BMJ Open Feasibility study protocol: implementing consultation-based high-quality palliative care services in intensive care units

Ye Sul Jeung $(1)^{,1}$ Yejin Kim $(1)^{,1}$ Seyeon Kim $(1)^{,1}$ Yoon Sun Jung $(1)^{,2}$ Tae Jung Kim $(1)^{,2,3}$ Shin Hye Yoo $(1)^{,4}$

To cite: Jeung YS, Kim Y, Kim S, *et al.* Feasibility study protocol: implementing consultation-based high-quality

consultation-based high-quality palliative care services in intensive care units. *BMJ Open* 2025;**15**:e093558. doi:10.1136/ bmjopen-2024-093558

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (https://doi.org/10.1136/ bmjopen-2024-093558).

YSJ and YK contributed equally.

Received 10 September 2024 Accepted 16 May 2025

Check for updates

© Author(s) (or their employer(s)) 2025. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ Group.

¹Center for Palliative Care and Clinical Ethics, Seoul National University Hospital, Jongno-gu, Korea (the Republic of) ²Department of Critical Care Medicine, Seoul National University Hospital, Jongno-gu, Korea (the Republic of) ³Department of Neurology, Seoul National University Hospital, Jongno-gu, Korea (the Republic of)

⁴Department of Human Systems Medicine, Seoul National University College of Medicine, Jongno-gu, Korea (the Republic of)

Correspondence to Dr Shin Hye Yoo; ifi1024@snu.ac.kr

ABSTRACT

Introduction Critically ill patients in intensive care units (ICUs) receive life-sustaining treatments aimed at restoring or maintaining organ function. ICU admission often involves substantial multidimensional suffering that can burden patients, their families and surrogates. Multidisciplinary palliative care support can help alleviate their sufferings. In South Korea, however, palliative care has not yet been integrated into critical care settings, highlighting the need to explore the feasibility of its implementation within the ICU.

Methods and analysis This study aims to test the feasibility of a consultation-based palliative care intervention in the ICU. The study will include 20 patients admitted to the ICU of a tertiary hospital due to sudden severe acute brain injury or progressive organ failure, along with their family caregivers. A palliative care team, comprising a social worker and a palliative care physician, will provide consultations to the ICU healthcare professionals based on the palliative care needs, following family counselling. Additional family meetings will be held if necessary. The primary outcomes will include participation rates, family counselling rates and study completion rates. The intervention's potential impact will be assessed by changes in surrogate decision-making conflict, self-efficacy, depression and anxiety, postdecision regret and the experience of patient-centred and family-centred care. The demand and acceptability of the intervention will be assessed through semi-structured interviews with family surrogates, followed by gualitative analysis.

Ethics and dissemination This study will be conducted in accordance with the Declaration of Helsinki and applicable national laws and regulations. The clinical study protocol, along with any protocol amendments and the informed consent form, has been approved by the Institutional Review Board of the Hospital (2404-111-1532). We plan to submit the study results for presentation at conferences and for publication in international peerreviewed journals. Data will also be made available on request to participants, funding agencies and interested researchers.

Trial registration number NCT06490835.

INTRODUCTION

Advancements in medical technology have improved the standard of care for critically

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Prospective single-arm prepost design to explore feasibility in an ICU setting.
- ⇒ Inclusion criteria targeting patients with severe acute brain injury or advanced organ failure.
- ⇒ Integration of both ICU healthcare professionals and family caregivers in data collection processes.
- ⇒ Use of mixed-methods combining quantitative outcomes and qualitative interviews.
- \Rightarrow Lack of a control group limits causal inference.

ill patients and expanded treatment options. Nevertheless, mortality rates among patients in intensive care units (ICUs) remain high.^{1–3} Critically ill patients in ICUs face significant challenges in making treatment decisions, including life-sustaining treatments, arising from factors such as the sudden onset of illness, uncertainty about prognosis, including potential recovery and disability, the involvement of various healthcare professionals due to complex medical issues, temporary or long-term limitations in decision-making capacity caused by the illness, and ethical conflicts.^{4–6}

Families of critically ill patients experience ğ psychological distress due to the illness of their loved ones and encounter various challenges during surrogate decision-making, l simi including insufficient information,^{7–11} uncer-tainty and confusion about values,¹²¹³ commu-nication issues^{11 14–16} lack of support,^{17–19} and time constraints.⁹ Consequently, they may experience psychological stress such as guilt or regret,^{9 20-22} as well as psychiatric symptoms, including depression, anxiety,²³²⁴ and posttraumatic stress disorder.²⁵⁻²⁹ To alleviate these challenges, providing information on the benefits and risks of the treatment options, clarifying personal values regarding the potential outcomes, and offering guidance and support from healthcare professionals is essential.

The need for palliative care in the ICU has already been supported.^{1 30 31} The core areas

Protected by copyright, including for uses related to



Figure 1 Scheme of consultation-based palliative care services to provide high-guality palliative care to families of critically ill patients in the ICU. The arrows indicate the flow of consultation processes between the palliative care team. ICU physicians. patients, and families, ICU, intensive care unit,

of ICU palliative care include symptom management, effective communication, development of care plans that reflect the patient's values and preferences, support for surrogate decision-makers, coordination of care transitions, workforce support, and the provision of psychological and emotional support to both patients and families, including bereavement care.^{30 32–34} ICU palliative care can offer enhanced symptom relief, higher satisfaction among patients, families, and healthcare providers, and improve

overall quality of medical care.³¹ Additionally, ICU palliative care has been shown to have economic benefits, such as reducing ICU length of stay and lowering end-of-life (EOL) costs in hospitals.^{35 36}

A multidisciplinary team approach is essential to meet $\vec{\mathbf{q}}$ uses related to text and data mining, AI training, and similar technologies the complex palliative care needs of patients and their families. This approach can be implemented in two ways: by forming a multidisciplinary team within the ICU to provide palliative care directly, or by having a specialist

Table 1	Eligibility criteria				
	Inclusion criteria	Exclusion criteria			
Patient	 Diagnosis of sudden and severe acute brain injury due to at least one of etiology (vascular, traumatic, metabolic, toxic, infectious, or anoxic) AND Glasgow Coma Scale score of 3-8 for at least 24 hours AND Unable to express themselves verbally or non-verbally OR Diagnosis of advanced stage organ failure (any of the following) Chronic lung disease requiring long-term oxygen therapy or mechanical ventilation Decompensated liver cirrhosis Chronic heart failure with the New York Heart Association class III or IV Progressive neurological disease with a modified Rankin Score of 3-5 (e.g., dementia, Parkinson's disease, and amyotrophic lateral sclerosis) Three or more chronic comorbidities causing limitations in activities of daily living AND APACHE II score ≥ 14 at the time of screening AND ICU stay of 7 days or more 	 Inder 19 years of age Unable to speak, understand, or read Korean Refusing palliative care consultation Referred to palliative care prior to study enrollment Within 48 hours of ICU admission Presence of active cancer under treatment within 6 months prior to ICU admission Care goals set to "comfort care" at the time of study enrollment Death expected within 48 hours at the time of study enrollment Lack of capacity to participate in the study without an appropriate surrogate 			
Family caregive	 Family caregiver of a patient who meets the inclusion criteria (Family: defined as the patient's spouse, lineal ascendants and de- scendants within two degrees of kinship and their spouses, siblings and their spouses, and relatives within eight degrees of kinship and their spouses) Aged 19 or older Willing and able to provide consent for participation in the study 	 Under 19 years of age Unable to speak, understand, or read Korean Determined by a physician to be in extremely poor health, making participation in the study infeasible Refusing palliative care consultation 			
Cases where either the patient or the family caregiver meets any of the following conditions.					

palliative care team offer consultations to the primary ICU team.^{32 37} The specialist palliative care addresses the needs of the referring primary ICU team while counselling the patient and family to identify their key values and preferences. They solidify patient-centred care goals and provide feedback to the primary ICU team to facilitate shared decision-making.³⁸

In South Korea, however, palliative care is not yet integrated into critical care settings, resulting in a lack of appropriate palliative care for ICU patients with poor prognoses. Moreover, national hospice palliative care services include only cancer patients in outpatient or general ward settings; it does not encompass the ICU setting. There remains a considerable gap in the provision of palliative care for non-cancerous diseases.³⁹ Therefore, this study investigates a consultation-based palliative care model as a feasible approach in the ICU environment in South Korea. This study aims to present the intervention protocol, detailing the process, components, and outcomes of the intervention.

METHODS AND ANALYSIS Study design and setting

This clinical study utilises a single-arm pre-post intervention design to explore the feasibility of applying consultation-based palliative care services to provide high-quality palliative care to families of critically ill patients in ICUs. Recruitment commenced in June 2024 and is anticipated to continue until June 2025. During this period, efforts are directed towards securing the maximum possible number of analyzable cases meeting the inclusion/exclusion criteria among critically ill patients admitted to the ICU. The expected recruitment

target is 20 cases (comprising 20 patients and their 1:1 matched family caregiver, totaling 40 individuals). The sample size was determined based on the average annual number of palliative care consultations requested from the ICU at this tertiary hospital. An average of 60 palliative care consultations were requested each year from the emergency ICU, with approximately 30 involving patients with non-cancer illnesses, who represent the target population of this study. Based on this, fewer than 30 patients per year were estimated to meet the eligibility criteria. Therefore, a target sample size of 20 patients was deemed feasible for this exploratory study assessing feasibility and acceptability of the intervention. All subsequent data Š collection is projected to be completed by December 31, copy 2025. The study protocol has been registered at Clinical-Trials.gov (NCT06490835).

This study is conducted within the emergency ICU of a tertiary hospital in South Korea with approximately 1800 beds, providing care for critically ill patients from across the country. The 20-bed emergency ICU operates as a closed unit, with separate teams of doctors and nurses providing 24-hour care throughout the year. This ICU team traditionally manages the palliative care needs of critically ill patients, including symptom management and discussions about treatment plans. The intervention in this study comprises a palliative care consultation team (PCCT), which includes a palliative care physician and a social worker, collaborating with an ICU attending physician (figure 1).

Eligibility criteria

Detailed inclusion and exclusion criteria for patients and family caregivers are summarised in table 1. Patients are selected based on diagnoses of severe acute brain injury

Table 2 Major interventions of the PCCT					
Intervention methods	Description				
Family counselling	 Direct interviews with the patient's family, conducted by the social worker from the PCCT Identification of the family's palliative care needs related to the patient's care and decision-making, serving as basic information for the consultation Provision of psychological and emotional support to the family 				
Consultation	 Provision of consultation by the PCCT to the ICU attending physician, synthesising the family's psychosocial and decision-making needs with the medical perspective of palliative care needs Guidance for integrating holistic palliative care into the ICU treatment process. Key content: management of the patient's pain and physical/mental symptoms, understanding of the disease and treatment options, decisional conflict, emotional and practical support for the patient and family, support in setting goal of care related to the patient's values and preferences, provision of information on support systems, bereavement and grief support. 				
Support for family meetings	 Family meetings held by the ICU attending physician as part of the standard provision of usual palliative care whenever the need arises Discussion members convened depending on the issues at hand, such as the necessity for comprehensive medical judgement due to high uncertainty, insufficient information, value conflicts in decision-making, and communication problems between family members and healthcare professionals. Support facilitation from the specialist or social worker from the PCCT, depending on the purpose and nature of the meeting convened 				
ICU, intensive care unit: PCCT, palliative care consultation team.					



Figure 2 Overall flow of the intervention. ICU, intensive care unit.

or advanced organ failure, meeting specific criteria for Glasgow Coma Scale, an acute physiology and chronic health evaluation (APACHE) II score, and ICU stay duration. Family caregivers must meet age and consent requirements. Exclusion criteria include individuals under 19 years of age, recent active cancer treatment, refusal of palliative care consultation, or other conditions detailed in table 1. Patients expected to die within 48 hours were excluded, as the structured palliative care consultation process requires sufficient time for meaningful implementation, including family counselling and decision-making support. In South Korea, where there is no formal proxy system, healthcare decision-making is limited to spouses and direct blood relatives; therefore, palliative care discussions were confined to these individuals.

Recruitment of participants

Attending physicians of the primary ICU team, who serve as co-investigators in this study, initially assess whether patients admitted to the ICUs meet the eligibility criteria. He or she refers patients deemed eligible as participants to the PCCT using a separate referral form within the electronic medical record system (see online supplemental file 1). The referral form includes confirmation of the patient's verbal consent to participate in the study, along with detailed information regarding the patient's medical condition, treatment plans, discussions with the family, and reasons for the referral. Then, the social worker from the PCCT delivers a comprehensive explanation of the study's purpose and methods to potential participants. Written consent is obtained if they willingly express their intention to participate (see online supplemental file 2). After obtaining the consent, the palliative care physician from the PCCT reviews the patient's medical records and the referral form. If there is insufficient information, the palliative care physician discusses the case with the ICU physician either in person or over the phone. Description of intervention

Overview

The aim of the intervention is to offer psychosocial support to the patient's family, decision making support, and to enhance patient-centeredness. The intervention

received by ICU patients and their families encompasses services provided by the PCCT and high-quality palliative care administered by the ICU attending physician, in addition to standard critical care. Key components of services from the PCCT include family counselling, family meeting support, and consultation on addressing identified palliative care needs through patient assessment and family counselling (table 2). If a participant requests to discontinue the intervention at any point, the merven-tion will be paused, and the participant will be allowed to withdraw from the study. The overview of the interven-tion is shown in figure 2. Family counseling Family counselling by the PCCT social worker is a supportive and therapeutic process that also gathers

information to assess the palliative care needs of the patient and family. Using a patient- and familycentred approach, particularly for families in distress, the social worker encourages all family members to express their opinions and emotions, promotes 2 communication, and helps to explore the patient's values and preferences. The social worker conducts a psychosocial assessment that includes the patient's g values and preferences. The social worker conducts personal history, psychological and emotional status, Pe family evaluation, socioeconomic support needs, and available resources. Additionally, a decision-making ð assessment is performed, encompassing factors related to family decision-making, dealing with uncertainty in current medical decisions, providing sufficient information, clarifying values, addressing communication ā issues, and facilitating shared decision-making. These assessments are conducted to provide foundational information for the PCCT in advising the attending physician and establishing intervention plans, including family meetings.

The social worker contacts participants to schedule 1 hour counselling appointments, aiming for all family members, including the primary caregiver, to gather in a private space. While face-to-face counselling is preferred, phone counselling is available if a similar technol necessary. Sessions are recorded and transcribed for documentation.

Interim consultation

The interim consultation provides the ICU team with comprehensive guidance on the management & of symptoms, understanding of the disease and treatment options by the patient and family, decisional conflict, and communication to ensure the provision of high-quality palliative care. Additionally, when a family meeting is necessary, the reasons for recommending the meeting and the required preparations are provided in the form of a response to the referral. If a family meeting is deemed unnecessary, the interim consultation is bypassed, and the process proceeds directly to the final consultation.

Basic procedures and roles of family meetings Table 3

Standard protocols

- Share the purpose and focus of the family meeting
- Confirm the family's understanding of the patient's condition and treatment options
- Ensure the sufficiency of information needed for decision-making
- Provide explanations and summaries of relevant healthcare professionals about patient's condition and treatment options.
- Present discussion topics
- Listen to the family's opinions on the discussion topics
- Set goal of care appropriate for the patient
- Establish detailed action plans
- Provide emotional support to the family members

PCCT, palliative care consultation team.

Support for family meetings

Additional family meetings tailored to the family's needs are conducted as necessary. A family meeting, convened by an ICU attending physician as part of usual care, supports decision-making between healthcare professionals and the family to establish treatment and care plans. These meetings address the need for comprehensive multidisciplinary medical judgement, and to overcome high medical uncertainty, insufficient information, value conflicts in decision-making, and communication issues. During the intervention, the PCCT has supporting roles in resolving complex issues and mediating conflicts in the family meeting. While family meetings follow basic procedures, they can be adjusted to fit specific purposes and situations (table 3).

Final consultation

Expanding on the content of the interim consultation (symptom management, understanding of the disease and decision-making conflict factors, psychosocial support, and communication), the final consultation encompasses care goal setting in the patient's best interest and decision support aligned with these care goals. It also includes information on available support systems, support for EOL care and the bereavement process, and final recommendations in the form of an interdepartmental referral response.

High-quality palliative care by ICU attending physicians

The attending physicians appropriately integrate the recommendations of the PCCT into patient care and treatment, adjusting the goal of care and connecting necessary resources. The physicians also assess the need for further discussions, considering potential changes in the patient's condition or goal of care.

Outcomes

The primary outcome is the feasibility of applying consultation-based high-quality palliative care, determined by the proportion of eligible individuals who

Specific instructions in case v	with high medical uncertainty
---------------------------------	-------------------------------

- Participation of the attending physician and all relevant medical teams with the aim of making comprehensive medical judgments and consolidating palliative care approaches.
- Support for meeting facilitation by the palliative care physician from the PCCT
- Assistance with family meeting preparation and provision of emotional support by the PCCT social worker

Specific instructions in case with the aim of value clarification and facilitation of communication

- Support for value seeking and pursuing processes to enhance patient-centeredness in surrogate decision-making, and support for resolving value conflicts and communication issues within the family and between the family and attending physician.
- ► Family meeting facilitation support by the PCCT social worker

Protected by copyright, includi participate, undergo family counselling, and complete ßu the study. All secondary outcomes are exploratory in nature, intended to generate hypotheses and inform **Q** uses future research, given the limited sample size. Secondary outcomes include changes in family caregiver's decisional conflict, self-efficacy, psychological distress, and decision regret as effects of intervention. Additional secondary outcomes are the level of patient- and family-centred to care experienced by the caregiver,^{40 41} caregiver satisfaction with the services, length of hospital stay, survival discharge rate, and details of comfort care during ICU stay. Data collection completion rate and patient recruitment time are also included. To address the limitation of a small sample size in this study and to enhance the З reliability of the research findings, a qualitative assessment of the feasibility and satisfaction with the intervention will also be conducted as a supplementary measure. \triangleright Additionally, relevant data up to the point of withdrawal will be included in the analysis to ensure comprehensive reporting. table 4 outlines the timing and methods for **g** collecting all outcome measures and survey variables.

Statistical analysis

l simi The outcome measures encompass both categorical variables and continuous variables. For continuous outcomes measuring changes before and after the intervention, a paired t-test or Wilcoxon signed-rank test will be utilised. Categorical variables will be assessed using frequencies (%). All statistical analyses will be two-sided, with a value $\overline{\mathbf{g}}$ of p<0.05 considered statistically significant.

Ethics and dissemination

The study protocol has received approval from the Institutional Review Board of Seoul National University Hospital (No. 2404-111-1532). The results of this study will be shared with critical care societies, interested researchers, and funding agencies. We intend to disseminate the findings extensively through multiple channels, including

an

, and

Table 4 Outcome measures			
Outcomes	Instrument used	Data source	Timing of measurement
Primary Outcome			
Feasibility of applying consultation-based high- quality palliative care in ICUs	Participation rate, palliative care counselling rate, study completion rate	Families and patients	1 day (at discharge)
Secondary Outcomes			
Change in surrogates' decisional conflict	Decisional Conflict Scale (DCS)	Family	Pre-post comparison (baseline vs within 1 week after consultation)
Change in surrogates' decisional self-efficacy	Decisional Self-Efficacy Scale	Family	Pre-post comparison (baseline vs within 1 week after consultation)
Change in surrogates' psychological distress	Hospital Anxiety and Depression Scale (HADS)	Family	Pre-post comparison (baseline vs within 1 week after consultation)
Surrogates' decision regret after the intervention	Decision Regret Scale	Family	Follow-up (Within 1 week/1 month after consultation; Up to 3 months after the final consultation for deceased patients)
Level of patient- and family- centred care experienced by surrogates after the intervention	Modified Patient Perception of Patient-Centeredness (PPPC) Scale	Family	Follow-up (Within 1 week/1 month after consultation; Up to 3 months after the final consultation for deceased patients)
Surrogates' satisfaction with the intervention services	Overall satisfaction (5-point scale: very dissatisfied, dissatisfied, neutral, satisfied, very satisfied)	Family	Within 1 week after the final consultation
Length of hospital stay		Chart review	1 day (at discharge)
Survival to discharge rate		Chart review	1 day (at discharge)
Days of symptom relief treatments received in the ICU		Chart review	1 day (at discharge)
Proportion of patients receiving symptom relief treatments during the ICU stay		Chart review	1 day (at discharge)
Use of life-sustaining procedures within 48 hours before death		Chart review	1 day (at discharge)
Use of symptom relief treatments within 48 hours before death		Chart review	1 day (at discharge)
Data collection completion rate	Proportion of data collected at each time point exceeding 90%	Chart review, Families and patients	Within 3 months after the final consultation
Time taken to recruit patients		Chart review, Families and patients	Within the first year of study initiation
Other Outcomes			
Qualitative evaluation of intervention feasibility and satisfaction	Semi-structured, one-on-one interviews with surrogates	Family	Within 3 months after the final consultation
Additional analysis of surrogates' psychological distress changes	Hospital Anxiety and Depression Scale (HADS)	Family	One month after the final consultation (within 3 months for deceased patients)
ICU, intensive care unit.			

6

presentations at academic conferences, submissions to peer-reviewed journals, and posts on relevant social media platforms. Additionally, the study results will be submitted to ClinicalTrials.gov for broader accessibility.

DISCUSSION

To the best of our knowledge, our study is the first to investigate the feasibility of implementing consultation-based, high-quality palliative care services in an ICU setting where specialist palliative care is not routinely available. Previous studies have indicated that palliative care consultations in the ICU tend to be provided too close to the time of death, limiting their potential benefits.⁴² This highlights the need for research exploring the feasibility and effects of interventions that provide early palliative care to patients who might benefit the most from it.⁴³ In this context, our intervention is significant, as it identifies patients who could benefit from palliative care early on, integrating specialist palliative care into critical care to deliver high-quality palliative care from the outset.

In our study, the selected palliative care intervention focuses on delivering palliative care tailored to the overall situation of the patient and family through early consultation. This approach ensures continuous and effective interaction and communication between the primary ICU team and the patient's family throughout the ICU care process. Various models of ICU palliative care delivery exist, such as consultative and integrative.⁴⁴ In an environment lacking established ICU palliative care, we opted for an intervention model where the PCCT's role is not to consistently manage symptoms directly, but rather to enhance the capacity for primary palliative care through consultation.^{45 46} This approach aims to enhance the delivery of palliative care while efficiently utilizing limited resources,⁴⁷ positioning the PCCT as facilitators and mediators. Unlike previous studies,^{40 43 46 48 49} which predominantly employed independent roles of PCCT or interventions in terms of quality improvement within the primary ICU team, our approach presents a contextspecific, pragmatic adaptive, consultative model. Here, PCCT acts as a facilitator, selectively supporting cases with complex needs to enhance primary palliative care capacity. This targeted strategy optimizes resource use while improving the overall quality of palliative care delivery in the ICU.

In previous studies on ICU palliative care interventions,^{43 46-48} the primary outcomes were typically subjective measures, such as family satisfaction and depression, or clinical outcomes for patients. Our study shares the limitation of difficulty in assessing patient outcomes due to the medical conditions of ICU patients, but it stands out by including person-centered care outcomes, like the Patient Perception of Patient-Centeredness Questionnaire,⁴¹ proxy-reported by caregivers as a secondary outcome. As a feasibility study with an exploratory focus, we aimed to incorporate a range of outcomes from patient and family perspectives, as well as healthcare system and

process aspects, while qualitatively evaluating those less suited to quantitative assessment.

Despite these strengths, our study has several limitations. First, we used a single-arm design for the pilot trial at a single center. Since PCCTs for ICUs are not widely implemented across healthcare institutions, and our intervention included both the PCCT and primary palliative care by ICU attending physicians, we considered a randomized design unsuitable for this pilot study. Second, the small sample size and single-arm pre-post design limit statistical power and introduce potential confounding. Patient-specific factors—such as under-lying conditions, prior ICU management, and ICU length of stay—may influence outcomes. While relevant clinical variables will be recorded to aid interpretation, 8 all secondary outcomes should be considered exploratory and hypothesis-generating. Furthermore, defining a standard target for feasibility is challenging due to variations in ICU palliative care delivery across healthcare systems. To address these issues, qualitative methods were incorporated to provide contextual insights and support comprehensive evaluation. Third, patients expected to die within 48 hours were excluded. As the structured palliative care r use consultation requires a minimum window for effective implementation, immediate end-of-life care in such cases is more appropriately provided by ICU clinicians. Future studies could explore rapid-response palliative care models or enhanced ICU-based primary palliative care to support families facing imminent death. Finally, our study only included ICU physicians as direct participants, a even though ICU nurses play a critical role in palliative care.⁵⁰ This may limit the interpretation of our intervention's potential impact. However, given our focus on a decision-making support, we prioritized enhancing ICU physicians' competency.

In conclusion, this study would have the potential to investigate the provision of high-quality palliative care via training, and similar technologies a consultative palliative care model integrated into ICU care as a feasible and acceptable approach. The results of this study can give insights for modelling the effective palliative care delivery in an ICU environment.

Contributors YSJ and YK: conception and design of study, drafting and critically revising the manuscript. SK: conception and design of study. YSJ and TJK: development of the protocol and manuscript review. SHY: conception and design of study, drafting and critically revising the manuscript, development of the protocol and manuscript review. SHY is responsible for the overall content as the guarantor. All authors approved of the final version of the manuscript. The funder had no involvement in any aspect of the study or publication process.

Funding This research was supported by a grant from the Patient-Centered Clinical Research Coordinating Center (PACEN), funded by the Ministry of Health & Welfare of the Republic of Korea (grant number: RS-2023-KH137917).

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been

Open access

peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs

Ye Sul Jeung http://orcid.org/0000-0003-4709-5951 Yejin Kim http://orcid.org/0000-0002-1479-3385 Seyeon Kim http://orcid.org/0009-0007-3911-9876 Yoon Sun Jung http://orcid.org/0000-0001-7408-4436 Tae Jung Kim http://orcid.org/0000-0003-3616-5627 Shin Hye Yoo http://orcid.org/0000-0001-7473-1082

REFERENCES

- 1 Mercadante S, Gregoretti C, Cortegiani A. Palliative care in intensive care units: why, where, what, who, when, how. BMC Anesthesiol 2018;18:106.
- Angus DC, Barnato AE, Linde-Zwirble WT, et al. Use of intensive care at the end of life in the United States: an epidemiologic study. Crit Care Med 2004;32:638-43.
- Angus DC, Truog RD. Toward Better ICU Use at the End of Life. 3 JAMA 2016;315:255.
- Bibas L, Peretz-Larochelle M, Adhikari NK, et al. Association of Surrogate Decision-making Interventions for Critically III Adults With Patient, Family, and Resource Use Outcomes: A Systematic Review and Meta-analysis. JAMA Netw Open 2019;2:e197229.
- Herridge MS, Tansey CM, Matté A, et al. Functional disability 5 5 years after acute respiratory distress syndrome. N Engl J Med 2011:364:1293-304.
- Detsky ME, Harhay MO, Bayard DF, et al. Six-Month Morbidity 6 and Mortality among Intensive Care Unit Patients Receiving Life-Sustaining Therapy. A Prospective Cohort Study. Ann Am Thorac Soc 2017:14:1562-70.
- Clark JA, Wray NP, Ashton CM. Living with treatment decisions: 7 regrets and quality of life among men treated for metastatic prostate cancer. J Clin Oncol 2001;19:72-80.
- Feiler D, Müller-Trede J. The One That Got Away: Overestimation of Forgone Alternatives as a Hidden Source of Regret. Psychol Sci 2022:33:314-24
- 9 Hilger C, Schostak M, Otto I, et al. Time pressure predicts decisional regret in men with localized prostate cancer: data from a longitudinal multicenter study. World J Urol 2021;39:3755-61.
- October TW, Jones AH, Greenlick Michals H, et al. Parental Conflict, 10 Regret, and Short-term Impact on Quality of Life in Tracheostomy Decision-Making. Pediatr Crit Care Med 2020;21:136-42.
- Iverson E, Celious A, Kennedy CR, et al. Factors affecting 11 stress experienced by surrogate decision makers for critically ill patients: implications for nursing practice. Intensive Crit Care Nurs 2014:30:77-85
- 12 Jezewski MA. Do-not-resuscitate status: conflict and culture brokering in critical care units. Heart Lung 1994;23:458-65.
- Schenker Y, Crowley-Matoka M, Dohan D, et al. I don't want to be 13 the one saying "we should just let him die": intrapersonal tensions experienced by surrogate decision makers in the ICU. J Gen Intern Med 2012;27:1657-65.
- Curtis JR, Engelberg RA, Nielsen EL, et al. Patient-physician communication about end-of-life care for patients with severe COPD. Eur Respir J 2004;24:200-5.
- Davidson JE, Powers K, Hedayat KM, et al. Clinical practice 15 guidelines for support of the family in the patient-centered intensive care unit: American College of Critical Care Medicine Task Force 2004-2005. Crit Care Med 2007;35:605-22.
- 16 Majesko A, Hong SY, Weissfeld L, et al. Identifying family members who may struggle in the role of surrogate decision maker. Crit Care Med 2012;40:2281-6.
- Bowman K. Trepidation: a family member's response to shift change 17 in the intensive care unit. Dimens Crit Care Nurs 2010;29:288-92.

- Mitchell ML. Courtney M. Cover F. Understanding uncertainty and 18 minimizing families' anxiety at the time of transfer from intensive care. Nurs Health Sci 2003;5:207-17
- 19 Nelson JE, Puntillo KA, Pronovost PJ, et al. In their own words: patients and families define high-quality palliative care in the intensive care unit. Crit Care Med 2010;38:808-18.
- Cohan JN, Orleans B, Brecha FS, et al. Factors Associated With 20 Decision Regret Among Patients With Diverticulitis in the Elective Setting. J Surg Res 2021;261:159-66.
- 21 Szproch AK, Maguire R. A systematic review of the factors associated with regret post-cancer treatment. J Psychosoc Oncol 2022:40:1-25
- 22 Wilson A, Winner M, Yahanda A, et al. Factors associated with decisional regret among patients undergoing major thoracic and abdominal operations. Surgery 2017;161:1058-66.
- Lautrette A, Darmon M, Megarbane B, et al. A communication 23 strategy and brochure for relatives of patients dying in the ICU. N Engl J Med 2007;356:469–78.
- Siegel MD, Hayes E, Vanderwerker LC, et al. Psychiatric illness in the 24 next of kin of patients who die in the intensive care unit. Crit Care Med 2008;36:1722-8.
- Protected by copyright, including for uses related to text and data mining, AI training, and 25 Anderson WG, Arnold RM, Angus DC, et al. Posttraumatic stress and complicated grief in family members of patients in the intensive care unit. J Gen Intern Med 2008:23:1871-6.
- 26 Paparrigopoulos T, Melissaki A, Efthymiou A, et al. Short-term psychological impact on family members of intensive care unit patients. J Psychosom Res 2006;61:719-22.
- 27 Pochard F, Darmon M, Fassier T, et al. Symptoms of anxiety and depression in family members of intensive care unit patients before discharge or death. A prospective multicenter study. J Crit Care 2005;20:90-6.
- Wendler D, Rid A. Systematic review: the effect on surrogates 28 of making treatment decisions for others. Ann Intern Med 2011:154:336-46
- Azoulay E, Pochard F, Kentish-Barnes N, et al. Risk of post-traumatic 29 stress symptoms in family members of intensive care unit patients. Am J Respir Crit Care Med 2005;171:987-94.
- Hua M, Wunsch H. Integrating palliative care in the ICU. Curr Opin Crit Care 2014:20:673-80.
- 31 Michels G, Schallenburger M, Neukirchen M, et al. Recommendations on palliative care aspects in intensive care medicine. Crit Care 2023;27:355.
- 32 Doherty C. Feder S. Gillespie-Heyman S. et al. Easing Suffering for ICU Patients and Their Families: Evidence and Opportunities for Primary and Specialty Palliative Care in the ICU. J Intensive Care Med 2024;39:715-32
- O'Mahony S, McHenry J, Blank AE, et al. Preliminary report of the 33 integration of a palliative care team into an intensive care unit. Palliat Med 2010:24:154-65
- Kim JM, Godfrey S, O'Neill D, et al. Integrating palliative care into 34 the modern cardiac intensive care unit: a review. Eur Heart J Acute Cardiovasc Care 2022;11:442-9.
- Chung TH, Nguyen LK, Lal LS, et al. Palliative Care Consultation in 35 the Intensive Care Unit Reduces Hospital Costs: A Cost-Analysis. J Palliat Care 2025;40:3-7.
- Kyeremanteng K, Gagnon L-P, Thavorn K, et al. The Impact of 36 Palliative Care Consultation in the ICU on Length of Stav: A Systematic Review and Cost Evaluation. J Intensive Care Med 2018:33:346-53.
- Aslakson RA, Curtis JR, Nelson JE. The Changing Role of Palliative 37 Care in the ICU. Crit Care Med 2014;42:2418-28.
- 38 Nelson JE, Bassett R, Boss RD, et al. Models for structuring a clinical initiative to enhance palliative care in the intensive care unit: a report from the IPAL-ICU Project (Improving Palliative Care in the ICU). Crit Care Med 2010;38:1765-72.
- 39 Kim K, Park B, Gu B, et al. The National Hospice and Palliative Care registry in Korea. Epidemiol Health 2022;44:e2022079.
- White DB, Angus DC, Shields A-M, et al. A Randomized Trial of a 40 Family-Support Intervention in Intensive Care Units. N Engl J Med 2018;378:2365-75.
- 41 Andersen SK, Vincent G, Butler RA, et al. ProPACC: Protocol for a Trial of Integrated Specialty Palliative Care for Critically III Older Adults. J Pain Symptom Manage 2022;63:e601-10.
- Seaman JB, Barnato AE, Sereika SM, et al. Patterns of palliative care 42 service consultation in a sample of critically ill ICU patients at high risk of dying. Heart Lung 2017;46:18-23.
- Helgeson SA, Burnside RC, Robinson MT, et al. Early Versus Usual 43 Palliative Care Consultation in the Intensive Care Unit. Am J Hosp Palliat Care 2023;40:544-51.

similar technologies

<u>ð</u>

Open access

- 44 Curtis JR, Higginson IJ, White DB. Integrating palliative care into the ICU: a lasting and developing legacy. *Intensive Care Med* 2022;48:939–42.
- 45 Halangk W, Dietz H. Capacities of oxidative metabolism in digitonintreated bovine epididymal spermatozoa. *Biomed Biochim Acta* 1986;45:1249–57.
- 46 Ma J, Chi S, Buettner B, et al. Early Palliative Care Consultation in the Medical ICU: A Cluster Randomized Crossover Trial. *Crit Care* Med 2019;47:1707–15.
- 47 Kamdar HA, Gianchandani S, Strohm T, et al. Collaborative Integration of Palliative Care in Critically III Stroke Patients in the

Neurocritical Care Unit: A Single Center Pilot Study. *J Stroke Cerebrovasc Dis* 2022;31:106586.

- 48 Chang DW, Neville TH, Parrish J, *et al*. Evaluation of Time-Limited Trials Among Critically III Patients With Advanced Medical Illnesses and Reduction of Nonbeneficial ICU Treatments. *JAMA Intern Med* 2021;181:786–94.
- 49 Carson SS, Cox CE, Wallenstein S, et al. Effect of Palliative Care-Led Meetings for Families of Patients With Chronic Critical Illness: A Randomized Clinical Trial. JAMA 2016;316:51–62.
- 50 Nelson JE, Cortez TB, Curtis JR, et al. Integrating Palliative Care in the ICU: The Nurse in a Leading Role. J Hosp Palliat Nurs 2011;13:89–94.