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Nurse leaders' perspectives on a feasibility randomized controlled trial evaluating an online training program to improve evidence-based leadership: a qualitative descriptive study

Shuang Hu^{1,2}, Siying Liu³, Huiping Hu⁴, Jiale Hu⁵, Batool Shumaila⁶, Wenjun Chen¹, Qizhi Yang⁷, Gaoming Liu³, Maritta Välimäki^{6,8*} and Xianhong Li^{1*}

Abstract

Background Qualitative evaluation is crucial for leadership feasibility RCTs, as it deepens the interpretation of findings and informs definitive trial design. Yet, such evaluations are lacking. This study describes nurse leaders' perspectives on a feasibility RCT evaluating an online training program to improve evidence-based leadership.

Methods This qualitative descriptive study followed a feasibility RCT. Using purposive sampling, we recruited nurse leaders from the intervention group. From August 15 to August 24, 2023, we conducted five focus group interviews with 25 participants. Data were analyzed using content analysis, focusing on four feasibility categories: (1) intervention content and delivery, (2) trial design, conduct, and processes, (3) outcomes, and (4) measures. The reporting of the study was guided by the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.

Results Participants valued the training but found its complex content challenging to understand and apply in daily practice; this led to specific suggestions for refinement (Category 1). They emphasized the need for leadership training to be accessible to all nurses, recommending either entry requirements or multi-level training tailored to different competency levels (Category 2). For outcome evaluation, they proposed replacing "self-efficacy" with "evidence-based leadership efficacy" (Category 3), developing targeted assessment tools for evidence-based leadership, and incorporating qualitative methods to assess the intention to leave their professional role or workplace (Category 4).

Conclusion This study pioneers the qualitative evaluation of a feasibility RCT focused on leadership training, providing participant-informed insights across key feasibility domains. The findings yield valuable insights for

*Correspondence:
Maritta Välimäki
marittav@hkmu.edu.hk
Xianhong Li
xianhong_li@csu.edu.cn

Full list of author information is available at the end of the article



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enhancing the feasibility and effectiveness of future evidence-based leadership training programs utilizing RCT designs. Furthermore, they offer practical guidance for developing leadership interventions in comparable contexts.

Trial registration This trial was prospectively registered at ClinicalTrials.gov (NCT05244499) on February 7, 2022. The protocol and feasibility RCT are published in peerreviewed journals.

Keywords Descriptive qualitative study, Evidence-based leadership, Feasibility randomized controlled trial, Leadership, Nurse leader, Online training

Background

AQ1 Leadership training is a critical strategic priority, with U.S. organizations investing approximately \$102 billion in employee training in 2023, of which 12% was dedicated to leadership development [1–3]. Despite this substantial investment, a significant leadership competency gap persists [4]. Leadership competence is a multidimensional process of influence exerting direct and indirect influence on individuals, their environment, and organizational infrastructures [5]. Alarming, only 13% of organizations consider their leadership training initiatives successful [4]. This shortfall stems from two key challenges [2, 4, 6]: both a systemic failure in organizations to cultivate enough capable leaders, and a common lack of essential leadership competencies among individuals. These issues highlight fundamental flaws in current leadership training initiatives, raising serious concerns about their overall effectiveness [6].

Feasibility randomized controlled trials (RCTs) serve as a critical methodological milestone to improve the future effectiveness of leadership training and the efficient use of research resources [7]. Defined as small-scale randomized studies conducted before a definitive RCT, their purpose is to evaluate the practicality and workability of the planned research protocol [7]. In this context, feasibility asks the question ‘can the trial be done within existing contextual constraints?’ [8]. For the planning of a definitive RCT, this phase is indispensable as it enables researchers to identify and mitigate fundamental issues, such as recruitment challenges and intervention fidelity, before scaling up [9]. By facilitating protocol refinement during the development phase, feasibility RCTs help ensure that substantial resources are not committed prematurely and reduce the likelihood that costly large-scale studies produce inconclusive or ineffective outcomes [7, 10].

Feasibility RCTs utilize diverse methods to optimize trial protocols [8]. While quantitative methods provide generalizable data on feasibility metrics, such as recruitment rate [11], they cannot explain the underlying “why” and “how” behind these metrics [12]. Consequently, qualitative evaluation is increasingly emphasized [8]. By offering valuable insights into participants’ experiences and needs, it helps researchers refine study protocols to enhance the prospects of a definitive trial [10,

13]. Moreover, qualitative methods help elucidate the inherent complexities of feasibility RCTs [10]. For example, they can reveal unexpected barriers to intervention adherence or participant burden that quantitative metrics alone cannot capture [14], fostering a more comprehensive understanding of the challenges and potential for success of these studies. Therefore, qualitative assessment is crucial for leadership RCTs, as it moves beyond determining whether a trial is feasible to explaining why and how feasibility outcomes occur, strengthening the interpretation of findings and informing subsequent definitive trials [15].

We conducted a targeted literature search in Medline (Ovid) to identify existing feasibility RCTs focused on leadership. The search was limited to articles with “leadership,” “feasibility,” and “pilot” in the title and included studies published between January 2000 and November 2024, with no language restrictions. This search yielded three feasibility RCTs [15–17]; however, their assessments relied exclusively on quantitative metrics such as recruitment rates. Separately, four additional feasibility studies employing qualitative methods were identified [18–21]. It is noteworthy that these studies assessed feasibility outside of a randomized controlled design and focused solely on the intervention itself [18–21]. Thus, the current evidence base lacks qualitative insights into participant perspectives on the feasibility of conducting leadership RCTs. This absence hinders a nuanced understanding of trial feasibility and impedes evidence-based protocol refinement [15].

O’Cathain’s framework [10] provides a structured approach for integrating qualitative research into feasibility studies to understand the challenges of the feasibility RCT and inform the design of a future definitive RCT. According to this framework, the questions that a qualitative study can address fall into four categories: (1) intervention content and delivery, (2) trial design, conduct, and processes, (3) outcomes, and (4) measures. Guided by this framework, we conducted a qualitative evaluation to gain insights into nurse leaders’ perspectives on a feasibility RCT assessing an online training designed to improve evidence-based leadership competencies. In this study, evidence-based leadership competencies refer to a process of: identifying leadership problems in daily practice; collecting and analyzing organizational data to

gain a deeper understanding of the leadership problems; seeking solutions to identified leadership problems in the scientific literature; integrating stakeholder perspectives; integrating all sources of information into practice, and evaluating the impact in real-world situations [22].

While a quantitative evaluation of this feasibility RCT, conducted in China, demonstrated a certain level of feasibility and potential effectiveness [11], there remains a lack of in-depth participant perspectives. The intervention was designed specifically for nurse leaders, who are recognized as catalysts for practice change in healthcare, making their inclusion both theoretically and practically critical for assessing the feasibility of leadership RCTs [23]. This focus also addresses a literature gap: qualitative evidence from the perspective of nurse leaders, key stakeholders and end-users, remains scarce for this type of study [15–17].

Specifically, this study aimed to address four research questions corresponding to the framework's domains [10], namely, how nurse leaders describe: (1) the intervention content and delivery, (2) the trial design, conduct, and processes, (3) the outcomes of the intervention, and (4) the measures of the outcomes. The findings will directly inform the design of a future definitive leadership RCT and offer transferable insights for developing similar studies in comparable settings [24]. Furthermore, they will contribute to nursing leadership literature by identifying participant-informed strategies for improving intervention delivery and to nursing practice by offering actionable recommendations for leadership training design and implementation.

Methods

Design and theoretical framework

A qualitative descriptive study [25] was conducted to describe participants' perspectives regarding the feasibility of the RCT. This approach, grounded in the philosophical tenets of naturalistic inquiry, is particularly well-suited to applied research questions that seek rich, first-hand descriptions of participant experiences [26]. It was intentionally selected to align with the objectives of this feasibility study. Qualitative description enables a direct, pragmatic exploration of key feasibility domains, such as intervention content and delivery, without requiring highly abstract theoretical interpretation [25]. This was essential for capturing the authentic voices and practical insights of nurse leaders, which are crucial for informing the refinement of the study protocol before a future definitive trial [10]. Moreover, the core tenets of qualitative description acknowledge both the diversity of shared experiences and the intrinsic connections within human interaction [25]. Within the context of this feasibility study, these tenets supported our aim of understanding not only individual perceptions but also

shared or divergent views on the RCT's feasibility from nurse leaders' perspectives. The Consolidated Criteria for Reporting Qualitative Research (COREQ) [27] checklist was followed in reporting this study [see Additional file 1].

O'Cathain and colleagues' framework [10] was used to guide development of the focus group questions and data analysis (see 'Background' section for a detailed description). This framework helps researchers identify a comprehensive range of questions that are most effectively addressed through qualitative research during the feasibility stage [28].

The feasibility randomized controlled trial

Previously, we conducted a feasibility RCT to implement and evaluate an evidence-based leadership training for nurse leaders [11, 22]. Following the trial, the present qualitative study was conducted to describe the participants' perspectives on its feasibility.

In the feasibility RCT, potential participants were recruited from two tertiary hospitals via an online recruitment letter. Eligible participants were randomly allocated in a 1:1 ratio to either the intervention or control group. The intervention group received the online evidence-based leadership training. The training followed Kirkpatrick's Model [29], a framework for training evaluation that guided the development and evaluation of the training content. Focusing on the reaction, learning, and behavior levels, the training included the following seven modules: (1) orientation and leadership problem identification; (2) leadership problems and competencies; (3) collecting and analyzing organizational information; (4) evidence from the scientific literature to support problem-solving; (5) considering stakeholders' views; (6) implementation of evidence-based change; (7) evaluation of evidence-based change [22]. Participants were divided into small groups (11–12 participants per group) and participated in online lectures, peer-group discussions, and tasks. Training materials included voice-recorded PowerPoint presentations and reading materials. The training was conducted on the Xiaoe-Tech platform (<https://admin.xiaoe-tech.com>), accessible via mobile or computer. The intervention spanned nine months, with modules lasting 1–5 weeks. Each group was assigned to a tutor who provided support by giving feedback on tasks and answering questions throughout the training. Additionally, a tutor coordinated the training program to maintain its fidelity. The tutors were experienced researchers in leadership, and the program lead (who also served as a tutor) trained them before each module to ensure consistency and fidelity of the training. Three text message reminders were sent during each module to prompt participation. Participants were not required to complete a module within the 1–5 week period to

continue the training; they could access subsequent modules regardless of prior completion. Further details are available in the published feasibility RCT [22].

The control group accessed traditional digital educational materials via the same online platform over the same period. To control for variables, both groups followed identical module topics, schedules, tasks, and progress reminders. However, the content differed: the control group received more extensive reading materials (partially overlapping with, but more comprehensive than, those provided to the intervention group) to ensure that the materials covered each module topic. In addition, the control group did not receive video lectures, tutoring, feedback, or peer support, constituting a self-directed learning approach. Feasibility and potential effectiveness of the trial were assessed before and after the training [11].

Participant selection

Sampling

A purposive sampling strategy was employed [30], inviting all nurse leaders from the intervention group only to participate. This approach ensured that all participants had direct exposure to the intervention [30], thereby providing valuable insights into its feasibility and that of the study design. In this study, nurse leaders are defined as nurses “in managerial positions who are responsible for managing daily activities and long-term goals for a healthcare organization, regardless of their hierarchical level (middle or senior) [31]”. The inclusion criteria for nurse leaders were as follows: (1) participating in the online evidence-based leadership training; (2) being assigned to the intervention group, and (3) willingness to share their perspectives on the feasibility of the trial. Nurse leaders on leave at the time of the data collection (e.g., study leave, maternity leave, etc.) were excluded from this study.

Method of approach

The research team developed a recruitment letter and sent it to all participants in the intervention group via mobile text message to request their permission to participate in the study (their phone numbers were obtained during the feasibility RCT stage, at which time participants gave permission to be contacted for future research related to the trial). Participants were asked to reply within one week if they were willing to join the study. Nurse leaders who agreed to participate were informed of the focus group interview schedule and location via mobile text message.

Sample size and non-participation

In the feasibility RCT, all 119 participants were registered nurses, with 59 in the intervention group and 60 in

the control group. In the intervention group, 21 nurses completed the entire training. All 59 intervention group participants were invited to join this qualitative study: 25 (42.4%) participated in the focus group interviews, while 34 (57.6%) did not respond. Because all trained nurses were invited, the sample size was determined by willingness to participate rather than data saturation [32].

Setting

Following the feasibility RCT, participants for this qualitative study were recruited from August 1 to August 7, 2023, at two tertiary hospitals in China. Focus group interviews were conducted from August 15 to August 24, 2023. Chinese tertiary hospitals [33] typically have over 500 beds and are staffed with at least 0.4 nurses per bed. By the end of 2022, China had a total of 3,523 tertiary hospitals, with over 5 million registered nurses serving a population of 1.4 billion. In 2022, during the feasibility RCT, the two tertiary hospitals together had 160 nurse leaders, 4,990 beds, and handled approximately 4 million outpatient and emergency visits.

Data collection

We developed the focus group interview questions based on O’Cathain’s framework [10]: (1) intervention content and delivery; (2) trial design, conduct, and processes; (3) outcomes; and (4) measures. The questions were accompanied by prompts to encourage participants to share and explain their perspectives. Example questions included: “Please describe your opinions about the training content and delivery” and “What is your opinion regarding the trial design, conduct, and processes?” Near the end of the focus group interview, the interviewer instructed the assistant to solicit further feedback, specifically about the impact of COVID-19 on training participation and additional perspectives on the trial’s feasibility. The complete focus group interview guide is provided [see Additional file 2]. Participants received several documents before the interview started, including background information forms, informed consent forms, and training materials, such as module topics, to help them better recall the content.

We conducted small focus group (mini-focus group) interviews with four to six participants to collect data. Mini-focus groups are particularly suitable when participants possess substantial professional experience and may benefit from interacting with peers to stimulate deeper reflections [34]. Compared to individual interviews, this format was selected to stimulate discussion and uncover shared or contrasting perspectives among peers who had undergone the same study, thereby generating richer data on the collective experience of participating in the feasibility study [35]. Compared to larger traditional focus groups, the mini-format was deemed

more feasible to schedule within the busy clinical schedules of nurse leaders and was expected to foster a more engaged conversation where all participants could contribute meaningfully [34], given the potentially complex and evidence-based leadership-focused topic [36].

An interviewer and an assistant conducted all the focus group interviews. The interviewer (SH) was a female PhD student in nursing, while the assistant interviewer (WC) was a male lecturer with a PhD in nursing currently serving in the same university's department of nursing. Both are registered nurses and nursing researchers with training in qualitative research. A prior relationship existed between the interviewers and participants, as the interviewers served as tutors during the training. Both interviewers openly shared their roles as researchers and their research interests in evidence-based leadership to support transparency and help participants understand their professional backgrounds.

To mitigate potential limitations inherent in group dynamics, we adopted several strategies. First, we established ground rules for respectful dialogue at the outset [37]. We also actively invited contributions from quieter members and ensured that no single participant dominated the discussion [38]. During data analysis, we further ensured that both consensus and dissenting views were systematically identified and examined [39]. In addition, all focus group interviews were conducted face-to-face in a dedicated conference room at one of the tertiary hospitals. The room was reserved exclusively for the focus group interviews, with only the interviewers and participants present, to create a safe and confidential environment conducive to open communication [39].

Audiovisual recordings were made using an iPad Mini 6.0 (MK7 × 3CH/A, 256 GB), and audio recordings were captured with an iFLYTEK SR302 device. Field notes were made by both interviewers during the focus group interviews, documenting nonverbal behavior and group dynamics. To enhance the authenticity of the focus group interviews, we used labels to identify participants (e.g., A1, B2) and interviewers (e.g., M1, M2). Participant labels combined a letter for the focus group interview session and a number for the individual, such as A1 for the first participant in the first session and B2 for the second participant in the second session. Repeat focus group interviews were not conducted, as the collected data sufficiently addressed the research questions and further insights were not deemed necessary.

To ensure data accuracy, each focus group interview was audio-recorded using a recording device (iFLYTEK, SR302), transcribed verbatim immediately after the focus group interview, and documented in Microsoft Word (version 2019) (SH). Transcription errors were reviewed by three team members (SL, HH, and GL) using the audiovisual recordings. Labels for participants

and interviewers were also added. A total of five focus group interviews were conducted. The average focus group interview duration was 81 min (ranging from 76 to 94 min). Transcript formed five Word files totaling 89 pages, formatted with the following settings: margins of 3.17 cm (left and right) and 2.54 cm (top and bottom), single line spacing, and the "SimHei" font in 10.5 pt. Transcripts were not returned to participants for correction.

Data analysis

The transcripts were imported into NVivo 14.0 for data analysis [40]. We used content analysis to analyse the data, as the structure of our analysis is based on prior knowledge, aligning with the process of this method [41]. Based on the content analysis method and our research questions, we used a deductive approach to analyze the data. The data analysis followed these steps: (1) a structured analysis matrix, including both categories and sub-categories, was developed by SH using a deductive approach based on O'Cathain's framework [10]; (2) SH, meticulously reviewed all transcripts, underlining the text (including a single word, words, and sentences as coding units) [42] that appeared to describe the sub-categories, and then coded and named the highlighted text according to the sub-categories; (3) to ensure the credibility, XL, a senior qualitative researcher, reviewed all results including codes, sub-categories, and categories [43]. Uncertainties were discussed between SH and XL until a consensus was reached. An example of the data analysis and synthesis process was provided in Fig. 1. Illustrative quotations were used to support codes from participants, and they were translated into English by an independent bilingual researcher (SH) and cross-checked by another bilingual researcher (WC). We did not present the findings to the participants or ask for their feedback.

Trustworthiness

The criteria of credibility, transferability, dependability, and confirmability were applied to establish the trustworthiness of the study [44]. First, to ensure credibility, mini-focus group interviews were conducted, with five participants in each group. This approach ensured that every participant had the opportunity to fully express their perspectives [34]. Additionally, open-ended questions were used to encourage participants to share their perspectives in their own words, without being constrained by predefined answers. This strategy helped minimize focus group interview bias [44]. At the end of each focus group interview, the interviewer team summarized the main findings and asked the participants to confirm whether the interpretations accurately reflected their views, ensuring group consensus [34].

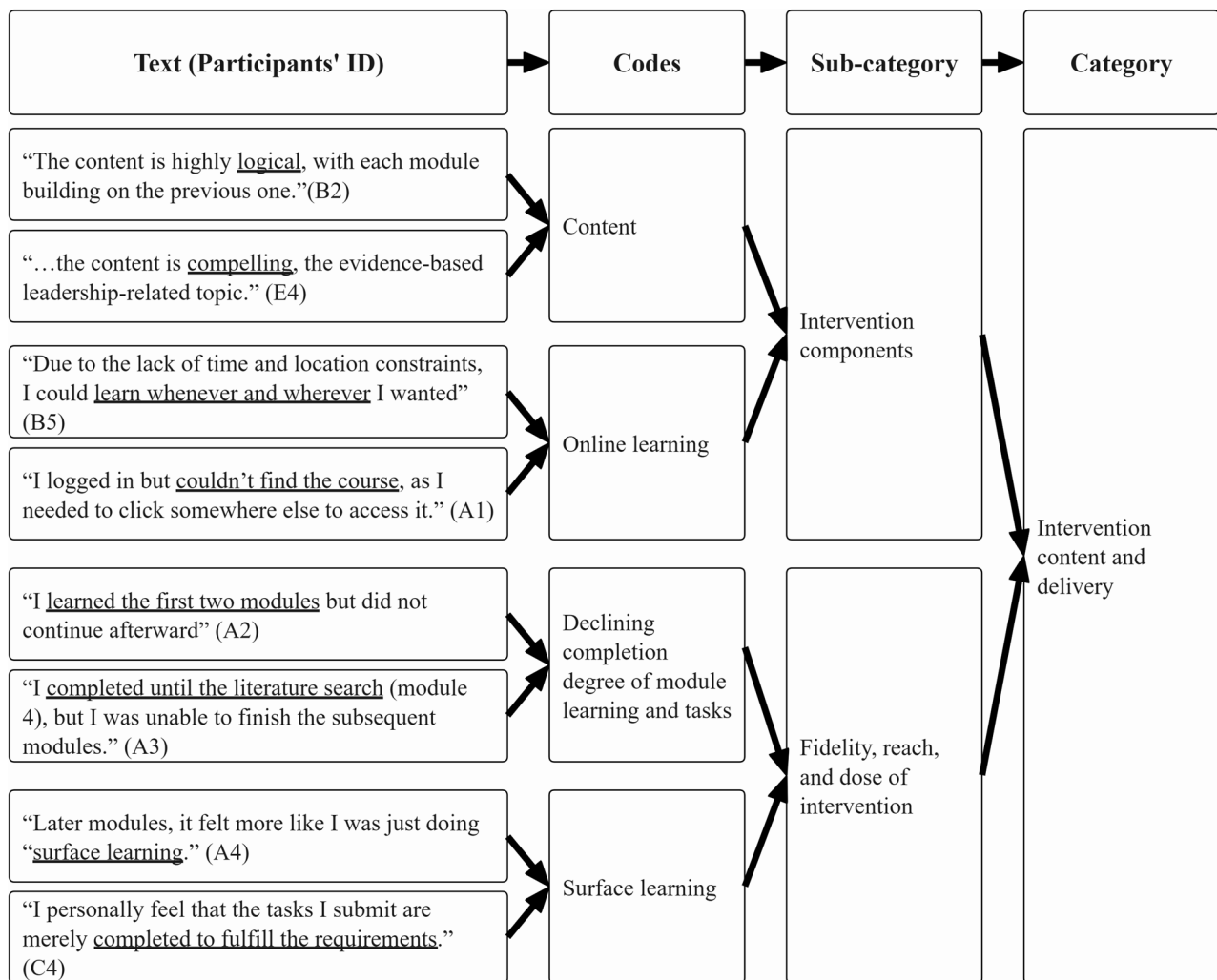


Fig. 1 An example of the data analysis and synthesis process

Second, transferability was facilitated by providing a “thick description” of the study’s context, including information about the study setting, sample size, sampling strategy, demographic characteristics, eligibility criteria, focus group interview procedure, and topics. This allows readers to assess the potential applicability of the findings to their own settings [45].

Third, dependability was ensured through a review by one of the research team members (XL), who was familiar with the participants. She reviewed the findings of the study, which include citations, codes, sub-categories, and categories. These efforts helped strengthen the trustworthiness of the study [44]. And last, confirmability was established by providing multiple citations that clearly demonstrated the connection between the findings and the data [44]. More than one relevant citation was included in each sub-category to illustrate the range of perspectives.

Results

Study participants

All 25 participants were female registered nurses, including head nurses (unit-level nursing managers responsible for clinical and administrative oversight) and associate head nurses (assistant nurse managers supporting unit leadership) [46, 47], and most were between the ages of 40 and 49 years. Approximately two-thirds held a post-graduate degree. Nearly half had 10–19 years of experience as a nurse leader, while over one-third had worked in healthcare for 20–29 years. Table 1 provides a detailed summary of participant characteristics.

The demographic characteristics of the qualitative study sample ($n = 25$) were generally similar to those of the overall intervention group in the feasibility RCT ($n = 59$) [11], with comparable distributions in gender, education, and position.

Table 1 Participant demographics

Characteristics	Number (Percentage)
Specialty	
Nursing (registered nurses)	25 (100%)
Age	
30–39 yrs	5 (20%)
40–49 yrs	15 (60%)
50–59 yrs	5 (20%)
Gender	
Female	25 (100%)
Degree	
Bachelor	10 (40%)
Postgraduate	15 (60%)
Position	
Head nurse/Associate head nurse	25 (100%)
The length of working as a nurse leader	
< 10 yrs	11 (44%)
10–19 yrs	12 (48%)
20–29 yrs	2 (8%)
The total length of time working in the healthcare setting	
< 20 yrs	9 (36%)
20–29 yrs	10 (40%)
30–39 yrs	6 (24%)

Trial feasibility

Figure 2 provides an overview of the four main categories and eight subcategories identified from the focus group interviews, illustrating participants' perspectives on the feasibility of the leadership RCT.

Category 1: Intervention content and delivery

Four sub-categories in this category emerged in our study. They include: (1) feasibility and acceptability of intervention in practice; (2) intervention components; (3) intervention development, and (4) fidelity, reach, and dose of intervention.

Feasibility and acceptability of intervention in practice

Findings related to the feasibility and practical acceptability of the training or its delivery within the context were grouped into this sub-category [8]. Participants recognized evidence-based leadership as a crucial and highly relevant topic for individuals in their leadership roles, which served as a key motivator for their engagement in the course. However, they also highlighted challenges stemming from their limited basic knowledge of evidence-based leadership, which made it difficult to learn and apply the learning into practice. Additionally, participants noted that work obligations, familial responsibilities, and the impact of the pandemic further hindered their ability to fully participate in the training.

Studying evidence-based leadership in the role of a head nurse can be highly beneficial. After completing the course, it brings advantages not only to yourself but also to your team, making it a win-win situation. (ID E1)

Due to a weak basic level of evidence-based leadership, it was difficult to learn and apply the learning into practice. (ID B4)

I have work obligations as well as family responsibilities, in addition to my studying. (ID E4)

During that period (the pandemic), I can say there wasn't enough time or energy to dedicate to studying, so I had to pause for a while (ID B5)

Intervention development This sub-category includes qualitative findings on participants' suggestions for developing or refining the intervention for a future definitive trial [8]. Participants suggested making the navigation of the online learning platform more user-friendly and introducing incentives, such as continuing education credits, to increase participants' engagement. They also recommended diversifying the types of tasks to make them more engaging and interesting (tasks were not mandatory for course progression) and proposed replacing written feedback with verbal guidance from tutors, while reducing group sizes to allow tutors more time and energy to support individual participants. Additionally, they proposed including more detailed examples from clinical practice in the modules to enhance their comprehension of the course content.

The platform is quite complex to navigate and not very straightforward. It would be ideal if clicking a link would take you directly to the desired information. (ID B1)

Incentives could be introduced to enhance the motivation of participants. (ID B1)

I personally find that offering continuing education credits gives me more motivation to engage in training. (ID B3)

The question types could be more varied. Most of them are question-and-answer, which can be quite overwhelming and exhausting. (ID B3)

If you could offer one-on-one or small group (one-on-two or one-on-three) tutoring through online meetings, allowing for verbal discussions with the tutor, I believe it would lead to better outcomes. (ID A5)

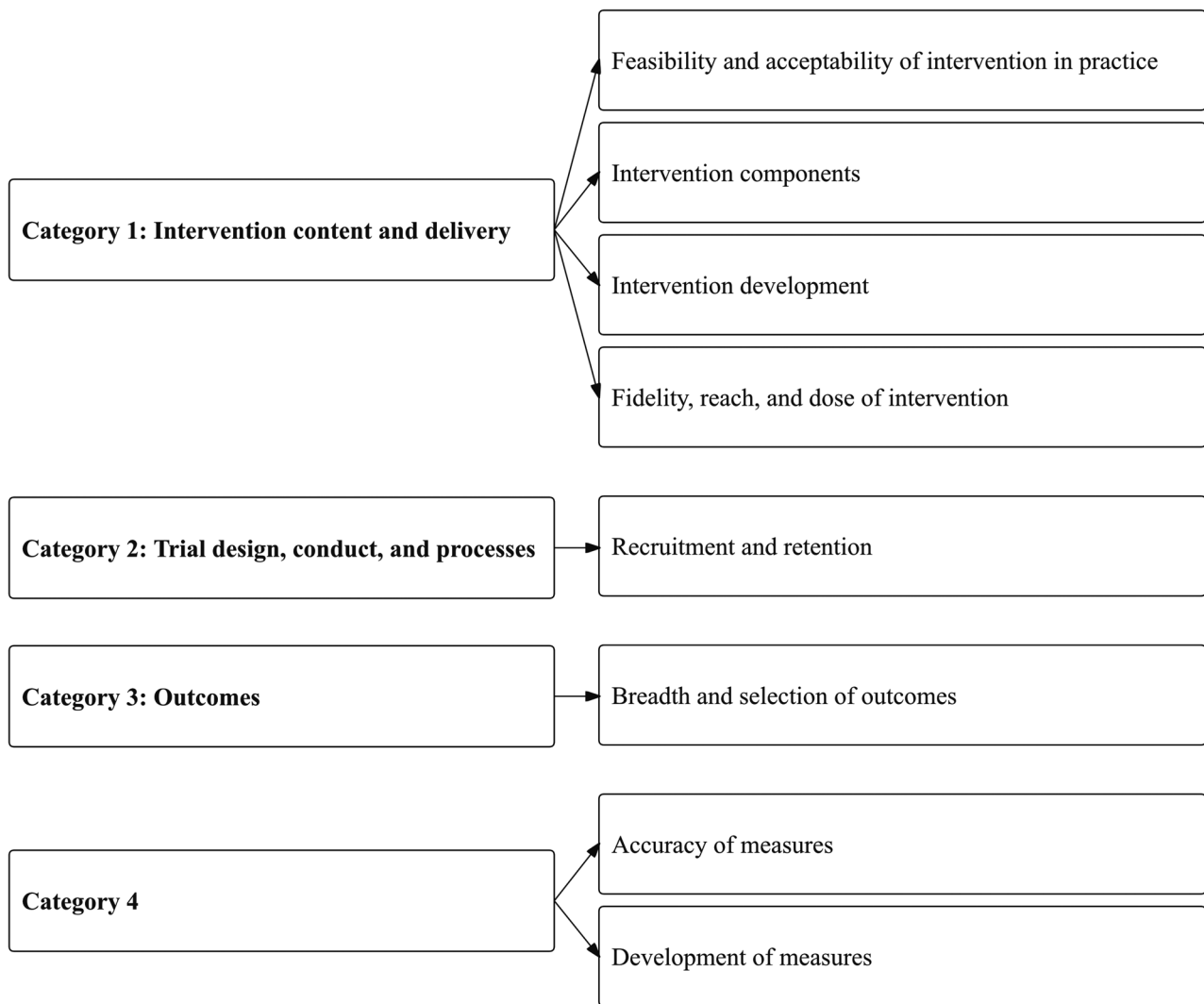


Fig. 2 Summary of qualitative findings

I feel there are too few examples, and more should be provided, particularly regarding issues related to clinical practice. (ID C4)

Intervention components Qualitative data supported a description of the components of the training included in this sub-category [8]. These components involved four aspects of the training: content, online training, tutoring, and tasks. Participants appreciated the logical structure of the course, with each module building on the previous one, as well as the flexibility of online learning, particularly in terms of learning time and location. However, they highlighted that the complexity of the platform navigation impeded both the course itself and its delivery. Specifically, participants reported that after logging in, they had to navigate through multiple menus and click several times to access the training content, and similar difficul-

ties arose when trying to reach the tutor interaction area. Participants praised the professionalism of the tutors but noted that the complexity of the platform limited their interactions with the tutors, restricting the full potential of the tutors’ roles. While participants found the tasks valuable for reinforcing learning, they also mentioned that completing them was challenging.

The content is highly logical, with each module building on the previous one. (ID B2)

...the content is compelling, the evidence-based leadership-related topic. (ID E4)

Due to the lack of time and location constraints, I could learn whenever and wherever I wanted. (ID A5)

I logged in but couldn't find the course, as I needed to click somewhere else to access it. (ID A1)

She (the tutor) was able to answer most of the task questions well... I think the tutors' lecturing on the course was excellent. (ID C4)

I do not know where I can find the feedback and submit my questions, the role of the tutor was not fully realized (ID E5)

Completing tasks allows for the recall and reinforcement of the content learned. (ID D3)

The course task is challenging, as completing the tasks requires a significant amount of time and effort. (ID D4)

Fidelity, reach, and dose of intervention The findings related to the alignment of the training with its planned delivery were included in this subcategory [8]. Participants reported a gradual decline in their completion of module learning and tasks, attributing this to the increasing complexity of the module content and tasks. Notably, they described engaging in “surface learning,” characterized by behaviors such as accessing the online course without deep engagement and submitting low-quality tasks.

I learned the first two modules but did not continue afterward (ID A2)

I completed until the literature search (module 4), but I was unable to finish the subsequent modules. (ID A3)

Later modules, it felt more like I was just doing surface learning. (ID A4)

I personally feel that the tasks I submit are merely completed to fulfill the requirements. (ID C4)

It became increasingly complex from Module 1 to 7, and I found it harder and harder to learn. (ID A3)

Category 2: Trial design, conduct, and processes

A subcategory titled “Recruitment and Retention” was identified within this category, following O’Cathain’s framework [8]. This subcategory encompassed findings that highlighted trial-specific recruitment and retention challenges and outlined actions taken to address them [8]. In our study, participants discussed issues related to recruitment but did not offer specific suggestions for

improving retention. Participants highlighted that the inclusion criteria should be broadened to allow nurses who were interested in participating. However, they noted that evidence-based leadership was a complex topic requiring a certain level of foundational competence from participants. They suggested either establishing specific entry requirements or designing the training at different levels to accommodate participants’ varying competencies.

I think you could invite graduate students, as they may be interested in engaging with this type of training. (ID D5)

Those future leaders, they are interested in or hopeful about becoming leaders in the future. (ID D1, D4)

You could relax the criteria; it doesn't necessarily have to be head nurses—all nurses need this training. (ID D4)

When considering inclusion and exclusion criteria, it may be helpful to first assess participants' baseline competency levels. While some participants have a foundation in evidence-based practice, others may lack such a background. Since individual competency levels vary, their learning needs may also differ..... It is recommended to either establish specific entry requirements or design the training into different levels tailored to participants' varying competencies. (C5)

Category 3: outcomes

This category included a single sub-category: breadth and selection of outcomes. This sub-category encompasses findings that highlight the importance of training outcomes or improvements observed by participants, both in their own leadership practice and among their staff, which should be considered for inclusion in the definitive trial [10]. Overall, participants recognized the significance of both primary (e.g., acceptability of the intervention, adherence to the course) and secondary (e.g., self-efficacy) outcomes. For details on specific outcomes and their evaluation methods, refer to the feasibility RCT [11]. Participants also reported enhanced evidence-based leadership efficacy, including greater confidence in identifying and addressing leadership problems (e.g., low staff morale). Consequently, they recommended incorporating “evidence-based leadership efficacy” as an outcome variable, proposing it as a replacement for “self-efficacy.”

Self-efficacy can be replaced with evidence-based leadership efficacy.....I feel that my evidence-based leadership efficacy has improved after the course. After studying the seven modules, I feel more confident and empowered in identifying and addressing certain issues in clinical work. (ID A5)

Category 4: measures

Two sub-categories were identified within this category: (1) accuracy of measures and (2) development of measures.

Accuracy of measures This sub-category includes findings related to the validity of the process and outcome measures [8]. In the feasibility RCT, two questionnaires were combined to evaluate evidence-based leadership competencies [11]: the Multifactor Leadership Questionnaire [48] and the Evidence-Based Practice Questionnaire [49], the latter of which includes items assessing knowledge of evidence-based practice. Some participants expressed concerns, noting that while the questionnaires captured certain changes in evidence-based leadership competencies, they were not comprehensive. For instance, they failed to address areas like identifying leadership problems.

These two scales evaluate evidence-based practice and leadership separately. While they do include aspects such as evidence search, their focus is not particularly strong. For example, they fail to assess the identification of leadership problems. (ID A2)

Additionally, participants provided two contrasting perspectives on how the training influenced their intention to leave, that is, their intention to leave their professional role or workplace (i.e., turnover intention). On the one hand, the training enhanced evidence-based leadership competencies, enabling participants to manage their work more effectively and increasing their likelihood of staying in their current roles. On the other hand, the training also fostered these competencies, inspiring participants to seek personal growth and prompting some to leave in pursuit of better opportunities.

It's possible that through the training, my evidence-based leadership has improved, and my work performance has gotten better, making me no longer want to leave my position. (ID E1)

I feel that my evidence-based leadership has improved, so I can consider working elsewhere. People strive for better opportunities. Why should I stay here? (ID E2)

Development of measures Findings related to the development of validated measures for both processes and outcomes in a future definitive trial were included in this sub-category [8]. Participants recommended developing an evaluation tool for evidence-based leadership competencies, ensuring it aligns closely with the underlying concept and course content.

You could develop an evaluation tool to assess evidence-based leadership based on the course content or the process, or the concept related to evidence-based leadership. (ID C5)

Participants also proposed the integration of qualitative methods to elucidate the impact of training on their intention to leave their role or workplace.

Conduct an interview like today's, which explores in detail the changes in the intention to leave and the reasons behind these changes. (ID E3)

Discussion

This study described nurse leaders' perspectives on a feasibility randomized controlled trial (RCT) that evaluates an online training program designed to improve evidence-based leadership competencies. The findings highlight the complexities involved in assessing the feasibility of leadership training programs using RCT designs and provide evidence from four key aspects.

Regarding the intervention content and delivery, participants acknowledged the value of evidence-based leadership training and appreciated its key components, including the content, online format, tutoring, and tasks. Our findings align partially with a previous feasibility RCT [16], which also emphasized the importance of leadership training programs and identified critical components for leadership development, such as content and tutoring. Moving forward, our study identified two important perspectives from participants for improving tutoring in future leadership training programs. First, it is recommended to incorporate verbal guidance and discussion in online leadership training. This aligns with e-learning design research indicating that sole reliance on written communication can hinder engagement, particularly when addressing complex or numerous topics [50]. Second, small-group tutoring sessions (e.g., one-on-one or dyadic formats) are advisable. A systematic review on coaching for healthcare leadership development supports this, noting that participants highly value one-on-one interaction formats in such programs [11].

Extending previous evidence on feasibility leadership RCTs [15, 16], our study identifies online training as a promising and novel component for leadership

development. Originating in the 1990s, online training has gained widespread adoption in healthcare, primarily due to its flexibility in terms of time and location [51, 52]. While participants in our study valued this flexibility, they highlighted a key implementation barrier: the complexity of platform navigation hindered their full engagement. Consequently, they recommended the use of a more user-friendly platform in future training. This aligns with the findings of Montes et al., who also emphasize that a usable platform is critical, since interface complexity may undermine both learner motivation and intervention fidelity in virtual educational settings [53].

Building on previous evidence from feasibility leadership RCTs [15, 16], this study identified tasks as an additional promising component of leadership training. However, participants reported difficulties in task completion. The TASKS (Task and the Task Implementer's Affect, Skills, and Knowledge) Framework from Implementation Science offers a relevant explanation for these challenges [54]. This framework outlines four key barriers to task implementation: knowledge, resources (e.g., time), emotion (e.g., motivation), and logic (e.g., thinking strategies) [54]. In our study, barriers hindering task completion included varying levels of leadership competencies (knowledge) [11], limited time (resources), insufficient tutor guidance (resources), and low motivation (emotion). To improve future programs, participants suggested adding incentives, increasing examples in training modules, and diversifying task types.

In relation to trial design, conduct, and processes, participants in our study emphasized that leadership training is essential not only for nurse leaders but for all nurses. They also suggested establishing specific entry requirements or designing training at multiple levels to accommodate participants' varying competencies. Previous leadership RCT feasibility studies have primarily relied on quantitative metrics, such as recruitment rates, cluster participation and randomization, intervention deliverability and fidelity, outcome measures, and data collection procedures [15]. In contrast, our study advances this knowledge by integrating participant-derived perspectives, for example, suggestions to align training content with competency levels. These insights directly inform recruitment strategies and represent added value beyond standard quantitative indicators. Incorporating such feedback from the outset holds the potential to enhance recruitment rates in future trials [55].

Regarding outcomes, participants emphasized the importance of both primary and secondary outcomes. A key suggestion from participants was to refine the outcome focus by replacing the broad construct of "self-efficacy" with "evidence-based leadership efficacy." While existing measures are available for general leadership self-efficacy (e.g. [56]), to our knowledge, no validated

instrument specifically captures evidence-based leadership efficacy. This shift highlights a need for more precise, context-specific outcome assessment in leadership training evaluations. Our findings thus prioritize outcome domains for future trials, proposing that evaluating self-efficacy specifically in the context of implementing targeted leadership behaviors may be crucial for demonstrating training effectiveness. Given that behavior change is typically a long-term process and may not show immediate results [57], measuring this behavior-specific self-efficacy could serve as a more suitable indicator of a training's short-term impact [58], offering timely insights into its practical relevance [59].

Regarding the measures, participants expressed concerns about how evidence-based leadership competencies and intentions to leave their role or workplace were assessed. For evidence-based leadership competencies, they questioned whether combining questionnaires on evidence-based practice [49] and leadership [11] was appropriate for measuring this composite construct. They suggested that dedicated tools for evaluating evidence-based leadership should be developed. This feedback underscores the complexity of evidence-based leadership, which reflects not just the sum of its components but the dynamic interaction between evidence-based practice and leadership principles [11, 60]. Consequently, the instruments used in our prior feasibility RCT [11] and other observational studies [61, 62] may not fully capture the construct's true nature. Additionally, our findings raise concerns about the quantitative evaluation approach to intention to leave one's role or workplace. In the feasibility RCT, intention to leave was measured using a 3-item self-developed questionnaire (e.g., "In the last 6 months, how often have you planned to leave your ward?"), scored on a Likert scale from 0 to 4. Participants noted that both an increase and a decrease in intention to leave could reflect positive training effects, a decrease may indicate strengthened organizational commitment, while an increase may suggest that the training raised awareness of a mismatch with the current workplace. They suggested that qualitative evaluation methods be used in future trials to better assess and understand how training impacts participants' intention to leave their role or workplace. This finding is particularly important, as intention to leave their role or workplace is a commonly used outcome measure in leadership training and is often assessed using self-developed quantitative questions [31, 63]. Organizations implementing such training should be aware that participation could potentially increase turnover intentions, with possible implications for workforce retention.

Implications for theory

This study contributes to theory by bridging established behavioral theories with practical outcome measurement in leadership intervention research. Theoretical frameworks such as Self-Efficacy Theory [64], the Health Belief Model [65], and the Theory of Planned Behavior [66] consistently posit self-efficacy as a key determinant of behavior. Our findings advance this theoretical groundwork by proposing leadership behavior-specific self-efficacy as a construct distinct from general leadership self-efficacy. While general leadership self-efficacy captures a leader's overall confidence in leading others, leadership behavior-specific self-efficacy focuses on confidence in performing specific evidence-based leadership behaviors (e.g., appraising evidence). This construct can be operationalized by adapting existing leadership self-efficacy scales (e.g. [56]), to measure confidence in applying evidence-based leadership behaviors. It provides a more precise, short-term indicator of training effectiveness than general self-efficacy, as it directly targets the behaviors taught in the intervention [58, 59].

Additionally, participants' critiques and their call for specialized tools to assess evidence-based leadership competencies highlight an important theoretical point: evidence-based leadership may be a distinct, multifaceted construct that requires its own conceptual and operational definition [11, 60]. It cannot be fully measured through proxies of its individual components alone [36]. Thus, this study contributes to theory by underscoring the need for validated instruments specifically designed to assess evidence-based leadership competencies, such as identifying leadership problems in daily practice, collecting and analyzing organizational data, and integrating stakeholder perspectives [22].

Implications for practice

Based on our findings, we propose several applied recommendations for designing and implementing future evidence-based leadership training RCTs. First, tutoring appears to be a promising component, and its effectiveness might be optimized by using smaller groups and direct verbal discussions. Second, for online training, prioritizing user-friendly platforms may be important for engagement. Third, to potentially boost participant engagement and trial completion, programs could incorporate incentives, practical examples, and diverse task types. Fourth, aligning training content with participants' competency levels may be important for recruitment and retention. A person-centered approach [67], such as latent profile analysis (a statistical method for identifying subgroups based on similar characteristics) [68], could help identify distinct competency profiles and guide tailored training, potentially supporting more efficient resource use and targeted support [69]. Fifth,

evidence-based leadership efficacy might be considered as a key outcome measure, with competencies assessed using instruments specifically designed and validated for this construct. Finally, employing complementary evaluation methods, such as in-depth qualitative analysis, may be valuable for developing a better understanding of how the training influences participants' intention to leave their role or workplace.

Implications for research

This qualitative study was conducted following a feasibility RCT. The findings have not yet been used to modify the RCT protocol, as the decision to proceed to a definitive trial is still under consideration. Nevertheless, the results offer clear, participant-informed recommendations for refining future trial design, conduct, and progression decisions. Specifically, as outlined in our findings, participants suggested broadening inclusion criteria while considering baseline competency levels, improving platform usability, adding incentives and task variety, reducing group sizes, and adopting evidence-based leadership efficacy as a key outcome. These insights can directly inform the development of a future definitive RCT should the decision be made to proceed.

Limitations

Several limitations of this study should be acknowledged. First, the use of the mini-focus group method, while conducive to generating interactive data, carries inherent constraints. These include the potential influence of group dynamics, such as conformity pressure or social desirability bias, wherein participants might modify their expressed views in a group setting. Second, the voluntary nature of participation and the non-random selection of interviewees from the intervention group may introduce self-selection bias, potentially overrepresenting perspectives from individuals with higher motivation or more positive predispositions. Third, the study's context, conducted with a specific sample of nurse leaders within two tertiary hospitals, necessarily limits the generalizability of the findings. The insights are rich and contextually grounded but may not be directly transferable to other populations or healthcare settings. Fourth, the exclusion of tutors' perspectives constitutes an additional constraint, as their insights could have provided a more comprehensive evaluation of the RCT's feasibility. Finally, to enhance trustworthiness, member checking by returning transcripts to participants was not performed, which could have allowed for clarification and respondent validation. However, a summary of key points was verified with participants at the end of each session to confirm interpretive accuracy. Despite these limitations, this study provides pioneering, in-depth insights into participant perceptions regarding the feasibility of

a leadership-focused RCT. The findings offer valuable guidance for refining the study protocol in preparation for a definitive trial.

Conclusions

This study examined nurse leaders' perspectives on a feasibility randomized controlled trial (RCT) evaluating an online training program aimed at improving evidence-based leadership competencies. It highlights the complexities involved in assessing the feasibility of leadership training programs using RCT designs and provides evidence from four key aspects. The findings offer valuable insights for enhancing the feasibility and effectiveness of future evidence-based leadership training programs employing RCT designs. Additionally, these findings can inform the development of leadership programs in similar contexts.

Abbreviations

RCT	Randomized Controlled Trial
COREQ	Consolidated Criteria for Reporting Qualitative Research
U.S.	United States

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

S. H.: Conceptualization, Data curation, Formal analysis, Writing - original draft, Writing review and editing, Funding acquisition. S. L.: Data curation, Methodology. H. H.: Data curation, Methodology, Funding acquisition. J. H.: Conceptualization, writing review, and editing. B. S.: Writing review and editing. W. C.: Conceptualization, Data curation. Q. Y.: Writing review and editing. G. L.: Data curation, Resources. M. V.: Conceptualization, Methodology, Writing review and editing, Funding acquisition, Supervision. X. L.: Conceptualization, Methodology, Writing review and editing, Validation, Project administration, Supervision.

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Data availability

The anonymized data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Ethics Committees of Nursing and Behavioral Medicine Research at the Xiangya School of Nursing, Central South University (Number: E2023134; Date: July 4, 2023). Written informed consent

was obtained from all participants in the focus group interviews. Participants were also asked to give their verbal informed consent voluntarily before the video and voice recording started. Participants were assigned a label to avoid using their real names in the focus group interview to protect their privacy. They were also informed that all information they provided would be confidential and secure. This study was conducted in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Xiangya School of Nursing, Central South University, 172 Tongzipo Road, Changsha 410013, China

²School of Nursing, Hunan University of Chinese Medicine, Changsha, China

³Department of Nursing, Hunan Provincial Maternal and Child Health Care Hospital, Changsha, China

⁴Department of Nursing, Hunan Cancer Hospital, Changsha, China

⁵Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, USA

⁶Faculty of Medicine, Department of Nursing Science, University of Turku, Turku, Finland

⁷Northern Jiangsu People's Hospital Affiliated to Yangzhou University, Yangzhou, China

⁸School of Nursing and Health Sciences, Hong Kong Metropolitan University, 1 Sheung Shing Street, Ho Man Tin, Kowloon, Hong Kong SAR, China

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