Evaluating the effectiveness of a mnemonic to guide staff when providing patient education to autologous hematopoietic stem cell transplant patients

by Cheryl Page, Charissa Cordon, and Jiahui Wong

ABSTRACT

Effective patient education can influence cost savings and improve patient outcomes (CCO, 2006). Nursing staff provide education to patients and families through the assessment of learning needs, incorporating the teach-back method to assess comprehension, and documenting the care provided. For this pilot study, an educational intervention was developed incorporating a mnemonic memory aid to support a consistent, standardized approach in delivering effective patient teaching. Forty-five hematology nurses from Hamilton Health Sciences participated in the study, of which 36 completed the follow-up assessments. The mnemonic aid “CARE”, developed for this study, helped nurses to recall the steps involved in patient education. The improved knowledge and the use of the mnemonic aid in patient education was sustained over the three- to six-weeks follow-up period. While there was an increase in documentation of the patient education after the intervention, the changes did not reach the statistically significant level. Further research on the use of mnemonics in nursing education would complement this pilot study.

INTRODUCTION

The purpose of this pilot study was to explore if a mnemonic memory aid, introduced during an educational intervention on providing patient education, would help nurses to recall the steps involved when providing this care. The study focused on the education provided by the nurse to the autologous transplant patient population at Hamilton Health Sciences.

Effective patient education has been linked to both cost savings and improved patient outcomes, as noted in the patient education guideline from Cancer Care Ontario (CCO, 2006). Stenberg and colleagues’ (2018) comprehensive review of the current literature regarding the financial impact of patient education found that patient education interventions led to decreased health care costs. In a separate comprehensive review of literature on patient education and outcomes, Stenberg et al. (2016) found that patients who participated in educational programs had better symptom control and improved self-management. Pidala, Anasetti, and Jim (2009) specifically note the importance of the role of patient education in improved quality of life in the complex autologous stem cell transplant patient population. A partnership involving education needs to be developed between the health care team and patients during all treatment stages to help mitigate and manage the risk of side effects. Additionally, the family or identified support people should be included in the education (CCO, 2015). When information is provided to patients, it has a positive impact not only on the patient experience, but also on clinical outcomes such as: decreased symptoms, decreased length of hospital stay, improved patient knowledge, and increased patient satisfaction (Treacy & Mayer, 2000). Treacy and Mayer (2000) specifically note that patient education can lead to reduced patient-reported anxiety, depression, mood alterations, nausea, and pain.

A review of literature by Koutroupolou et al. (2010) emphasizes that the nurses’ role in providing patient education is key and oncology nurses need to be trained to meet the patients’ educational needs. Marcum et al. (2002) discuss that while many nurses agree to the value of patient education, barriers to providing this care (i.e., resources, support, and training) need to be overcome. The benefits of patient education are clear, but to provide effective patient education, staff require both the resources and skills to effectively provide this education.

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Review of Literature

Health beliefs are rooted in culture (Yosso, 2005); providing patient education involves recognizing and building on knowledge that adults have gained based on experiences and knowledge they already possess (Chapman, 2003). Education may be interpreted by people in diverse ways based on individual backgrounds (Yosso, 2005). The patient should feel safe to voice their concerns and to identify any lack of knowledge. Safety can be compromised if the patient feels humiliated, harassed, or pressured to disclose personal information (CCO, 2009).

A person’s ability to live a healthy lifestyle, access health services, or seek advice from health care providers has a direct effect on that person’s health, however, the patient would require some level of health literacy to be able to do these activities. Health literacy is the ability to navigate our health care system to accomplish these tasks (Wizowski, Harper, & Hutchins, 2008). Low health literacy skills are connected to poor health, increased hospitalization, increased mortality, and higher health care costs (Rootman & Gordon-El-Bihbety, 2008; Wizowski et. al., 2008). Cox, Bowner, and Ring (2010) stress the importance of health literacy in oncology, stating, “The skill set of health literacy is particularly important for patients undergoing anti-cancer treatment, as it is important to understand and be able to act upon potentially serious complications of their treatment” (p. 223).

Each health care system has its own culture that patients need to learn to navigate. Through patient education, nurses can empower patients to successfully navigate this system. The focus for patient education needs to be on providing education that is patient and family focused rather than health care provider focused, using plain language understood by the patient (CCO, 2009). Teaching nurses how to communicate and provide patient education effectively is crucial to this process (Beck, Daughtridge, & Sloane, 2002).

Patients gather information from many sources during and between contacts with their health care team. These sources could include media, friends and family, as well as other patients. Tian and Robinson (2008) found that both younger and older cancer patients sought out media and family for health-related information, though the incidence was higher in the younger patients. These findings have important implications for health care workers when providing patient education (Tian & Robinson, 2008). Nursing staff need to assist patients and their families to assimilate this information and provide patient education effectively to this process (Beck, Daughtridge, & Sloane, 2002).

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Teaching and coaching are key components of the Practice Standards and Competencies for the Specialized Oncology Nurse (CANO 2006) and Standards and Competencies for Cancer Chemotherapy Nursing Practice (CANO, 2017). More specifically, the specialized oncology nurse prepares individuals with cancer and their families for the many different aspects of the cancer experience, assessing and providing education to meet their needs and evaluating and documenting the outcomes of the education (CANO, 2017). As the patient is receiving information from multiple sources, it is important for nurses to have a consistent standardized approach to assessing the learning needs of patients, providing information and checking back to assess understanding.

Coordination of educational efforts involves the whole health care team. Patient education is needed at diagnosis, treatment initiation, and when there are any changes in plans of care (CCO, 2009). The way in which health care services are delivered makes it difficult to have continuity and consistency in providing patient education, and in assessing the patient’s understanding of what was taught. Staff in one area may start this education and staff in another area may reinforce it. Documentation is the key to communicate the status of education to other members of the health care team. CCO (2008) lists the education plan for the patient as part of the Oncology Documentation Standards.

One strategy to support a consistent standardized approach to providing patient education that can be easily applied by nurses is the use of mnemonics. Mnemonics are well known memory aids (Putnam, 2015). Putnam (2015), Dunlosky et al. (2013) and Farenga et al. (2007) all note that mnemonics help people recall information they have learned. Newnham et al. (2015) found that using an acrostic type of mnemonic as a memory aid successfully improved documentation post rounds in a pediatric unit. Multiple studies in nursing have shown the benefit of utilizing a mnemonic as a practical memory aid when providing nursing care (Linnard-Palmer, 2012; Mannix, Parry, & Roderick, 2017; Watterson et al., 2018; Woodfin, Johnson, Parker, Mikach, Johnson, & McMullan, 2018). For this pilot study, a mnemonic was developed to sustain a patient education training program for nurses, thus allowing them to better retain and recall the important steps in patient education. The mnemonic acts like ‘a hook’ to allow the nurse to retrieve learned information from their memory.

Development of Mnemonic

For this pilot study, a four-step process, using the mnemonic “CARE”, was formulated to remind the nurses about the steps in providing patient education. The CARE mnemonic uses the first letter of the first word in each of the steps for providing patient education, which include: C: Check understanding, A: Adapt education, R: Reassess comprehension, E: Edoc or paper documentation.

This mnemonic was developed by first dividing the main steps in providing patient education. The first step involves assessment of the patient’s learning needs considering their current placement in their trajectory of care. The patient’s understanding of their current treatment and plan of care is influenced by many factors, both within and outside of the health care facility where the patient is receiving treatment. The influences within the centre include the health care team’s internal communication and the nurse’s understanding of the treatment pathway (Desme et al, 2013; Levin-Zamir & Bertschi, 2018). Outside the health care facility, the patient receives information from media and significant others that can influence their understanding of their treatment (Bevan & Pecchioni, 2008). It is important to assess the patient’s
The Kirkpatrick Model (2006) looks at four levels of evaluation in education. Level one evaluates the degree to which the participants acquire the intended knowledge, skills, and/or attitudes based on their participation in training. Level three evaluates the degree to which the participants apply what they learned during the training to his/her job. Level four evaluates the degree to which the targeted objectives or outcomes occurred because of the training.

**METHOD**

This study utilized a quasi-experimental non-equivalent time-series research approach using a convenience sample of participants.

**Participants:** The sample included nurses who currently worked in either oncology day services or inpatient hematology areas at Hamilton Health Sciences. At the time of the study, there were 18 nursing staff actively working in the outpatient hematology area and 58 nursing staff in the inpatient unit. This resulted in a population of 76 potential participants for this pilot study. Recruitment for the study included an information session to nursing staff. The intervention was explained in detail to nurses and, for those interested in the study, an informed consent was obtained.

**Intervention:** The educational intervention, in which the mnemonic was introduced, included an education session delivered by the educator in a small group format available to all nursing staff, including nurses who consented to the study and those who declined. The education session included assessing for patient educational needs over the trajectory of care, health literacy, the teach-back method, and documentation of patient education. The mnemonic was introduced to serve as a prompt to participants on the steps for patient education.

**Measurements:** The effectiveness of the training program was evaluated using the Kirkpatrick Model for evaluation as a guide. The model involves four levels of assessment: reaction, learning, behaviour, and results (Kirkpatrick, 2006).

For the purposes of this study, surveys were adapted from the Kirkpatrick Model and assessed satisfaction, knowledge and behaviours at three points in time (i.e., before, after, and during the follow-up period three to six weeks post the educational intervention utilizing the mnemonic). The three- to six-week period was chosen to measure retention of the education within the time constraints allotted for this study.

1. **Survey on participant satisfaction with the education session.** The satisfaction survey was tailored to the training content and included three items on the quality of the educator, the usefulness of the session content, and the relevance to clinical practice. A Likert-type scale was used with ‘0’ indicating strongly disagree with each statement and ‘5’ indicating strongly agree.

2. **Survey on participant knowledge and behaviours.** The self-report knowledge (four items) and behaviour survey (three items) covered four areas: assessing patient education needs, health literacy, teach-back method, and documentation of patient education. A Likert-type scale was used with ‘0’ indicating very low knowledge to ‘5’ indicating very high knowledge. They were administered to the participants at three time points: at baseline before the

![Figure 1: Patient education mnemonic](Image)
The usefulness of mnemonic aid. A single item was used to measure usefulness of the mnemonic. A Likert-type response option was used with ‘0’ indicating strongly disagree to its usefulness and ‘5’ indicating strongly agree.

4. Chart audit. To assess whether the intervention (education sessions in conjunction with the mnemonic aid) had affected patient education, two chart audits were conducted for all autologous patients transplanted at Hamilton Health Sciences: one-month prior to the intervention (retrospective chart audit), and one-month post intervention.

The surveys and audits were mapped to the Kirkpatrick (2006) Model of evaluation (see Table 1). The surveys were designed to assess Kirkpatrick (2006) evaluation levels one, two and three and a chart audit was used to assess level four as follows:

Level one: To what degree did the participants react favourably to the patient education training? This was assessed immediately post training.

Level two: To what degree did the participants acquire the knowledge of how to institute patient education? Retention of the knowledge about patient education was assessed as a baseline pre-intervention, immediately post intervention, and three to six weeks post intervention.

Level three: To what degree did the participants apply what they learned during the patient education training to his/her job? This was assessed as a baseline pre-intervention, immediately post intervention, and three to six weeks post intervention by self-report survey.

Level four: What results were accomplished because of the training intervention? The outcome was captured in patient education documentation through two chart audits pre-intervention and during post-intervention follow-up (see Table 1).

Statistical Analyses: A non-parametric Friedman test was conducted on the changes in knowledge and behaviour before, after the educational intervention, and three to six weeks following the intervention. The four content areas—assessing patient education needs, health literacy, teach-back method, and documentation—were tested separately. As this was an exploratory pilot study, a two-tailed analysis was utilized so that a positive or negative change would be captured for the chart audit data.

Hertzog (2008) recommends at least 10% of the population is required for pilot studies. In our situation, with a population of 76 nurses, that would translate to a minimum of eight nurse participants. Based on staff composition and availability, the aim was 25% or 20 nurses. Using the survey measuring knowledge before and after the educational intervention, a sample size of 20 clinicians would have 80% power to detect a difference of 0.62 standard deviation, at the p=0.05 level of significance (two tailed). This is a moderate effect size.

RESULTS

A total of 45 staff members consented to the study, of which 36 completed all study components.

First Level of Evaluation: Reaction

The first level of evaluation measured the degree to which the participants of the study reacted favourably to the patient education session (intervention). The post intervention survey was completed by 44 of the 45 participants. About 75% (33/44) of the participants strongly agreed and a further 23% (10/44) agreed that the training was relevant to their work. The survey found that 68% (30/44) of the participants strongly agreed and a further 30% (13/44) agreed that the training was delivered in an effective way. Seventy-five percent (33/44) of participants strongly agreed and a further 20% (9/44) agreed that this education intervention on patient education benefited the health care team (see Figure 2).

Second Level of Evaluation: Knowledge

The second level of evaluation measured the degree to which the participants in the study acquired knowledge regarding how to institute patient education. This evaluation was assessed as a baseline before the intervention, immediately following the intervention, and during the three to six weeks post intervention to measure retention. The first knowledge question about assessing patient educational needs rendered a Chi-square value of 25.15, which was significant (p< 0.01). The second knowledge question about health literacy rendered

<table>
<thead>
<tr>
<th>Kirkpatrick Evaluation Level</th>
<th>Evaluation</th>
<th>Baseline Evaluation</th>
<th>Immediately Post Training Evaluation</th>
<th>3 to 6 weeks Post Training Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reaction</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Knowledge</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>Behaviour</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>Outcomes</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
a Chi-square value of 39.11, which was significant (p< 0.01). The third knowledge question about the teach-back method rendered a Chi-square value of 33.91, which was significant (p< 0.01). The fourth knowledge question about documentation of patient education rendered a Chi-square value of 21.91, which was also significant (p< 0.01). Each of the measures of Kirkpatrick’s level two for knowledge related to patient education showed a significant increase from baseline pre-intervention (see Table 2). Figure 3 illustrates this positive knowledge shift.

Third Level of Evaluation: Behaviour

The third level of evaluation measures the degree to which the participants applied their learning in their practice. This evaluation was assessed as a baseline before the intervention, immediately following the intervention, and three to six weeks post intervention. Behaviour areas that were measured included: assessing patient education needs, incorporating the teach-back method, and documentation of patient education. A non-parametric Friedman test of differences among repeated measures was conducted on the three different behavioural assessments related to patient education. The first behaviour question about assessing patient educational needs rendered a Chi-square value of 35.90, which was significant (p< 0.01). The second behavioural question about the use of the teach-back method rendered a Chi-square value of 25.33, which was significant (p< 0.01). The third behaviour question about documentation of patient education rendered a Chi-square value of 25.33, which was also significant (p< 0.01). Each of the

Table 2: Results of the knowledge assessment pre and post the intervention.

<table>
<thead>
<tr>
<th>Time</th>
<th>Pre-Intervention (n=45)</th>
<th>Post-Intervention (n=44)</th>
<th>3 to 6 Weeks Post (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response:</strong></td>
<td>Assessment</td>
<td>Health Literacy</td>
<td>Teach-Back</td>
</tr>
<tr>
<td>Very Low</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Low</td>
<td>3</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Moderate</td>
<td>29</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>High</td>
<td>12</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Very High</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 2: Kirkpatrick Level 1 Results: Reaction of Participants to the Education

Figure 3: Shift in knowledge related to patient education pre and post intervention.
measures of Kirkpatrick’s level three evaluation for behaviour related to patient education showed a significant increase from baseline pre-intervention (see Table 3). Figure 4 illustrates this positive behaviour shift.

The participants were asked to score the degree to which the mnemonic helped them to remember the steps for patient education pre-intervention, post-intervention and three to six weeks post intervention. A non-parametric Friedman test of differences among repeated measures was conducted on this data and rendered a Chi-squared value of 6.96 with a p-value of 0.03. The participants scored the value attached to the mnemonic quite high prior to the intervention; 49% of respondents agreed (22/45 participants) and 31% strongly agreed (31/45 participants) that the mnemonic was beneficial. Immediately post intervention, participants still scored the value attached to the mnemonic quite high with 42% of responses agreeing (19/45 participants) and 44% strongly agreeing (20/45 participants) that the mnemonic was beneficial. Three to six weeks following the intervention, these rates continued to be high, but declined from initial measurements with 47% of participants (17/36) agreeing and 25% (9/36) strongly agreeing that the mnemonic was beneficial. These results did not change significantly from pre-intervention to the post intervention time points (see Figure 5).

The participants were asked to list the steps for patient education before the education session, immediately following the session, and during the three to six weeks following the education. The list was expected to include checking for patient understanding, adapting education, reassessing comprehension utilizing the teach-back method, and documenting the patient response. A non-parametric Friedman test of differences among repeated measures was conducted on the response and rendered a Chi-squared value of 22.56, which was significant (p < 0.01). The participant’s ability to list the steps for providing patient education increased significantly from pre-intervention, as illustrated in Figure 6.

**Fourth Level of Evaluation: Results**

The fourth level of evaluation measures the degree to which results were accomplished because of the educational intervention. This evaluation was completed through a review of the staff members’ documentation of patient education in patient charts before and after the intervention. The Pearson Chi-squared value calculated for the documentation of patient education showed a significant increase from baseline pre-intervention (see Table 3).
education was 3.43 with a significance of 0.064, which is not significant. There were no cases of full documentation encompassing the topic taught and the patient response in the 12 charts audited prior to the intervention; three cases of full charting were noted in the 12 charts audited post-intervention (see Figure 7). These numbers encompassed all of the autologous transplant patients during one month pre and one month post the intervention.

**DISCUSSION**

In this pilot study, the education provided to staff on patient education was well received; the participants indicated that the education was relevant, effectively presented, and beneficial to their health care team. The results also showed a significant increase in knowledge of patient education in the areas of assessment, health literacy, teach-back, and documentation of patient education from baseline pre-intervention, as well as in the scores related to self-reported behaviour concerning patient education and the capacity to list the steps of the education process. The participants scored the value of the mnemonic in recalling the steps for patient education as very high prior to the intervention likely in anticipation that this would assist them to remember. Subsequently there was no significant change in this score, as it remained high immediately post-intervention and only dropped slightly by three to six weeks post intervention.

The chart audit was completed to assess documentation outcomes following the intervention. While there were no incidences of full documentation (i.e., included the topic taught and the patient response) prior to the educational intervention, there were three charts with full documentation found after the intervention. As the education did not encompass the entire staff, capturing 45 of the 75 staff providing care to these patients, this may have had an effect on the charting results. While 36 nurses received the educational intervention during the study, it was difficult to assess if one of these nurses was caring for the patient at the time that the patient required an educational intervention. This study only scanned for a minimum of one documentation about an educational intervention during the hospitalization, which would be the minimal expectation.

A further limitation to the chart audit results is the difference between the electronic inpatient and paper-based outpatient charting methods at the time of the audit. While there were no incidences of full documentation (i.e., included the topic taught and the patient response) prior to the educational intervention, there were three charts with full documentation found after the intervention. As the education did not encompass the entire staff, capturing 45 of the 75 staff providing care to these patients, this may have had an effect on the charting results. While 36 nurses received the educational intervention during the study, it was difficult to assess if one of these nurses was caring for the patient at the time that the patient required an educational intervention. This study only scanned for a minimum of one documentation about an educational intervention during the hospitalization, which would be the minimal expectation.

A further limitation to the chart audit results is the difference between the electronic inpatient and paper-based outpatient charting methods at the time of the audit. This limitation may have been mitigated by incorporating a pre- and post-intervention visual audit or observation of nurses teaching patients to capture if the steps in providing patient education occurred, with the exception of documentation. In addition, the completion of clinical documentation is affected by other factors beyond this intervention, including 1) time available for full documentation, 2) training specific on core elements of documentation, and 3) the electronic medical records system to support effective documentation and retrieval in busy clinics. It may also be beneficial to re-enforce the education by providing follow-up discussions and reminders to staff regarding the mnemonic, the steps for providing patient education, and
documentation. Wallner and Bäuml (2017) found that retrieval of information over time increased when there was repetition of the information. In addition, continuing this chart audit beyond the three- to six-week time period could have measured for sustained retention of the education.

Additional memory aids have been identified in the literature in addition to mnemonics. Some of the methods that have been shown to help increase retention of educational information by nurses include kinesthetic learning, flash cards, creative projects, and the use of repetition (Alton, 2016; Wagner, 2014). This study reviewed only one potential memory aid in isolation. Future studies comparing the effectiveness of different types of memory aids, including mnemonics, would be beneficial.

A further limitation of this study is the small sample size. This study took place at one centre and reviewed patient education provided to a specific patient population at that centre. This narrow focus limits the generalizability of these results to other clinics or centres.

**CONCLUSION**

The purpose of this study was to explore whether a mnemonic memory aid, introduced during education on providing patient education, would help nurses to recall the steps involved in patient education at each visit. The results of the study indicate that this approach was an effective method to increase both the knowledge and the behaviour of participating nurses when providing patient education.

Further studies are required to evaluate the effectiveness of training programs for practising nurses, patient education strategies, and the use of pragmatic approaches to training.

For example, this study can be replicated on the use of mnemonics at other centres, as well as in other areas of health care continuing education to assess the overall usefulness for mnemonics in staff education. If our finding is supported by other studies, the next step could involve a randomized controlled trial comparing conventional nursing staff education without a memory aid to the use of a mnemonic to further test the unique contribution of mnemonic aid in improving standardized patient teaching and education.

**REFERENCES**


