# Knowledge, Barriers and effect of special training on Insertion, care and maintenance of venous port catheters among Oncology Nurses

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*Abstract:*  *Central venous access devices (CVADs) have become an integral aspect of managing acute care setting patients especially chemotherapy. Despite of various advantages Central Venous access devices potential for causing blood stream infection, occlusion and other complications. In this regard, there are many opportunities for nurses to assist patients improving their cancer experience.*
*Aim: The purpose of this study was to determine baseline CVAD knowledge of nurses working in Oncology setup and also to assess the effect of special training programme.*
*Setting: The study was carried out Cancer Hospital, Varanasi.*
*Methods: The study used a descriptive, Pre-Test-Post-test design was used questionnaire consist of 20 knowledge based questions and barriers affecting care of CVAD were included, Participant achievement of program objectives was measured at two time points before training (pre-test) and again one week after special training programme completion. Data analysis revealed positive program effects as evidenced by statistically significant knowledge test score increments that persisted after program completion. Barriers relevant to the practice standard Central venous access devices care were also addressed.*
*Results: In this study 100 oncology nurses participated, the knowledge score gained by respondents in results shows that the mean value of knowledge in pre-test was 19.11 ± 1.30 and at post-test was 29.08± 1.61. Since the "p" value for the test is 0.05. Participants also acknowledged barriers in practicing Central venous access device care are divided two domains knowledge and in practice i.e. Educational gap /lack in basic professional training, Knowledge deficit, Lack of regular hands on Training as knowledge barrier, in practice they reported device specific issue, Low CVAD exposure based on the unit under which they are working, and Lack of time and workload.*
*Conclusion: From all the above findings it can be concluded that the structured education is very effective in updating knowledge and improving practice standard of oncology nurses regarding venous access device care.*

*Keywords: Oncology; Nurse's knowledge, CVAD.*

## 1. INTRODUCTION:

Cancer is considered as one of the major health issues worldwide (Baykal U, Seren S, Sokmen S, 2019.) Overall incidence of Cancers has been increased since 70s to date (Irwin K., 2007). Estimated number of people living with cancer in India is around 2.25 million, every year, new cancer patients registered: Over 11,57,294 lakh, Cancer-related deaths: 7,84,821(NICPR, 2018), By 2020, the **number** of **patients** globally will shoot up to 20 million, and 72 per cent of them will be from the third world. The development of chemotherapy administration and total parenteral nutrition necessitated the need to provide central venous access for a prolonged period of time. A device was developed in the United States in the 1970s that, when inserted into a peripheral vein and guided into the central vessels, acquires the characteristics of a central catheter. Initially implemented in ICUs, it was called Peripherally Inserted Central Catheter (PICC) Line Insertion. It is a safe alternative of central access of prolonged duration that permits the administration of solutions of high osmolarity and extreme or vesicant pH into the peripheral veins (Todd 1999). The insertion of a CVAD requires the passage of a catheter through the epidermis and stratum corneum,

creating a surgical wound that persists for as long as the CVAD is in situ. A CVAD is typically inserted in a sterile percutaneous manner through the skin of the upper chest or upper arm by a specially trained physician or nurse.

Central venous access devices (CVADs) have become an important component of managing oncology patients by offering vascular access for administration of intravenous (IV) fluids, blood products, parenteral nutrition, analgesics, antibiotics, chemotherapy etc. Despite of various advantages Central Venous access devices potential for causing blood stream infection, occlusion and other complications. Bloodstream infections are the gravest CVAD complication (Ullman et al., 2014). The Centers for Disease Control and Prevention (CDC) in the United States, estimate that 12% to 25% of these infections are fatal (CDC, 2011). In Quebec, data indicates the 20-day case fatality for central line bloodstream infections (CLABSI) is 14% among pediatric and adult intensive care unit (ICU) cases (INSPQ, 2016a), and 10% among hospital-wide cases (INSPQ, 2016b). Preventing negative outcomes associated with CVAD complications requires knowledge and understanding surrounding best practice and comprehending the mechanism by which infections occur (Kallen, Patel, & O'Grady, 2010).

An estimated 25% of patients admitted to the hospital require a CVAD, equating to more than seven million vascular access devices per year in the United States (Wuerz, 2016) Lack of knowledge and compliance regarding CVAD guidelines negatively affect patient outcomes, thereby increasing morbidity, mortality (Cicolini et al., 2014; Ullman et al., 2014), In this regard, there are many opportunities for nurses to assist patients improving their cancer experience. ( Wells M.2001)

**1.1. Need for the Study:** There are many opportunities for nurses to assist improving patient's experience of cancer, insertion, care and maintenance of Central venous access devices is one of the very essential component in oncology setup.

Rickard (2003) stresses the need for training and a systematic updating of protocols so as to ensure that all nurses carry out procedures in the same way and to promote easier monitoring and development.

Besides lack of basic professional nursing training, Lack of time and workload is also a factor which might hinder nurses from applying good practice standard in caring for patients with a Central Venous Catheters, especially in busy Oncology setup.

Specialised CVAD clinics are available only few of the hospitals like Tata Memorial Centres and it's all associated Hospitals like Homi Bhabha Cancer Hospital and Mahmana Pandit Madan Mohan Malaviya Cancer Centre, Varanasi but the nurses who are working in the other Oncology setups are unaware about the care of venous access device, Here Investigator have an opportunity to improve the knowledge and updating their current CVAD care practices with the objective to improve the quality and outcome of oncology patients with CVAD devices.

**2. SUBJECTS AND METHODS:**

**2.1. Aim of the study:** The aim of this study was to assess oncology nurse's knowledge about insertion, care and maintenance of CVAD devices and impact of special training programme.

The study also address the potential barriers faced by oncology nurses in practicing optimal care of CVAD devices.

**2.2. Research Hypothesis:** Oncology Nurses knowledge with regard to Insertion, Care and Maintenance of Venous Port Catheter will improve after receiving the special training programme.

**2.3. Research design**: A quasi experimental study design (pre-posttest) was utilized to fulfill the aim of the study.

**Setting of the Study:** The study was conducted at Mahamana Pandit Madan Mohan Malaviya Cancer Centre, Varanasi.

**Study Duration:** Four week

**Study Population:** Oncology Nurses working at Homi Bhabha Cancer Hospital and Mahamana Pandit Madan Mohan Malaviya Cancer Centre, Varanasi

**Sample Size:100**

**Sampling Technique:** Convenience sampling.

**Inclusion Criteria:**

1. Graduate Oncology Nurses working at Homi Bhabha Cancer Hospital and Mahamana Pandit Madan Mohan Malaviya Cancer Centre, Varanasi.

2. Participants who are available during the period of data collection.

3.Nurses who are working in Oncology setups.

 4. Participants who are willing to participate in the study.

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**Exclusion Criteria:**
1. Participants who are not willing to participate.
2. Non Oncology Care nurses.

**2.4. Ethical consideration:** Permission to conduct the proposed study was obtained from the institutional review board. Later, during the phase of data collection, all participants informed about the purpose and nature of the study in order to obtain their acceptance to participate in the study. Moreover, anonymity and confidentiality were assured through the coding of data and all obtained information was secured and wouldn't affect their annual appraisal.
**Tools: Tool utilized in the current study consists of two parts:**
**Part I**: **Demographic profile of the studied participants**
**Part II**: **Questionnaire related to knowledge regarding (pre – post) test.**
**Tool validity and reliability:** Tool validity was established by a panel of 5 experts (Nursing Experts and Oncology Consultants). They reviewed the tools for clarity, relevance, comprehensiveness, understanding, and applicability. Reliability of the used tool was confirmed by Alpha Cronbach test at (0.90) and content validity index was 0.89.

**2.5. SCORING:**
**The knowledge score has been classified as:**
Poor Knowledge: 0-5
Average Knowledge: 6-10
Good Knowledge: 11-15
Very Good Knowledge: 16-20

**2.6. Data Collection Procedure:**
      A formal permission was obtained from the ethical committee of the Hospital, total of 100 Oncology Nurses were selected for the study as per the inclusion criteria of study. The purpose of the study was explained to the Participants and Questionnaire for assessment of pre-test knowledge of CVAD insertion, care and maintenance was given on the same day followed by special training on CVAD on the same day of pre-test. Post-test assessment of knowledge of Oncology Nurses was done by giving Questionnaire on seventh day.
**2.7. Statistical Analysis:**
      Analysis of data was done in accordance with the objectives. The data was analysed using frequencies and percentage for demographic characteristics. Mean, Mean Difference, Median and Standard Deviation was used to describe the level of knowledge score. Paired 't' test was also done to find out the effectiveness of the structured teaching programme in terms of knowledge.

**3. RESULTS:**
      **Table-1: Frequency distribution of demographic characteristics of the Participants.**

| Variables | Frequency (F) | Percentage (%) |
|---|---|---|
| **Mean Age ± SD** | $31.10 \pm 11.26$ | |
| **Gender** | | |
| Female | 66 | 66% |
| Male | 44 | 44% |
| **Year of Clinical experience** | | |
| 0-5 years | 50 | 50% |
| 6-10 years | 45 | 45% |
| 11-15 years | 04 | 4% |
| 16 and above | 01 | 1% |
| **Qualification:** | | |
| Graduate(B.Sc Nursing) | 95 | 95% |
| Post Graduate(M.Sc Nursing) | 5 | 5% |
| Doctorate & Others | 0 | 0 |
| **Type Of Employment** | | |
| Permanent | 64 | 64% |
| Ad-hoc | 36 | 36% |

**Table (1)** illustrated that the mean age of the studied sample was 31.10 ± 11.26, and 66% were Female. Also Year of Clinical experience 50% have obtained maximum up to 5 Years of experience, 95% of the participants possess Graduate Degree in Nursing, Regarding the Type of Employment 64% of the Participants are permanent Government Benefitted employee and remaining 36% are Ad-hoc Category(Non-Permanent).

**Table 2 Distribution of overall knowledge score**

| S. No. | Knowledge Score | Pre Test % | Post test % |
|--------|-----------------|------------|-------------|
| 1. | **Poor          (0-5)** | **14%** | **0%** |
| 2. | **Average     ( 6-10)** | **61%** | **2%** |
| 3. | **Good          (11-15)** | **13%** | **46%** |
| 4. | **Very Good  (16 -20)** | **12%** | **52%** |

**Table (2)** In pre-test assessment 14% of the participants had poor (0-5) knowledge; 61% of the Participants had Average knowledge (6-10) ,11% of the participants had good (11-15) knowledge and 3% of the participants had very good (16 -20) knowledge. Whereas, post-test knowledge of the participants after special teaching intervention none of the participants scored (0-5) poor knowledge; 2% of the Participants scored Average knowledge (6-10) ,46% of the participants gained good (11-15) knowledge and 52% of the participants obtained very good (16 -20) knowledge.

**Table 3: Pair t test for the knowledge score:**

| Sl. No | Observations | Mean | Mean Difference | Standard Deviation | 't' Value | df | "p" |
|--------|--------------|------|-----------------|--------------------|-----------|----|----|
| 1. | Pre Test | 19.11 | 13.68 | 2.91 | 3.06* | 32 | 0.05 |
| 2. | Post test | 29.08 | | 2.89 | | | |

**Table (3)** The knowledge score gained by respondents in results shows that the mean value of knowledge in pre-test was 19.11 ± 1.30 and at post-test was 29.08± 1.61. Since the "p" value for the test is 0.05. The calculated 't' value was 3.06 which shows that there was a significant difference between mean pre-test and mean post-test knowledge score. This shows that the obtained mean difference of pre-test and post-test knowledge score was a true difference and not by chance. So, it can be concluded that, the special teaching intervention proven to be very effective in updating the current knowledge and practice and thus improving the outcome of the patients with central venous access devices.

**Perceived Barriers:**

**Table 4: Perceived Barriers to CVAD Care**

| | |
|---|---|
| **(I)NO BARRIERS** | **71%** |
| **(II)BARRIERS** | |
| **(a)KNOWLEDGE DOMAIN** | |
| Educational gap /lack in basic professional training | 2% |
| Knowledge deficit | 3% |
| Not Updating with recent Evidence based practices | 6% |
| Lack of regular hands on Training | 1% |
| **(b)PRACTICE DOMAIN** | |
| Specific to devices | 1% |
| Low CVAD exposure | 5% |
| Clinical performance monitoring | 1% |
| Lack of time /Workload | 10% |

**Table (4)** With regard to the barriers reported by Oncology nurses in terms of insertion , care and maintenance of Central Venous Access devices divided into two themes i.e., No barriers and barriers, within the barriers which is again divided into two  domains i.e. Knowledge and Practice under Knowledge domain 2% of the oncology nurses reported Educational gap /lack in basic professional training ,3% had experienced Knowledge deficit , 6% reported poor updating of EBP, and 1% reported Lack of regular hands on Training as knowledge barrier, In practice 1% reported device specific issue, 5% Low CVAD exposure based on the unit under which they are working, Clinical performance monitoring reported by 1% and Lack of time and workload experienced by 10% of the Oncology nurses as a barrier to understanding and adhering to CVAD guidelines.

## 4. DISCUSSION:

Overall, the oncology nurse's responses to the questionnaire level of current CVAD knowledge is good and special training programme is found very effective in updating the current knowledge and practice. This study demonstrated that nurses felt more confident following participation in the training. In relation to the oncology nurse's professional qualifications, the current findings revealed that, 95% of the participants possess Graduate Degree in Nursing and the rest of them had a post graduate degree this study was in an agreement with the study done by Barnes, et al. who studied physician and nurse beliefs of phase 1 trials in paediatric oncology and found that the majority of the studied sample were had a bachelor degree (Barnes MJ, Pressey J, Adams J, Hensler MA, Swain MA (2014) The present study sought to assess the oncology nurse's knowledge regarding insertion and care of central venous access devices it revealed that the total mean knowledge score of the studied nurses was 19.11 ± 1.30 and at post-test was 29.08± 1.61. Since the "p" value for the test is 0.05. The calculated 't' value was 3.06 which shows that there was a significant difference between mean pre-test and mean post-test knowledge score. the current study finding was congruent with a similar study done by Özden and Calișkan who conducted a study entitled "Turkish nurse's level of knowledge regarding implantable port catheter care" that revealed the mean knowledge score of the nurses regarding implantable port catheter care was 15.13+4.78 out of 20. Educational interventions have proven effective in improving nursing knowledge and reducing central line complications (Humphrey, 2015; Mathers, 2011; Ward, 2011) which is similar finding as in our study The knowledge score gained by respondents in results shows that the mean value of knowledge in pre-test was 9.11 ± 1.30 and at post-test was 29.08± 1.61 . Furthermore, the CDC recommends organizations educate staff about indications and infection prevention for CVADs (O'Grady et al., 2011). In the same line, the current study finding agreed with Deshmukh and Shinde who studied the impact of Structured Education on Knowledge and Practice Regarding Venous Access Device Care among nurses revealed that the experimental group's mean score of knowledge was increased from 14.6 to 21.3 in the post-test a structured program [Deshmukh M, Shinde M (2012) Impact of structured education on knowledge and practice regarding venous access device care among nurse. International Journal of Science and Research 2319-7064.]. It indicated that the structured education is effective in increasing the knowledge scores of subjects regarding venous access device care.

Participants also acknowledged barriers in practicing Central venous access devices are under two domains knowledge and practice i.e. Educational gap /lack in basic professional training, Knowledge deficit, Lack of regular hands on Training as knowledge barrier, in practice they reported device specific issue, Low CVAD exposure based on the unit under which they are working, % and Lack of time and workload, which is consistent with previously published literature (Deshmukh & Shinde, 2014; Chen et al., 2015; Fridkin & Pear, 1996).

It is also important to ensure that the current nursing practice does, in fact, align with the policy and/or procedures (Wuerz, 2016). Some monitoring and quality control is needed. The INS Infusion Therapy Standards of Practice (2016) recommends employing multiple methods to deliver education (e.g., lecture, reading materials, simulations, self-study), repeated over time, combined with outcome monitoring and feedback, to increase impact on professional behaviour. Interestingly, respondents recommended hands on training, education sessions, and monitoring or quality control.

## 5. RECOMMENDATIONS:

- Periodic consideration of in-service training programs regarding Central venous catheter implantation care according to the updated standards and guidelines.
- College of nursing should assess their current CVAD education and future CVAD content delivered in undergraduate and post graduate nursing programs. In particular, type of lines, care and maintenance of lines, and complications content should be examined.
- organizations need to examine their educational strategies for new hires and continuing education for experienced practising nurses.

## 6. CONCLUSION:

Central venous access devices /PICC line insertion, care and maintenance demands technical expertise, clinical judgment skills and conscious, safe and efficient decision-making. This is a highly complex and specialized practice, and oncology nurses who perform it should be efficient in taking care of CVAD devices/PICC lines.

Teaching programme was found to be very effective in updating the knowledge and improving the existing CVAD practice.

**Author's Bibliography:**

Dr. Rajni Sharma currently works at Tertiary Cancer Care Hospital, Department of Atomic Energy. Dr. Rajni does research in Medical Science Traumatology, Oncology and Evidence based practice. She is Eminent Speaker and Educator & has presented and published her research work at various National, International and Worldwide platforms.

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