Video Assisted Teaching Program on Knowledge and Preventive Practices of Catheter Related Blood Stream Infections among Health Care Professionals: A Hospital-based Prospective Study

Jeffin Thomas Jacob¹, Elsa Sanatombi Devi², Janet Prameela D’Souza³, Vandana Kalwaje Eshwara⁴, Chiranjay Mukhopadhyay⁵

¹M.Sc Nursing Student, ²Professor, ³Assistant Professor, Department of Medical Surgical Nursing, Manipal College of Nursing, Manipal Academy of Higher Education Manipal; ⁴Professor, Department of Microbiology, Kasturba Medical College, Manipal Academy of Higher Education Manipal; ⁵Professor & Associate Dean, Kasturba Medical College, Manipal Academy of Higher Education Manipal, India

Abstract

Objective: The objective of the study was to evaluate the effectiveness of video assisted teaching programme, in terms of improvement in knowledge and practices to prevent catheter related blood stream infections.

Method: The study adopted pre-experimental study design in the intensive care units of a selected tertiary referral hospital of Karnataka, India. The study included mainly the infection control practices followed by the health care personnel for the selected events related to catheter related blood stream infection prevention and knowledge of health care personnel regarding preventive practices of catheter related blood stream infection. The pre-test observations of practices related to prevention of catheter related blood stream infections was done using observational checklists and the knowledge assessment was done using structured knowledge questionnaire among health care personnel in the intensive care units and a video assisted teaching intervention was given, after seven days of intervention the post-test data was taken for the practices and knowledge.

Results: The results show that there was a significant difference in the pre-test and post-test knowledge scores, practices of nurses while administration of medications through central line and central line dressing procedure (p<0.05).

Conclusion: The present study showed that video assisted teaching on hospital infection control measures regarding catheter related blood stream infections was effective in supporting participants to increase their knowledge levels and preventive practices of catheter related blood stream infections and thereby reduce infection in the hospital.

Keywords: Knowledge, Infection Control, Health Personnel, Intensive care units

Introduction

Catheter Related Blood Stream Infections (CRBSIs) are the most common cause of health care associated blood stream infections. According to Centers for Disease Control and Prevention (CDC), there was 12 to 25% of mortality among patients who acquire catheter related blood stream infections, also have lengthy hospital stays and increase in their treatment costs. The burdens of
CRBSIs in the United States (US) were nearly 80,000 yearly. These infections also would increase the cost of stay in the hospital\(^1\).

A study was conducted with a purpose to provide a countrywide estimate of number of Health Care Associated Infections (HAIs) and to assess the mortality in US hospitals, the estimated number of HAIs in US hospitals were approximately 1.7million. The mortality related with HAIs in US hospitals were 98,987 and among these 30,665 is related to CRBSI\(^2\). A prospective observational clinical study was conducted on Health Care Associated Infections (HAIs) in northern India, to determine the risk factors and epidemiology from a tertiary care hospital, among 679 patients. Routine investigation of various HAIs infections such as, Catheter Associated Urinary Tract Infections (CAUTI), Catheter Related Blood Stream Infection (CRBSI) and Ventilator Associated Pneumonia (VAP) was done. The result shows that number of incidence of CRBSI was 86 (13.50%) among patients admitted in ICUs with central line catheters\(^3\).

A study conducted in the critical care units of Alexandria University Hospital, Egypt among 100 health care workers, 40 physicians and 60 nurses regarding knowledge and practices on prevention of CRBSI revealed that health care workers have poor adherence with the standard procedures of central venous catheter care so they should be periodically assessed for the knowledge and practices regarding guidelines for prevention of CRBSI\(^4\). A study conducted to improve the nurse’s knowledge to reduce CRBSIs in a haemodialysis unit of Walden University, Oman focused on implementing the CDC guidelines in order to improve the knowledge on evidence based guidelines regarding central venous catheters revealed a significant improvement in nurses’ knowledge following the educational intervention\(^5\).

The healthcare professionals working at the intensive care units need to have good knowledge on the preventive strategies of CRBSIs so as to adhere to such practices. The present study was carried out to assess the knowledge and preventive practices of health care personnel as well as to improve the knowledge to prevent CRBSIs among patients admitted in intensive care units, through a video assisted teaching intervention to reduce the incidence of CRBSIs.

### Materials and Method

#### Study Site, Design and Data Collection

This is a hospital based prospective study where in which the researcher adopted a pre-experimental study design (pre-test – intervention – post-test) carried out at the intensive care units of a selected tertiary referral hospital of Karnataka, India. After the ethical approval the pre-test observations of practices related to prevention of CRBSIs including practices of doctors while doing central line insertion (30events), practices of nurses while administering medications through central line (90events) and practices of nurses while doing central line dressing (50events) were observed using observational checklists and a structured knowledge questionnaire was used for the knowledge assessment among 72 health care personnel including physicians and nurses in the intensive care units and the questionnaire consisted of 30 multiple choice questions. Video assisted teaching intervention was given which dealt with the introduction on CRBSI, guidelines for central line insertion, guidelines for administration of medications through central line, and guidelines for central line dressing. After a gap of 7 days of video intervention the post-test data was taken for the practices of doctors while doing central line insertion (30events), practices of nurses while administering medications through central line (90events) and practices of nurses while doing central line dressing (50events). Knowledge was assessed to elicit the effectiveness of the teaching programme in terms of improvement in knowledge and practice scores.

The knowledge questionnaire consisted of 30 multiple choice items with one correct answer for each. Each correct answer carries one mark and the wrong answer carried zero marks. All the items had four alternative responses. The highest possible score was 30 and minimum score was zero. The knowledge score was classified arbitrarily as excellent knowledge (27-30), good knowledge (21-26), average knowledge (15-20), and poor knowledge (0-14).

The observation checklist was developed after a thorough review of literature, evidence based practices and experts’ opinion. The critical items in the observation check list carries five marks and other item carries one mark and if any practices in the checklist are not followed, zero was marked. The observation
check list on central line insertion consisted of 12 items. The highest possible score was 48 and minimum score was zero. The observation checklist on administration of medications through central line consisted of seven items the highest possible score was 27 and minimum score was zero. The observation checklist on central line dressing procedure consisted of seven items, the highest possible score was 31 and minimum score was zero. The study adopted event sampling for the observation of practices and purposive sampling for selecting the samples for administering knowledge questionnaire.

Ethical committee clearance was obtained from Institutional Ethical Committee, (IEC871/2016) and written informed consent from each study participants have been taken. Also the study has been registered prospectively under Clinical Trial Registry of India (CTRI), (REF/2017/01/013096).

Data Analysis

Data were analysed using SPSS version 16.0. The data analysis was done by using descriptive and inferential statistics. Descriptive statistics is used for analysing sample characteristics (frequency, percentage, mean and standard deviation). Inferential statistics (Paired t test and Wilcoxon’s sign rank test) was used to test the effectiveness of the intervention.

Findings

Demographic characteristics

Out of 72 participants, majority of them were females 60 (83.3%), with mean age of 26.31±3.82 years. Years of experience ranged from 1-5 years for 59 (81.9%) of the participants and 13 (18.1%) had more than five years of experience. Only 18 (25%) of the participants had the awareness of Evidence Based Guidelines on CRBSI preventive practices.

Knowledge among health care professionals

In the pretest, 16 (22.2%) had poor knowledge, 36 (50%) had average knowledge, and 20 (27.8%) had good knowledge. The post–test data shows that 2 (2.8%) had average knowledge, 35 (48.6%) had good knowledge and 35 (48.6%) had excellent knowledge on preventive practices of CRBSI. The mean of pre-test knowledge scores on preventive practices of CRBSI was 18.17±3.98. The maximum score attained was 26 and minimum was 10. The mean of post-test knowledge scores on preventive practices of CRBSI was 26.17±2.15. The maximum score attained was 29 and minimum was 20. Paired t test was computed to see the effectiveness of the video assisted teaching programme, which shows that there was a significant difference in the mean pre-test and post-test knowledge scores after the teaching programme on CRBSI (p<0.01) which was significant.

Description of practices of central line insertion among doctors

Out of 30 observations, the minimum score obtained in the pre-test was 8, the maximum score was 29, and the median of the pre-test scores of the practices of nurses assisting during central line insertion was 13 with an Inter Quartile Range of 8-19. The minimum score obtained in the post-test was 14, the maximum score was 29, and the median of the post-test scores of practices of nurses assisting during central line insertion was 19 with an Inter Quartile Range of 14-24. Wilcoxon Sign Rank Test was used to see the effectiveness of the video teaching programme on central line insertion practices, and the data shows that there was no significant difference in pre-test-and post-test practice scores on central line insertion after the video assisted teaching program (p>0.05) so it was concluded that video assisted teaching programme was not effective in improving the practice scores of central line insertion by doctors because they already had a good practice towards the preventive practice measures while doing central line insertion as there is no clinical significance observed in the findings.

Description of practices of administration of medications through central line

Out of 90 observations, the minimum score obtained in the pre-test was two, the maximum score was 22, and the mean practice score was 8.28±4.5. In the post-test, minimum score obtained was two, and the maximum score was 27, and the mean practice score is 18.96±5.3. Paired t test was used to see the effectiveness of the video teaching programme on practices of nurses while administering medications through central line, and the data shows that there was a significant difference in pre-test and post-test practice scores on administration of medication through central line after the video assisted teaching programme (p<0.05). Therefore, the null hypothesis was rejected and the research hypotheses was accepted, hence it concludes that the video assisted teaching program was effective in improving practices.
of nurses while administering medications through a central line. The Frequency (f) and percentage (%) of the practices of nurses while administering medications through central line is provided in Table 1.

Description of practices of central line dressing procedure

Out of 50 observations, the minimum score obtained in the pre-test was 11, the maximum score was 31, and the median of the pre-test scores of the practices of nurses while doing central line dressing was 16 with an Inter Quartile Range of 7-12. The minimum score obtained in the post-test was 16, the maximum score was 31, and the median of the post-test scores of practices of nurses while doing central line dressing was 26 with an Inter Quartile Range of 17-22. Wilcoxon Sign Rank Test was used to see the effectiveness of the video teaching programme on practices of nurses while doing central line dressing. The data shows that there was a significant difference in the pre-test and post-test practice scores of central line dressing after the teaching program (p<0.05), hence it concludes that the video assisted teaching program was effective in improving practices of nurses while doing central line dressing. The Frequency (f) and percentage (%) of the practices of nurses while doing central line dressing is detailed in Table 2.

Discussion

The present study shows that out of 72 participants, in the pre-test 16 (22.2%) had poor knowledge, 36 (50%) had average knowledge and 20 (27.8%) had good knowledge and none of them had excellent knowledge. The findings were supported by a study conducted to improve the nurse’s knowledge to reduce catheter related blood stream infection in a haemodialysis unit. The pre-test mean score was 52.17±9.36, also 46% of participants had inadequate knowledge, 54% had moderate level of knowledge and none of the participants had excellent knowledge.

The present study findings show that the mean pre-test knowledge scores on preventive practices of CRBSI was 18.17 with a standard deviation of 3.982 and the mean post-test knowledge scores on preventive practices of CRBSI was 26.17 with a standard deviation of 2.156. The results show that there was a significant increase in post-test knowledge scores (p<0.05). The findings were supported by a pre-experimental study conducted in Kathmandu Medical College Teaching Hospital among 40 nurses. The mean knowledge score was 14.75 with a standard deviation of 2.37 in the pre-test. After educational intervention, the score was 16.80 with a standard deviation of 5.51. The result shows that there was a significant increase in post-test knowledge scores (p= 0.039).

In the present study, out of 30 pre-test observations of central line insertion procedure by the doctors, 90% of them had performed hand –hygiene, 93.3% wore the cap, 96.7% wore the mask, 100% wore sterile gown & gloves. The result shows that, during the insertion of CVCs, most of the physicians had followed the preventive practice measures. These findings were supported by the study conducted to assess the HCWs knowledge and practices regarding the prevention of CRBSI. The result shows that during the insertion of CVCs, most physicians (87.5%) performed hand hygiene. Regarding sterile barrier precautions, 80% of physicians wore the cap, 85% wore masks, 90% wore the gown, and 80% wore sterile gloves. It shows that most of the physicians had followed the preventive practice measures while doing central line insertion.

Conclusion

In conclusion, the Center for Disease Control and Prevention strongly recommends that reporting and monitoring for infection control practices and surveillance on infection in the ICUs is a critical factor in CRBSI prevention. It also emphasizes about education and training among health care professionals regarding how to assess and implement infection control measures and periodic evaluation of the knowledge among them. The present study showed that video assisted teaching on hospital infection control measures regarding CRBSI was effective in supporting participants to increase their knowledge levels and practices of preventive aspects of CRBSI and thereby reduce infection in the hospital.

Acknowledgement: This study had received financial support from Dr TMA Pai Endowment chair in antimicrobial stewardship.
**Conflict of Interest:** No conflicts of interest.

**Table 1:** Frequency (f) and percentage (%) of the practices of nurses while administering medications through central line (n=90)

<table>
<thead>
<tr>
<th>Preventive Practices</th>
<th>Pre-test</th>
<th>yes</th>
<th>(f)</th>
<th>(%)</th>
<th>No</th>
<th>(f)</th>
<th>(%)</th>
<th>Post-test</th>
<th>yes</th>
<th>(f)</th>
<th>(%)</th>
<th>No</th>
<th>(f)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performs hand hygiene</td>
<td></td>
<td></td>
<td>25</td>
<td>27.8</td>
<td>65</td>
<td>72.2</td>
<td></td>
<td>50</td>
<td>55.6</td>
<td>40</td>
<td>44.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uses clean or sterile gloves before touching the catheter</td>
<td></td>
<td></td>
<td>11</td>
<td>12.2</td>
<td>79</td>
<td>87.8</td>
<td></td>
<td>82</td>
<td>91.1</td>
<td>8</td>
<td>8.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follows strict aseptic technique</td>
<td></td>
<td></td>
<td>54</td>
<td>60.0</td>
<td>36</td>
<td>40.0</td>
<td></td>
<td>89</td>
<td>98.9</td>
<td>1</td>
<td>1.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrub the cap or hub for at least 15-30 seconds</td>
<td></td>
<td></td>
<td>4</td>
<td>4.4</td>
<td>86</td>
<td>95.6</td>
<td></td>
<td>51</td>
<td>56.7</td>
<td>39</td>
<td>43.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identifies the appropriate lumen for administering the medicine</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td>90</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposes of all syringes, needles according to the hospital policy</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td>90</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performs hand hygiene</td>
<td></td>
<td></td>
<td>19</td>
<td>21.1</td>
<td>71</td>
<td>78.9</td>
<td></td>
<td>34</td>
<td>37.8</td>
<td>56</td>
<td>62.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2:** Frequency (f) and percentage (%) of the practices of nurses while doing central line dressing (n=50)

<table>
<thead>
<tr>
<th>Preventive practices</th>
<th>Pre-test</th>
<th>yes</th>
<th>(f)</th>
<th>(%)</th>
<th>No</th>
<th>(f)</th>
<th>(%)</th>
<th>Post-test</th>
<th>yes</th>
<th>(f)</th>
<th>(%)</th>
<th>No</th>
<th>(f)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performs hand hygiene</td>
<td></td>
<td></td>
<td>11</td>
<td>22.0</td>
<td>39</td>
<td>78.0</td>
<td></td>
<td>34</td>
<td>68.0</td>
<td>16</td>
<td>32.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puts on a pair of clean gloves.</td>
<td></td>
<td></td>
<td>48</td>
<td>96.0</td>
<td>2</td>
<td>4.0</td>
<td></td>
<td>50</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peels off the old dressing gently</td>
<td></td>
<td></td>
<td>50</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td>50</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puts on a new pair of sterile gloves</td>
<td></td>
<td></td>
<td>11</td>
<td>22.0</td>
<td>39</td>
<td>78.0</td>
<td></td>
<td>37</td>
<td>74.0</td>
<td>13</td>
<td>26.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applies antiseptic to the site using &gt;0.5% Chlorhexidine preparation with alcohol</td>
<td></td>
<td></td>
<td>33</td>
<td>66.0</td>
<td>17</td>
<td>34.0</td>
<td></td>
<td>50</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cover with either sterile gauze or sterile, transparent, semipermeable dressing</td>
<td></td>
<td></td>
<td>48</td>
<td>96.0</td>
<td>2</td>
<td>4.0</td>
<td></td>
<td>50</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performs hand hygiene</td>
<td></td>
<td></td>
<td>15</td>
<td>30.0</td>
<td>35</td>
<td>70.0</td>
<td></td>
<td>26</td>
<td>52.0</td>
<td>24</td>
<td>48.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References


