

Assessment of Nurses Performance Regarding External Ventricular Drain among Children with Brain Tumor

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Abstract

Background: Brain tumors are the second most common childhood malignancies, after hematologic malignancies and are the most common pediatric solid organ tumor. External Ventricular Drain (EVD) is indicated for management of infection, intra ventricular hemorrhage, intra cranial pressure monitor or after tumor excision. **Aim:** This study aimed to assess nurses' performance regarding external ventricular drain among children with brain tumor. **Design:** A descriptive design was used. **Setting:** Inpatient Departments and Surgical Intensive Care Unit at Children Cancer Hospital Foundation in Cairo, Egypt (57357). **Subject:** A purposive sample included 100 nurses out of total number 152 nurses who work in the previously mentioned setting. **Tools:** Two tools were used; interviewing questionnaire sheet and observational checklist. **Results:** Most of studied nurses were females and also more than two thirds of them have competent practices. Moreover, there was a highly statistical significant difference between both nurses' total knowledge and total practice and their age and years of experience. **Conclusion:** Slightly more than two thirds of studied nurses have unsatisfactory knowledge while more than three quarters of them were competent in caring of EVD among children with brain tumor. There was no correlation between nurses' total knowledge and their total practices regarding care of EVD among children with brain tumor. **Recommendations:** Development of educational guidelines based on evidence-based nursing practices to promote excellence of nursing care and provides high-quality patient care regarding children with EVD.

Key words: Nurses' performance, External ventricular drain, Brain tumor.

Introduction

Brain tumors are the second most common childhood neoplasm, after hematological malignancies and are the most common pediatric solid organ tumors. The most common brain tumor in children is astrocytoma followed by embryonic tumors. The standard treatment of pediatric brain tumor is surgery, to remove the tumor, followed

by chemotherapy and radiotherapy. However, the resection is not always easy due to the localization and characteristics of the tumor (*Varela-Guruceaga et al., 2018*).

Pediatric brain tumors are classified into supra and infratentorial tumors. They could also be classified according to the age of diagnosis into congenital brain tumors, tumors of the infancy and older children. The prognosis

of pediatric brain tumors depends on the age at presentation, histological type and extent of resection (*Faltermeier et al., 2019*).

External ventricular drain (EVD) placement is used as a temporary treatment for hydrocephalus, increased intracranial pressure and for temporary cerebrospinal fluid diversion in patients with altered cerebral spinal fluid circulation or craniocerebral infections. One remarkable aspect is that EVD as the most accurate, reliable and cost-effective method for intracranial pressure monitoring, it is indicated for monitoring and management of intracranial hypertension after severe brain trauma. EVD is also an option in the management of post hemorrhagic hydrocephalus (*Fried et al., 2016*).

Moreover, EVD complications including hemorrhage and infection in addition to malposition which can be associated with significant morbidity and mortality. If EVD tube is displaced, it might cause unexpected complications (*Anami et al., 2016*).

Nursing management of children with EVD includes, assess physical condition, from head to toe and monitor ABCD. Assess neurological condition to detect any signs and symptoms of intracranial hypertension. Assess site of insertion and monitor any signs and symptoms of infection. Check patient position to prevent over or under drainage. Check EVD for potentially as needed by lowering the entire system and document amount, color and report changes in color which may indicate to infection or bleeding (*Liu et al., 2020*).

Significance of the study

According to the research department at Children's Cancer Hospital

Foundation- Egypt a total of 1,101 children diagnosed as brain tumor were enrolled from 2015 till the end of 2017, and 132 of them inserted EVD for management of infection, intra ventricular hemorrhage, intra cranial pressure monitor or after tumor excision; When the EVD is inserted, the children may be at risk for emergent situation or complications as subdural hematomas, hemorrhage, slit ventricle syndrome (collapsed ventricles). Therefore, the pediatric oncology nurse must be knowledgeable and competent in caring for children with EVD. Moreover, the nurse must establish a baseline for each children and assess the neurological changes, in addition to the position of the drainage system that must be checked by the nurse to ensure its patency and appropriate function to prevent over or under drainage.

Aim of the study:

This study aims to assess nurses' performance regarding external ventricular drain among children with brain tumor. This aim will be achieved through:

-Assessing nurses' knowledge regarding EVD among children with brain tumor.

-Assessing nurses' practices regarding care of children with EVD.

Research questions

-What are the levels of nurses' knowledge regarding care of children with EVD?

-What are the levels of nurses' practices regarding care of the children with EVD?

-Is there a relation between knowledge and practices of nurses regarding the care of EVD among children with brain tumor?

Subjects and Methods

Technical Design:

Research design:

A descriptive design was used to conduct this study.

Setting:

This study was conducted at the inpatient Pediatric departments 3rd extension, 4th floor and surgical intensive care unit. In the inpatient setting 3rd extension and 4th floor, the children diagnosed with brain tumor and connected with EVD. Moreover, within the surgical intensive care unit is the multispecialty medical care unit for critically ill children who require surgery or are recovering from surgery. Affiliated to a Children Cancer Hospital Foundation- Cairo, Egypt (57357). This hospital has the highest admission rate of children with cancer and considered to be the largest center for treating children suffering from cancer in Egypt.

Subjects:

A purposive sample of 100 nurses out of total number 152 nurses according to sample size formulas, who work at the previously mentioned setting, under the following criteria:

Inclusion criteria:

-Nurses caring of children with confirmed diagnosis of brain tumor.

-Nurses caring of children with EVD.

Exclusion criteria:

- Nurses who are working in others department as hematology units.

Tools for data collection:

Data was collected by using the following two tools:

I. Interviewing *questionnaire sheet*:

It was developed by the researcher after reviewing the relevant literatures and revised by supervisors. It was written in a simple Arabic language and consists of two parts:

Part one: It was concerned with characteristics of study subjects:

-Characteristics of the children included: Age, gender, level of education, and residence.

-Characteristics of the studied nurses included: Age, gender, level of education, years of experience, attendance of previous courses related to EVD care.

Part two: It was related to nurse's knowledge about brain tumor which composed of (2) questions, cerebrospinal fluid (4 questions), EVD (8 questions), infection (4 questions) and nursing care of children with EVD which composed of (18) questions. These questions in the form of multiple-choice and true/false in which nurses selected the one correct answer.

❖ Scoring system:

According to the responses obtained from the nurses, a scoring system was followed to assess nurses' knowledge; each question scored **one**

grade for correct answer and **zero** for incorrect answer. The scores of questions were summed-up and calculated to get a mean score, total score of knowledge (89) grades were allocated to all items of the questionnaire and accordingly the studied nurses' knowledge was categorized into:

-Less than 70% was considered unsatisfactory knowledge.

-70% and more was considered satisfactory knowledge.

II. Observational Checklists:

It was used to assess nurses' practices regarding care of the children with EVD. This consisted of:

-Hand washing procedure: it was adopted from *Chang (2020)*, it was consisted of 10 steps.

-Patient position procedure: it was adopted from *Challinor (2020)*, it was consisted of 8 steps.

-Change patient dressing procedure: it was adopted from *Révész (2017)*, it was consisted of 11 steps.

-Tubing care procedure: it was adopted from *Révész (2017)*, it was consisted of 4 steps.

-Documentation procedure: it was adopted from *Borzage (2018)*, it was consisted of 10 steps.

❖ Scoring system:

The right steps were **scored one** when done correctly and those done incorrectly or not done were **scored zero**. Total score of practices (39) scores were allocated to all items of the observational checklist. Then, score of steps were

summed-up and the total scores were converted into percent score and classified as the following:

-Less than 85% was considered incompetent practices.

-85% and more was considered competent practices.

Operational Design:

Preparatory Phase:

This phase includes reviewing of literature using books, articles, box internet periodicals and magazines related to be acquainted with research problem, this served to develop the study tools for data collection, and the development of the tools was designed under the supervisor's guidance.

Validity and Reliability:

Content validity was done by a jury of five experts in the field of academic pediatric nursing and medical to test its content validity and applicability, in addition to study team and Scientific Medical Advisory Committee (SMAC) in the study setting. Reliability was done using cronbach's alpha for questionnaire (0.87).

Pilot study

Pilot study was carried out on 10% (10 nurses) of the studied nurses to test the applicability and clarity of the constructed study tools. The pilot also, served to estimate the time needed for each subject to fill in the questionnaire, according to the results of the pilot, no correction was done, the participants in the pilot study were included in the main study sample.

Field Work

The actual fieldwork of this study was carried out at the third week of February (2019) up to the end of April (2019). The researcher was available in the study setting two days per week (Sundays and Thursdays) during morning shift from 9 am to 4 pm. The researcher interviewed each nurse, introduced herself and gave complete background about the study and its purpose before starting to collect data. The interviewing questionnaire was filled by the nurses within 15-20 minutes, while the observational checklists were checked by the researcher during actual nursing care, within 15-20 minutes for each one according to every procedure.

Administrative Design:

An official permission approval was obtained to carry out the study that issued letter from the Dean of Faculty of Nursing, Ain Shams University to the Administrators of Children's Cancer Hospital Foundation- Cairo, Egypt (57357).

Ethical Considerations:

Ethical approval was obtained from the scientific ethical committee of faculty of nursing Ain Shams University and Institutional Review Board from Children's Cancer Hospital Foundation- Cairo, Egypt (57357). In addition, a written informed consent was obtained from each participant prior to data collection. They were assured that anonymity and confidentiality would be guaranteed and the right to withdraw from the study at any time. Ethics, values, culture and beliefs were respected.

Statistical Design:

Data collected from the studied sample was revised, coded and entered using computer. Data entry and statistical

analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) software version 20. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (χ^2) was used for comparisons between qualitative variables. Level of statistical significance was accepted at P value < 0.05 .

Results

Table (1): clarifies that less than half (47%) of children were in the age group $10 < 15$ with mean age 11.2 ± 4.05 years and less than two thirds (62%) of them were male. Also, more than half (52%) of children were in secondary school and almost two thirds (66%) of them were from rural areas.

Table (2): shows that more than half (51%) of studied nurses were in the age group $25 < 35$ years with mean age 26.3 ± 5.97 years and more than two thirds (69%) of them were female. Moreover, 65% of studied nurses held Bachelor of Nursing and less than half (46%) of them had 5 years of experience.

Figure (1): illustrates that about two thirds (67%) of studied nurses have unsatisfactory knowledge regarding EVD among children with brain tumor, while the rest (33%) of them have satisfactory knowledge.

Figure (2): illustrates that 76% of studied nurses were competent in caring of EVD among children with brain tumor while, 24% of them were incompetent.

Table (3): shows that there was no statistical significant difference between studied nurses' total knowledge and their total practices regarding care of EVD among children with brain tumor.

Table (4): represents that there were statistical significant differences between nurses' age & years of experience and their total knowledge regarding care of EVD among children with brain tumor. Meanwhile, there was no statistical significant difference between nurses' gender, educational level

and attendance of previous courses related to EVD and their total knowledge.

Table (5): reveals that there was no statistical significant difference between nurses' characteristics and their total practices regarding care of children with EVD

Table (1): Distribution of the children according to their characteristic (n=100).

Items	No.	%
Age (years)		
<5	10	10
5 < 10	17	17
10 < 15	47	47
15 < 20	26	26
Mean ± SD		11.2±4.05
Gender		
Male	62	62
Female	38	38
Educational level		
Uneducated	10	10
Primary school	30	30
Secondary school	52	52
University	8	8
Residence		
Urban	34	34
Rural	66	66

Table (2): Distribution of the studied nurses according to their characteristic (n=100).

Items	No.	%
Age(years)		
<25	43	43
25<35	51	51
35≤45	6	6
Mean ± SD		26.3±5.97
Gender		
Male	31	31
Female	69	69
Educational level		
Nursing Technician Diploma	2	2
Bachelor of Nursing	65	65
Postgraduate	33	33
Years of experience		
<5	46	46
5<10	43	43
10 years and more	11	11
Mean ± SD		5.75±3.36
Previous training courses about EVD		
No	32	32
Yes	68	68

Figure (1): Percentage distribution of the studied nurses according to their total knowledge regarding EVD among children with brain tumor.

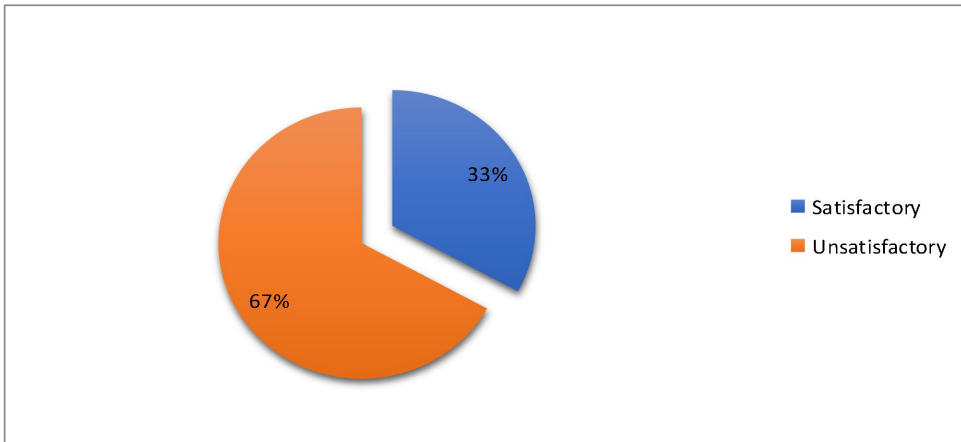


Figure (2): Distribution of Nurses according to their total practices regarding care of EVD among children with brain tumor.

Table (3): Correlation between studied nurses' total knowledge and their total practices regarding care of EVD among children with brain tumor.

Nurses' practice	Satisfactory		Unsatisfactory		Chi-square	p-value	
	No.	%	No.	%			
Competent	24	72.7	52	77.6	0.29	0.59	
Incompetent	9	27.3	15	22.4			
r & P value	r = 0.01 & P = 0.49						

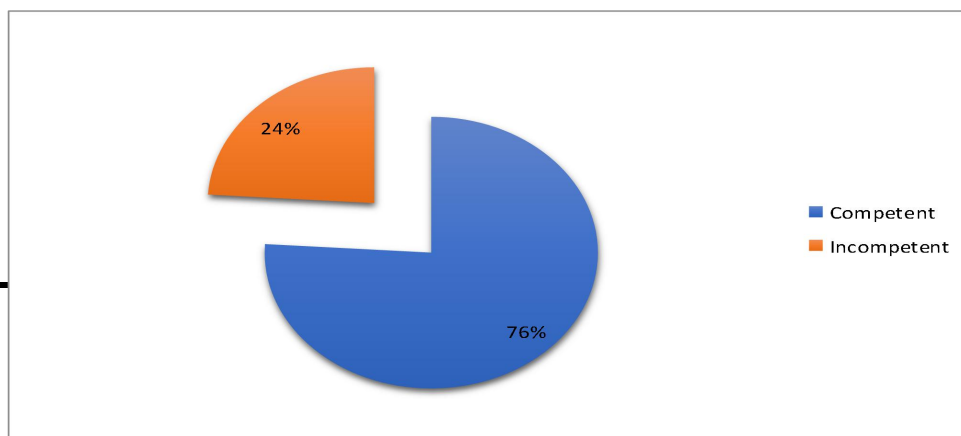


Table (4): Relation between nurses' characteristics and their total knowledge about EVD among children with brain tumor.

Nurses' characteristics	Nurses' knowledge				Chi-square	p-value
	Satisfactory		Unsatisfactory			
	No.	%	No.	%		
Age(years)						
<25	9	20.9	34	79.1	10.7	0.013*
25<35	23	45.1	28	54.9		
35≤45	1	16.7	5	83.3		
Gender					2.2	
Male	7	22.6	24	77.4		
Female	26	37.7	43	62.3		
Educational level					5.49	0.06
Nursing Technician Diploma	2	100.0	0	100.0		
Bachelor of Nursing	18	27.7	47	72.3		
Postgraduate	13	39.4	20	60.6		
Years of experience					18.16	0.0001*
<5	7	15.2	39	84.8		
5<10	24	55.8	19	44.2		
10 years and more	2	18.2	9	81.8		
Training courses about EVD					0.43	0.51
No	12	37.5	20	62.5		
Yes	21	30.9	47	69.1		

*Statistical significant difference

Table (5): Relation between nurses' characteristics and their total practices regarding care of children with EVD.

Nurses' characteristics	Nurses' practice				Chi-square	p-value
	Competent		Incompetent			
	No.	%	No.	%		
Age(years)						
<25	34	79.1	9	20.9	1.3	0.72
25<35	38	74.5	13	25.5		
35≤45	4	66.7	2	33.3		
Gender					0.53	0.46
Male	25	80.6	6	19.4		
Female	51	73.9	18	26.1		
Educational level					1.73	0.42
Nursing Technician Diploma	2	100.0	0	0.0		
Bachelor of Nursing	47	72.3	18	27.7		
Postgraduate	27	81.8	6	18.2		
Years of experience					2.46	0.48
<5	13	65.0	7	35.0		
5≤10	35	78.1	11	23.9		
10 years and more	8	72.7	3	27.3		
Training courses about EVD					0.71	0.39
No	26	81.2	6	18.8		
Yes	50	73.5	18	26.5		

No statistical significant > 0.05

Significant < 0.050

Highly significant < 0.001

Discussion

Regarding characteristic of children, the findings of the current study clarified that, more than half of children were males and less than half of them were aged from 10 <

15 years. These findings were not accordance with those of *Abd Elaziz et al. (2017)*, who found in a study, entitled "Nursing management protocol for mothers of children having ventricular peritoneal shunt" that more than two thirds of children were

females and more than half were aged less than five years regarding to sex.

Regarding characteristic of studied nurses, the findings of the current study showed that, more than two thirds of studied nurses were females. This finding was in agreement with those of *Huang et al. (2018)*, who found in a study entitled "Trends in the prevalence of congenital hydrocephalus in 14 cities in Liaoning province, China from 2006 to 2015 in a population-based birth defect registry from the Liaoning Women and Children's Health Hospital" that more than two thirds of studied nurses were females. Meanwhile, this finding is incongruent with those of *Omrani et al. (2018)*, who carried out a study entitled "Effect of introduction of a standardised peri-operative protocol on CSF shunt infection rate" and reported that more than half of studied nurses were males.

The findings of the current study revealed that, more than half of the studied nurses were in aged group 25<35 years with a mean age of 26.3±5.97 years. These findings were in agreement with those of *Kalu & Bwalya (2017)*, who found in a study entitled "Qualitative research in nursing and healthcare" that most of the nurses were in the age group ranged from 25<35 years. Meanwhile, these finding were not accordance with those of *Nielsen & Breedt (2017)*, who carried out a study entitled "Nursing care of the pediatric neurosurgery patient" and found that the mean age of the studied nurses was 42.8±9.4 years.

Concerning the current study clarified that, two thirds of the studied nurses held bachelor of nursing and less than half of them had experience less than 5 years. These findings were incongruent with those of *Elbilgahy & Mohammed (2019)*, who found in a study entitled "Improving the quality of nursing care

provided for children undergoing ventriculoperitoneal shunt" that less than one third of the studied nurses had held bachelor's degree in nursing and More than half of them had experience for less than 5 years. From the researcher's point of view, this may be due to the hospital (57357) that encourages nurses to obtain a bachelor's degree in nursing

The current study revealed that, two thirds of studied nurses had unsatisfactory knowledge regarding to EVD among children with brain tumor. This result was matched with those of *Rychik et al. (2019)*, who carried out a study entitled "Evaluation and management of the child and adult with Fontan circulation: a scientific statement from the American Heart Association" and found that two thirds of the studied nurses had unsatisfactory knowledge regarding EVD among children with brain tumor.

Regarding to total practices of studied nurses, the findings of the current study revealed that, more than three quarters of studied nurses were competent in caring of EVD among children with brain tumor. This finding was supported by *Zhang et al. (2018)*, who found in a study entitled "Anti-VEGF treatment improves neurological function in tumors of the nervous system" that two thirds of the studied nurses were competent in caring of EVD among children with brain tumor.

The findings of the current study showed that, there was no correlation between total knowledge and total practices of studied nurses. This finding was in agreement with those of *Shehab et al. (2018)*, who carried out a study entitled "Impact of an educational program on nurses' Knowledge and practice regarding care of traumatic brain injury patients at intensive care unit at Suez Canal University Hospital" and found that there was no correlation

between total knowledge and total practices of studied nurses.

The results of the present study revealed that, there were statistical significant differences between nurses' age & years of experience and their total knowledge. These findings were incongruent with those of *Shehab et al. (2018)*, who mentioned in a study entitled "Impact of an educational program on nurses' Knowledge and practice regarding care of traumatic brain injury patients at intensive care unit at Suez Canal University Hospital" that there were no statistical significant differences between nurses' total knowledge and their age & years of experience.

The findings of the current study revealed that, no statistical significant differences between nurses' total practices and their characteristics. These findings were corresponding with those of *Sam et al. (2018)*, who found in a study entitled "The organisms and factors affecting outcomes of EVD catheter-related ventriculitis" that there were no statistical significant difference between nurses' total practices and their characteristics.

Conclusion

Upon the findings of the current study it can be concluded that, slightly more than two thirds of studied nurses have unsatisfactory knowledge about EVD meanwhile, slightly more than three quarters of them were competent in caring of children with EVD. Moreover, there is no correlation between knowledge and practices of nurses regarding the care of EVD among children with brain tumor.

Recommendations:

-Establish continuous training courses with the assistance with the educational department at 57357 departments to improve nurses' knowledge and practices at the hospital regarding EVD.

-Development of a educational guidelines based on evidence-based nursing practices to promote excellence of nursing care and provide high-quality patient care regarding children with EVD.

-Further studies could be conducted to support the expansion of knowledge not only for the nurses' practices but involving the whole health team.

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