedures	-0.173	0.370
B-Related to Diagnostic Error	0.665	0.051
C-Related to Therapeutic procedures	-0.136	0.193
D-Related to Drug Reaction	0.130	0.296
E-Nursing Related Iatrogenic Events	0.254*	0.014*
F-Iatrogenic Events related to Hospitalization	0.184	0.066
Overall	0.070	0.491

rs: Pearson coefficient

*: Statistically significant at $p \leq 0.05$

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