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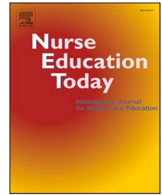

Research article

Perspectives of nursing students on end-of-life nurse education: A qualitative study of the guided death experience

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A R T I C L E I N F O

Keywords:
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A B S T R A C T

Background: Although various studies reported on educational methods for end-of-life care, there is lack of evidence on how nursing students experience simulated death.
Objectives: This study explored the experiences of undergraduate nursing students who participated in a guided death experience.
Design: The research utilized a qualitative descriptive design.
Settings: The research was conducted at a Japanese university nursing school.
Participants: A total of 82 nursing students were recruited to complete an end-of-life course in which they participated in a guided death experience as part of their third-year curriculum.
Methods: Descriptions of the guided death experience were analyzed using content analysis.
Results: Nursing students' experiences in the guided death experience fell into two main categories: "subjective experience of immersing oneself in the world of the patient who is dying" and "formation of nursing perspectives of end-of-life care." The former focused on subjective experiences of nursing students vividly expressing their own emotions such as grief, anger, fear, and depression during the guided death experience process. The latter expressed recognition of the essence of end-of-life-care through the guided death experience, such as thinking about needs of the person who is dying, being present, and listening to the individual.
Conclusions: In end-of-life nurse education, the guided death experience allows students to face first-person death. This fosters a core view of nursing in palliative and end-of-life care. Overall, the guided death experience is an important means of preparatory education for relevant clinical practice.

1. Introduction

In clinical practice, nurses may be assigned major care roles of monitoring and supporting people at their end of life (EOL) and their families. People who are dying exhibit emotional reactions, such as anxiety, denial, and anger toward intolerable stress plus physical, mental, social, and spiritual pain (Kubler-Ross, 1969). Nurses involved with people who are dying and their families may themselves experience complicated emotions and stress, making EOL caregiving more difficult (Anderson et al., 2015; de Carvalho et al., 2005). Studies suggested that nurses caring for people with cancer at the EOL are at risk of experiencing intense psychological fatigue and burnout, because of both the cancer's seriousness and difficulty controlling its symptoms (Alacacioglu et al., 2009; Yun et al., 2009).

Given the intense nature and difficulty of EOL care, practitioners and scholars worldwide recommended enhanced education for over 30 years (Allchin, 2006). Such provisions are often mandatory; for example, Japanese students must gain practical ability to support people at their EOL and their families upon graduation from basic nurse education.

Providing nursing graduates educational training in high-quality EOL care is a global concern (Royal College of Nursing, 2002). Pedagogical methods supporting EOL training include simulation education and basic nursing instruction (Gillan et al., 2016; Tamaki et al., 2019), wherein students place themselves in nursing positions to improve their knowledge, cognition, and attitudes toward EOL care. However, educational support remains insufficient for helping nursing students and new nurses deal with practical experiences related to death and emotion (Cavaye and Watts, 2010).

EOL care education starts with thinking about the nature of death. Jankelevitch (1994) introduced the "personal death" perception concept, with classifications for first-, second-, and third-person deaths. First-person death involves the self, second-person death involves those

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most familiar and important to individuals (e.g., family and friends), and third-person death involves others (e.g., media-reported deaths). In clinical training, nursing students focus on one person's optimal practical care, and death of a person who has become important to the student is second-person death. This enables learning about the need for specialized knowledge and skills in EOL care while instilling a sense of responsibility and ethics (Allchin, 2006; Yoshida et al., 2021).

Nurse education emphasizes the importance of understanding the person and incorporates numerous exercises—including re-experiencing and pseudo-experiencing—to help students think from the subjects' perspective to understand the person and their own professional care provider role (Miyake et al., 2005; Perot et al., 2020). These exercises deepen students' understanding of the person by intentionally creating experiences. Students are prompted to think “if I were an older person” or “if I had a visual impairment,” thus encouraging simulation of the given condition, disability, or illness (Bamakan et al., 2021; Bonito, 2019). In EOL care education, students experience simulated first-person death, including the types of emotion or thoughts one's own death brings, to facilitate deeper understanding of the person who is dying while increasing interest in—and motivation for—EOL nursing.

Basic nurse education should approach an understanding of first- and second-person death, and connect this to constructing a perspective of assistance—which is the basis for EOL care. Various schools offer the guided death experience (GDE), which is an important component of EOL care education. In Washington state, USA, for example, the GDE is widely practiced as a death education task in various settings, where individuals are prompted to think deeply about death (Shimojima and Gamou, 2009).

The GDE simulates first-person death. Typically, human death is not sudden but a gradual and conscious process. In Japan, the GDE facilitates general university students' awareness of the importance of life and death as a process (Shimojima and Gamou, 2009). Nursing students must face people who are dying in clinical practice. We included GDEs in their EOL care education, anticipating that experiencing changes people undergo during the dying process will encourage students to consider how best to support these people and their families during this time. The literature lacks detailed evidence on the educational significance of the GDE in nursing, including how it is experienced by undergraduate nursing students.

To address this gap, we investigated the conditions at University A, where simulation-based GDE education was incorporated into undergraduate EOL care classes. This study thus described the experience of nursing students during the GDE and discussed its educational significance.

2. Methods

2.1. Design

Employing a qualitative descriptive approach, we conducted all research in compliance with the consolidated criteria for reporting qualitative research or COREQ checklist (Tong et al., 2007).

2.2. Participants

We recruited 82 third-year nursing students who had taken an EOL care course at University A in 2018, all of whom agreed to participate in this research. During recruitment, we posted the study's overview on the university's website homepage and bulletin board. The posted material included assurances that participation was voluntary, students had the right to refuse to participate in the study, and participating (or not participating) would have no effect on their grades (see Section 2.6. Ethical considerations).

2.3. GDE

The GDE is an experiential program that simulates first-person death, focusing on loss during the dying process (see Table 1). Participants are given colored cards to write down “things important to them” according to the practitioner's instructions for each card color (e.g., write “important person” on a pink card). Then, the practitioner slowly recites the story of a certain person's dying process. Participants listen to the story while imagining themselves as “you” in the story. At several points in the story, the participants choose a card that is important to them and rip and discard it according to the practitioner's instructions. The practitioner creates this story after careful consideration of its setting and flow, so that participants can easily understand the issues presented (i.e., more easily imagine themselves in the story; Shimojima and Gamou, 2009). In this study, the GDE was conducted by the nursing teacher, who was also members of the research team (KO).

2.4. Data collection

The GDEs were conducted in a regular university lecture hall with all students enrolled in the EOL care module. After the GDE, participants were encouraged to reflect on their experiences using free-response forms to describe what they “felt, thought, noticed, and learned” (by participating in the GDE). To emphasize differences across participant responses, we included free-form data from all students enrolled in this module, rather than only considering data from specific participants (Graneheim et al., 2017).

2.5. Data analysis, trustworthiness, and rigor

Our analysis used Krippendorff's (2013) content analysis approach, which emphasizes the data's context and meaning to make valid inferences. The first author reviewed all data, separating them within a range that did not impair their contextual meaning, and extracting or coding the descriptive components related to the research purpose. We raised the level of abstraction according to the similarity of the meaning and content of the code and subcategorized accordingly. Based on the subcategories' similarities and differences, we compared and grouped them into categories with a high degree of abstraction that could express essential meanings. The categories' level of abstraction was also increased. After independent analysis, we repeatedly reviewed all analyses to ensure their credibility and authenticity. One researcher then comprehensively audited the full results to further ensure validity. Our research team has robust experience in qualitative and quantitative methods, as all members have acquired or are acquiring doctorate degrees. Audit trails and peer debriefing were used to improve trustworthiness and ensure rigor in our textual interpretation (Morse et al., 2002).

2.6. Ethical considerations

This study was approved by the ethics committee of the university affiliated with the authors. We published relevant information on both the university website and student bulletin board to ensure participants had the opportunity to opt out. Data from participants who opted out were immediately excluded. We assured all participants that their personal data would not be used for research purposes. All direct quotations in this paper are anonymized.

3. Results

We collected descriptions from 82 participants (76 women), all aged in their early 20s. The analysis revealed 40 subcategories, which were sorted into 11 categories (Table 2). Among these, two categories strongly characterized how nursing students experienced the GDE: “subjective experience of immersing oneself in the world of the person

Table 1
Overview of preparation and stories for the guided death experience (GDE).

Preparation by practitioner	To ensure GDE immersion, we created a story about osteosarcoma, which is predominant in young people. The environment was arranged such that subjects could concentrate on the GDE story as much as possible (e.g., leave space for seats between people, play music, dim lights in lecture room, encourage subjects to close their eyes and relax). The practitioner instructed the participants to read the GDE story and work according to the instructions. In several scenes of the GDE story, the participants selected one or two "cards you can give up". They were then instructed to tear them and place them in an envelope.	
Preparation by participants and task completion	Participants were dealt 16 cards, including four in each of four colors (light blue, green, yellow, pink). They then wrote four items each on the four cards, as follows: "important tangible things" for the light blue cards, "important activities" for the green cards, "important intangible things" for the yellow cards, and "loved ones" for the pink cards. These cards were torn according to the practitioner's instructions while listening to the readings of the GDE story, then discarded by placing them in an envelope.	
GDE storyline	**GDE story content**	**Number of cards**[a]
Appearance of symptoms	"You" lived a peaceful university life, attending lectures and engaging in club activities. One day, "you" notice a slight pain in your right knee while getting dressed. The pain increases. While being examined by a physician approximately one month later, "you" are told that a tumor is suspected. "You" go to a university hospital and make an appointment for a detailed examination.	1
Days until definitive diagnosis	During the 10 day-period between the detailed examination and explanation of the results, you only think about your illness or death, and feel uneasy.	1
Exacerbation of symptoms	While going to the university hospital to hear the test results, the symptoms in your right knee worsen. It also becomes difficult to move.	1
Announcement of suspicion of illness	You are notified that osteosarcoma is suspected, according to the results of the university hospital examination.	1
Definitive diagnosis/ notification	You are notified that it is high-grade osteosarcoma.	2
Experiencing the painful side effects of chemotherapy	You take a leave of absence at the recommendation of the attending physician. After being hospitalized and undergoing chemotherapy, you observe side effects, including loss of appetite and hair loss. You become worried about the future. The number of visits from friends decreases.	1
Amputation of lower limbs	You are given two types of chemotherapy, followed by amputation below the right knee.	2
Notification of disease progression and discontinuation of treatment	You continue the chemotherapy, as suggested by the physician, but the effects are insufficient. Respiratory symptoms begin to appear, and metastasis to the lungs is found. The physician states that no further treatment is available and recommends transfer to a palliative care hospital for medical treatment.	1
At-home care/hospitalization to palliative care ward	You are temporarily discharged from the hospital and spend time at your parents' home, spending time with childhood friends and other friends. Afterwards, you are hospitalized in a palliative care hospital, where the nurse will listen to your reminiscing and provide you with hot compresses. There are visits from faraway relatives and friends, and you realize that your death is approaching.	2
Increased dose of analgesics/ clouding of consciousness	During medical treatment at the palliative care hospital, the pain increases, and the attending physician increases the dose of analgesics. Your consciousness becomes cloudy.	2
Appearance of dyspnea	Strong dyspnea appears, and you realize that today is the day you will die.	1
	Your breathing slows down, and your dyspnea feels stronger.	1
Last breath	You take a slow, deep breath, which is your last breath, and you die (you are informed that you have died).	
Ending the GDE	The practitioner turned on the lights in the room and repeated the message "You are now alive" to the participants, encouraging them to take a breath of fresh air and return to the world of the living.	

[a] Number of cards that participants tore up and discarded as the GDE progressed.

who is dying" and "formation of nursing perspectives on EOL care." The former focuses on the subjective experience of students vividly expressing their own feelings during the GDE process. The latter expresses recognition of the essence of EOL care through the GDE experience (Table 2).

Sections 3.1 and 3.2. describe all 11 categories and present excerpts from the data to demonstrate how we derived our interpretations.

3.1. Subjective experience of immersing oneself in the world of the person who is dying

Participants reported various emotions during their first-person death simulation in the GDE. They expressed sadness and pain when parting with loved ones, losing items of importance, and leaving fond environments. These complex emotions were difficult to describe but generally included sadness and desolation. The following quotations pertain to the extracted codes:

I even felt guilt, and it was a truly trying and painful experience.

(P21)

I felt not only fear in the process of dying and the sadness of losing things that are important to me but also feelings that I could not put into words, like a vague anxiety.

(P67)

I felt a strong sadness, conflict, and resignation about wanting to live a little bit more, but that I was soon going to die.

(P59)

I felt various mixed emotions, such as sadness, emptiness, and strain.

(P38)

Participants reported depressive feelings of not wanting to meet others and sorrow or guilt over those they would leave behind:

I didn't feel like myself, and I didn't want to meet other people.

Table 2
Participant experiences with the guided death experience (GDE) as outlined in the subcategories, categories, and main categories.

Subcategories	Categories	Main categories
Sorrow over separation from loved ones	Negative emotions in the dying process	Subjective experience of immersing oneself in the world of the dying patient
Sadness for separation from important things and the environment		
Feeling lonely		
Fear of dying		
Regret of not having done something while alive		
Resignation to the process of dying		
Loss of hope		
Pain of losing loved ones		
Pain of losing important things and the environment		
Sadness over parting with others		
Shock		
Complex feelings that are difficult to express		
Feeling tired		
Feeling depressed	Negativity toward others	
Feeling sorry for the bereaved		
Anger toward healthy people and medical professionals	Anger toward healthy people and medical professionals	
Characteristic disappointment with death	Feeling unable to accept death	
Losing of self-worth	Losing of sense of self	
Realization of what they want to do (while still alive)	Desire and hope for life	
Hope for what they can do in the remaining time		
Beginning of strong feelings for life		
Realization that they are alive		
Acceptance of death (peaceful feeling)	Acceptance of and gratitude for death	
Gratitude for things taken for granted		
Gratitude for health and life		
Realization of the importance of connections with others		
Considering what you can do as a nurse	Awareness of the nursing needs of the dying patient	Formation of nursing perspectives on end-of-life care
Understanding the complex psychology of the dying person		
Empathic understanding of changes in emotion during the dying process		
Recognizing the importance of understanding the psychological process toward death		
Consciousness of the difficulty of understanding patients who are dying		
Consciousness of the importance of understanding the values of the patient		
Realizing the importance of being close to the patient as a nurse		
Thinking about how to provide necessary care to patients who are dying		
Importance of helping support the patient's wishes as a nurse		
Opportunity to face yourself	Recognition of one's own values	
A chance to reaffirm what is important to you		
Facing up to death		
Recognition of the impact that the words and actions of healthcare providers have on patients	Recognition of the influence of the attitudes of healthcare providers toward the dying patient	
Willingness to use the experiences during the survey (simulated death) in nursing and learning	Increased motivation for end-of-life care	
Imagining the ideal nurse who will provide end-of-life care		

(P18)

They described feelings of anger toward healthy people and the medical personnel:

> *I felt an anger of "why me," while the people around me are healthy.*
> (P1)

> *I felt anger toward the doctor's words of there being no more treatment.*
> (P6)

As participants approached the end of the GDE narrative, they realized they were not ready for death. This inability to accept death grew stronger:

> *I was unable to accept my own death until the very end, and I always thought, "I still want to live, I don't want to die."*
> (P54)

They said that their sense of self was greatly shaken, threatened, or lost:

> *I lost what I had cherished in my own life, and I didn't know what the meaning of my life was.*
> (P27)

> *I felt that my life had changed by 180 degrees as soon as I was diagnosed with the illness.*
> (P29)

> *I felt like a part of my body was being torn off, and I felt like I wasn't myself.*
> (P58)

Some participants were aware of what they wanted to do while still alive and hoped for what they could do in their remaining time. They also expressed an emergence of strong emotions toward "life" and the feeling of being alive, as induced through the death process:

> *I wanted to meet loved ones while I could and spend time with them as much as possible.*
> (P19)

> *As various feelings swirled about, there was always the hope that "maybe I'll be cured."*
> (P2)

As participants approached death, they felt gratitude for things they had taken for granted, including health and life. This instilled both calmness in the death process and acceptance. Participants realized the importance of connecting with people until the very end:

I can directly feel that I am alive right now, and that my living right now should not be taken for granted.

(P73)

As I receive this lecture (in this way right now), I felt gratitude for how I can breathe, and for each and every thing.

(P24)

3.2. Formation of nursing perspectives on EOL care

Participants expressed thoughts on EOL-care-related awareness, recognition, learning, and nursing perspectives after the first-person GDE. After experiencing first-person death, participants adopted the perspective of second-person death, gaining an awareness and understanding of the nursing needs of people who are dying. They were more aware of psychological complexities of the people who are dying and better able to empathize with their fluctuating feelings. In turn, they recognized the importance of the psychological process occurring during death. Simultaneously, they directly experienced the difficulty of understanding a person who is dying. After recognizing the importance of these critical psychological aspects as nurses, they expressed the need to understand the patient's values, remain close to them, and offer assistance that supported their wishes. Finally, they expressed their thoughts on ideal EOL care:

When I truly experience death, I think I will repeatedly feel more worried, angry, sad, and so on. I felt that the emotional conflict of patients is more complicated.

(P37)

I don't feel like I completely understood the feelings and situations of people who are dying (because it was a simulated experience), but I thought that it would be good if I can remember as much of this experience as possible when working with people who are dying.

(P50)

Each person has their own important things, but I would like to be involved with patients by observing their words, expressions, and narratives, and communicating with them so that they can come to terms with the end of their life and spend as much of their time as possible without regrets.

(P14)

When nursing a person who is about to die, I want to be able to get closer to that person's feelings and make an effort to be close to them.

(P74)

According to participants, the GDE was an opportunity for introspective thought, wherein they recognized the importance of things. This was also the first time they had faced their own deaths:

It was the first time that I thought specifically and realistically about death.

(P21)

I never thought about death in my daily life, but I realized that I had to think more about death before entering clinical practice.

(P9)

As participants described, nurses were aware that they were closest to persons who are dying and their families:

I directly felt again that medical staff must support the family because they are the people close to the patient.

(P27)

The participants were motivated to use their GDE in nursing and learning and also formed their own image of the ideal EOL-care nurse:

I haven't fully formed what death is for myself yet, but I developed a firm resolution to be a nurse who can think about the patient's feelings first.

(P15)

I felt that even if the patient is dying, it is necessary to provide assistance, such as creating an environment where the patient can live the rest of their life as themselves.

(P40)

I want to be emotionally close to patients as a nurse and think about death along with the patient.

(P19)

4. Discussion

Our content analysis revealed two main categories: (1) subjective experience of immersing oneself in the world of the person who is dying and (2) formation of nursing perspectives on EOL care. These findings suggest that the GDE is an important educational activity. Participants reported notable subjective experiences during the death process, including grief, anger, anxiety, fear, depression, helplessness, regret, and spiritual distress. Despite strong attachment to life, they expressed varied psychological states and changes in the death process, including acceptance. This is in line with previous reports on the psychology of people who are dying (Cavaye and Kübler-Ross, 1969; Ruijs et al., 2013; Seow et al., 2021). Participants gained greater awareness of the nursing needs of persons who are dying. They reported emotional experiences similar to those of people at the EOL, as the GDE prompted them to simulate suffering from malignant disease, receiving treatment, fighting the illness, and ultimately dying without treatment. This led to the recognition of the need to provide psychological care to the person who is dying. Ando et al. (2020) reported that the GDE could elicit psychological states and emotions such as fear of death, loneliness, and deep sadness. We expanded on Ando et al.'s (2020) observations through detailed data extraction and analysis, revealing greater diversity of subjective emotional experiences—such as those reflecting the psychology of people who are dying. Overall, the GDE induced extraordinary subjective emotional experiences that helped participants develop their future outlook, better understand the importance and complexity of EOL psychology, and become aware of the difficulty associated with understanding people who are dying. These experiences helped participants recognize these aspects of nursing. Our results suggest that the GDE is an important educational strategy for enhancing cognitive empathy in EOL care.

In psychology, empathy is a multidimensional structure that integrates cognitive and emotional definitions pertaining to the understanding of and surrogate emotional responses to others' psychological states (Suzuki and Kino, 2008). For nurses, Mochizuki (2007) emphasized the importance of cognitive empathy, which involves understanding the situation of the person receiving care, as opposed to emotional empathy, wherein individuals experience the same emotions as another person. Our results capture the structure of what participants experienced during the GDE, including subjective emotions during the dying process by temporarily adopting the perspective of the person who is dying and then adopting the perspective of a nursing student. They thus recognized the importance of understanding the psychological and care needs of people who are dying.

We also obtained important findings pertaining to spiritual pain, represented by the loss of the sense of self. As a practical barrier, spiritual pain is difficult for clinical nurses to understand and address (Kariya, 2018; Rushton, 2014). Nurse education and clinical practice should offer opportunities facilitating a deeper understanding of this concept. The GDE provides the ability to experience subjective spiritual pain, thus constituting a critical educational opportunity promoting awareness of

the condition itself and relevant care provisions, similar to Suzuki and Kino (2008), wherein students recognized the need for spiritual care. Ando et al. (2020) noted that learning based on a religious background (Catholic) during students' nursing degrees can create awareness of spiritual care. However, our participants experienced spiritual pain and developed awareness of spiritual care through a first-person death simulation, highlighting the potential learning through a GDE.

Participants reported positive emotions, including gratitude for health and life. As in Arata et al. (2019), clinical nurses are motivated to grow professionally through "awareness that life should not be taken for granted as a result of a patient's death." Currently, basic nursing's clinical training component provides only limited opportunities to understand people at EOL, which restricts students from cultivating nursing perspectives through people's death. In a GDE, imagining and confronting one's own death induces positive feelings toward life, which promotes better perspectives on clinical nursing. However, few studies on EOL nurse education reported on simulated first-person death experiences. This study contributes strongly to the literature by revealing the GDE's potential in areas related to emotions and thoughts during the death process, albeit in a simulated manner.

Through the GDE, subjective immersion in the world of people who are dying helped participants gain meaning, develop new perspectives on nursing, and improve attitudes toward EOL. This is reflected by several categories revealed through our analysis, including recognition of one's own values, recognition of how attitudes of health providers influence people who are dying, and increased motivation for EOL care.

As nurses play central roles in clinical EOL care, students must be prepared for this. However, many lack the ability to provide quality and compassionate EOL care (Johnson et al., 2009; Ramjan et al., 2010) and "[want] to avoid working in the field of palliative care and hospice because they [want] to avoid the negative emotions that are caused by working with death" (Dobrowolska et al., 2019).

In this study, participants became aware of the needs of people who are dying, including the requisite nursing care. They realized the need to support patients' quality-of-life until death and described a strong desire for such practice, including respecting the person's values and hopes; striving to understand their feelings; remaining close to them; and helping them spend their last moments without regrets. The GDE encourages nursing students to learn the basic concepts of palliative care, which lead to educational outcomes contributing to an intrinsic motivation for EOL care (World Health Organization, https://www.who.int/). This suggests the possibility of overcoming issues related to EOL care readiness.

Several studies on clinical EOL training reported the importance of knowing one's own death and any related values and beliefs (Cheon and You, 2022; Hold et al., 2015), including understanding the importance of "just being there," protecting a person's dignity, adopting a respectful attitude, and being "close by" both the person and their families. The GDE helped our participants learn the importance of proximity to people who are dying while allowing them to consider their own views on life and death. The COVID-19 pandemic made the implementation of clinical training difficult (Liu et al., 2020; Palmer et al., 2021), and students may have been unable to experience robust EOL nursing care. Nevertheless, the GDE produces important learning outcomes for those who will provide EOL care, including a better understanding of the importance of respecting persons who are dying and maintaining their dignity.

This research was based on findings obtained at one time point from experiences of third-year undergraduate nursing students from the GDE. Further research is needed to accumulate knowledge of the GDE's educational effects, including longitudinal studies to evaluate the GDE's impact on students' and nurses' professional practice.

The use of free-form descriptions enabled us to gain a broad range of insights into our participants' experiences with GDE. To deepen this understanding, future studies should conduct participant interviews. Although this study clarified nursing students' experiences by introducing the GDE in an EOL education context, interpersonal differences may exist depending on the experience's frequency and degree of immersion. This highlights the need for quantitative research.

5. Conclusions

Our findings suggest that the GDE is an important educational activity when teaching EOL nursing care. Participants were given the opportunity to face first-person death, which effectively fostered core perspectives of nursing in palliative and EOL care. Thus, the GDE is an important preparatory component for nursing students learning how to implement EOL care.

Ethical approval

This study was approved by the ethics committee of Tottori University (Record Number 20A005, April 2020).

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CRediT authorship contribution statement

Keiko Oba: Investigation, Conceptualization, Methodology, Writing – original draft, Supervision, Project administration. **Chika Tanimura:** Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Yoshimi Noguchi:** Methodology, Formal analysis. **Masami Chujo:** Validation, Visualization. **Shin-Ichi Yoshioka:** Methodology, Conceptualization, Formal analysis, Project administration, Supervision.

Declaration of competing interest

None.

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