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Preparing High-Risk Patients with Hematologic Malignancies for Critical Care: A Pilot Study (PREP-ICU)

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Abstract

Aim: This study aimed to evaluate the feasibility, effectiveness, and acceptability of an intensive care unit (ICU) orientation intervention to improve advance care planning among patients with hematologic malignancies.

Study Design: This prospective observational cohort study enrolled high-risk hospitalized patients with hematologic malignancies who had a directive for full resuscitative measures. The intervention consisted of a: (1) video outlining ICU interventions and outcomes; (2) a values and preferences workbook; and (3) a follow-up meeting to discuss goals of care. Feasibility outcomes included recruitment and completion rates for each study component. Effectiveness was assessed using pre- and post-video surveys measuring knowledge of ICU interventions and outcomes. Acceptability was evaluated using an emotional impact survey and the proportion of participants who chose to terminate the video prematurely.

Results: Fifteen participants were recruited. Regarding feasibility, 11 of 15 participants (73%) completed all study components. All participants (15/15) completed the video, and 13 of 15 (87%) completed the follow-up meeting. Regarding effectiveness, the proportion of participants achieving a score of 90% or higher increased from the 8% (1/12) on the pre-video survey to 58% (7/12) on the post-video survey. Regarding acceptability, no participants terminated the video prematurely. Most participants reported being glad to have had the opportunity to discuss ICU-level care (11/12, 92%) and stated that they would recommend the video to others (10/12, 83%).

Conclusions: This pilot study provides important data to inform the development of a larger evaluation of an ICU orientation initiative aimed at promoting goal-concordant care in the event of critical illness.

Keywords: Advance care planning; critical care; hematologic malignancy; intensive care; palliative care, pilot projects.

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Introduction

Critical illness is common among patients with hematologic malignancies (HM). For example, 20% of patients with acute leukemia are admitted to an intensive care unit (ICU) within 12 months of diagnosis [1]. Critical illness may result from either treatment- or disease-related complications, with acute hypoxemic respiratory failure and sepsis being the most common reasons for ICU admission [2,3]. Although outcomes for patients with HM admitted to the ICU have improved over time, ICU mortality remains between 30% and 50%, and 12-month mortality approaches 60% [4].

Critical illness often occurs suddenly and unexpectedly, leaving many patients too ill to communicate their wishes and preferences regarding care. Previous studies have shown that conversations about advance care planning (ACP) and life-sustaining therapies do not occur routinely [5]. Ideally, decisions regarding escalation to ICU-level care in the setting of critical illness should be initiated before clinical deterioration occurs and should be informed by: (1) an understanding of what ICU care entails and (2) the likelihood of survival and return to treatment. Patients should also have sufficient time to consider this information in light of their values and preferences to ensure that the care they receive is goal-concordant [6,7]. Unfortunately, once critical illness develops, patients often lack the time or decision-making capacity necessary to make informed choices [8].

When patients lack decision-making capacity, a substitute decision-maker (SDM) must guide treatment decisions based on the best available understanding of the patient's wishes. However, discussions between patients and their SDMs regarding treatment preferences are often absent before the onset of acute illness [9,10]. SDMs frequently experience stress, anxiety, and post-traumatic stress disorder (PTSD) related to decisions that may affect end-of-life (EOL) care [11]. Additionally, SDMs often choose more aggressive treatment approaches that may not align with the patient's preferences [12,13].

Advance care planning conversations with patients who have HMs often occur late in the disease trajectory or not at all [5,13-15]. Even among high-risk patients with HMs, ACP documentation is present in fewer than 50% of cases [15-17], and the conversations that do occur are rarely perceived as effective [5]. Patients with hematologic malignancies face several barriers to engaging in ef-

fective discussions about care planning in the setting of critical illness. Prognosis may be difficult to determine, treatment- and disease-related complications can result in life-threatening critical illness, and clinicians often struggle to identify when a patient is approaching the terminal phase of illness, particularly when substantial time and resources have been invested in treating the malignancy [18-20]. Consequently, patients with HMs are more likely than those with solid tumors to die in hospital or the ICU, receive more aggressive interventions, and have less involvement from palliative care services [21-24]. Furthermore, surrogate decision-makers for patients with HMs are more likely to experience elevated levels of PTSD [25,26]. Routinely exploring patients' values and preferences through meaningful ACP conversations may help mitigate some of the treatment-related burdens associated with HMs, facilitate the timely integration of palliative care, and maximize the likelihood that patients receive goal-concordant care.

Given the high incidence of critical illness in this population and the well-recognized challenges associated with timely and effective ACP discussions, innovative approaches are needed. The aim of this pilot study was to evaluate the feasibility, acceptability, and effectiveness of a video-based ICU orientation initiative designed to promote informed decision-making among hospitalized patients with HM who were actively receiving treatment with curative intent and were at high risk of developing critical illness. We hypothesized that a video-based ICU orientation tool would be feasible and acceptable and would be associated with improved ICU-related knowledge in this exploratory pilot study.

Materials and Methods

Study Design and Setting

We conducted a prospective observational pilot study in the acute leukemia and allogeneic hematopoietic stem cell transplant (HSCT) inpatient units at University Health Network in Toronto, Canada. The study was approved by the University Health Network Research Ethics Committee (Approval Number: 18-5317, Date: 03.05.2021). Informed consent was obtained from all participants prior to enrollment. All procedures were conducted in accordance with the ethical standards of the 1975 Declaration of Helsinki.

Participants

Patients were eligible for inclusion if they had a resusci-

tation status of “full cardiopulmonary resuscitation with no limitations,” were receiving active treatment, and met one of the following criteria: (1) acute leukemia with relapsed, refractory, or secondary disease; (2) HSCT within the previous two years, age greater than 60 years, and two or more comorbid conditions (Appendix 1); or (3) HSCT within the previous two years with a confirmed or suspected infection (i.e., bacteremia, pneumonia, invasive fungal infection, or febrile neutropenia). These criteria were selected because of their association with clinical deterioration and poor outcomes. To standardize delivery of the video and workbook components in this pilot study, enrollment was limited to English-speaking patients. Patients were excluded if they had previously been admitted to the ICU; had a pre-existing “Do Not Resuscitate,” “Do Not Intubate,” or “Do Not Transfer to ICU” order; were receiving palliative treatment or treatment with palliative intent; or had an estimated life expectancy of less than seven days.

Study recruitment and data collection were undertaken by a trained research coordinator. The principal investigator, a critical care physician, communicated with each patient’s most responsible physician to confirm eligibility and obtain approval before approaching patients regarding participation.

Intervention

An overview of the study framework is presented in Figure 1. The ICU orientation intervention consisted of three components delivered at the bedside within routine inpatient workflows. Part 1 consisted of a 14-minute educational video that described: (1) common ICU interventions (including intubation, invasive mechanical ventilation, central catheters, dialysis, and cardiopulmonary resuscitation); (2) short- and long-term ICU outcomes; and (3) factors relevant to decision-making regarding ICU care, with an emphasis on the importance of exploring personal values and preferences (Fig. 2). The video was viewed on a tablet at the patient’s bedside with an ICU physician (attending physician or fellow) present. Patients were encouraged to pause the video as needed and could watch it in multiple shorter segments to accommodate symptoms, fatigue, or interruptions related to clinical care. Part 2 consisted of a workbook designed to encourage reflection on personal values and care preferences. Part 3 was a follow-up meeting conducted 24–48 hours later with the same ICU physician. The purpose of this meeting was to discuss the patient’s values and preferences, answer questions regarding ICU-level care,

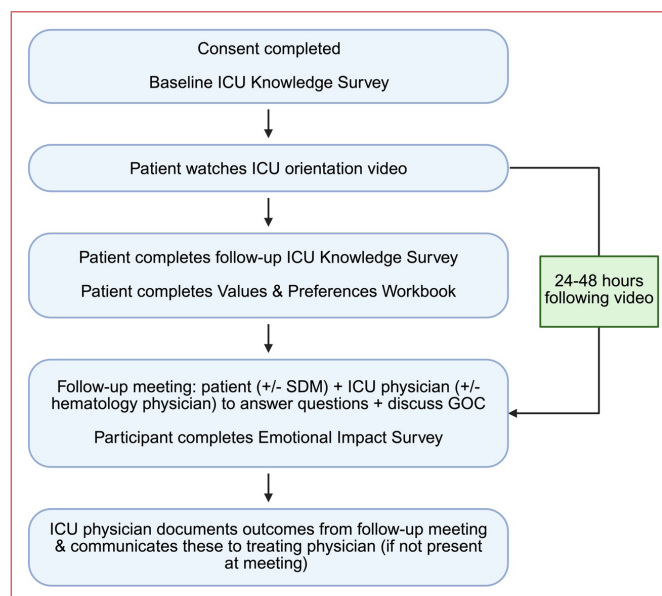


Figure 1. Overview of the study framework.

GOC: Goals of Care; ICU: Intensive Care Unit; SDM: Substitute Decision-Maker. Created with BioRender (Weir T., 2025, <https://BioRender.com/y7qcd1w>).

and revisit goals of care (GOC). The outcomes of these discussions were documented and communicated to the patient’s most responsible physician (MRP).

The ICU orientation video was developed using: (1) themes identified by a local working group consisting of intensivists, malignant hematologists, palliative care nurse practitioners, and palliative care physicians; (2) a review of the literature describing ACP interventions; and (3) presentations and discussions with relevant clinical stakeholder groups to identify content most applicable to their patient populations (e.g., leukemia physi-

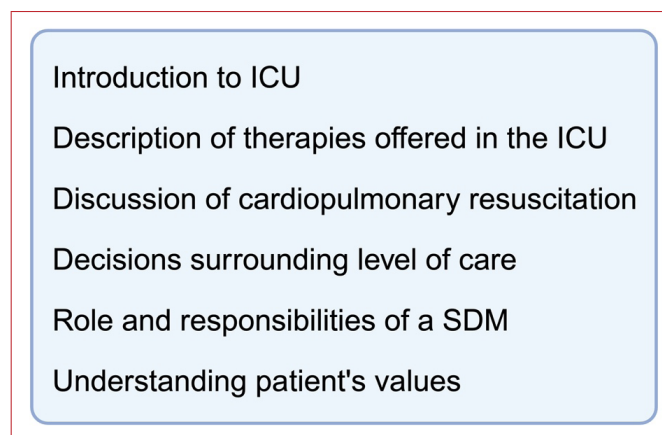


Figure 2. Key themes addressed in the orientation video.

ICU: Intensive Care Unit; SDM: Substitute Decision-Maker. Created with BioRender (Weir T., 2025, <https://BioRender.com/8qyqx5n>).

cians, allogeneic HSCT physicians, and ICU physicians). The video was subsequently presented at a meeting of the Critical Care Oncologic Investigative Network, a multidisciplinary, multicenter collaboration of oncology and critical care professionals, for additional feedback. A link to the video is provided in Appendix 2. A video-based ICU orientation intervention was selected for several reasons. First, it ensured that standardized information was delivered to all participants. Second, it provided patients with an opportunity to process the information and discuss it with loved ones before a formal goals-of-care conversation. Third, multiple studies have demonstrated benefits associated with video-assisted decision-support interventions without evidence of harm [27-29].

The workbook incorporated the Short Graphic Values History Tool together with questions regarding resuscitation preferences, designation of a substitute decision-maker, and decisional conflict. The Short Graphic Values History Tool is intended to reinforce patient-centered decision-making in the context of serious illness [30,31]. Participants were asked to complete the workbook before the follow-up GOC discussion.

Within 48 hours of viewing the video, each participant met with the same ICU physician to discuss GOC and document treatment preferences. This meeting also provided structured time to clarify understanding and address questions arising from the video, workbook, or subsequent reflection. Whenever possible, the discussion was scheduled during regular business hours (Monday to Friday, 09:00–17:00 h) and included the hematology MRP (or delegate) and the participant's SDM. Key themes emerging from the workbook and GOC discussion were documented in the medical record. When the hematology MRP or an appropriate delegate was unable to attend, the discussion summary was communicated via secure email.

Measures

The primary objectives of this pilot study were to assess: (1) effectiveness, (2) feasibility, and (3) acceptability. Effectiveness was evaluated by measuring changes in ICU-related knowledge using an ICU orientation knowledge questionnaire. The questionnaire was administered at enrollment (pre-intervention) and again within 24 hours after viewing the educational video (post-intervention). At the time the study was initiated, no validated ICU orientation knowledge instrument existed for

this patient population. Accordingly, questionnaire items were adapted from previously published decision-aid instruments [27,28] and focused on ICU interventions, anticipated outcomes, and decision-making considerations. Draft items underwent expert review by intensivists, malignant hematologists, and palliative care clinicians to establish content validity and face validity before being refined for clarity and readability. The final questionnaire consisted of 10 multiple-choice questions, each with four response options. Participants selected the answer they believed to be correct. Correct responses received one point, while incorrect responses received zero points. Total scores ranged from 0 to 10, with higher scores indicating greater knowledge. Feasibility was assessed by examining recruitment rates, time to completion of the first and second study encounters, and completion rates for study components and outcome measures. Acceptability was assessed by recording the number of participants who requested to stop the video and the number of interruptions requested. Participants also completed an emotional impact survey to determine whether the intervention caused significant distress.

As an exploratory measure of potential impact, we also recorded any changes in goals of care following the intervention. Resuscitation preferences were categorized as: (1) all indicated life-prolonging treatments; (2) ICU admission with limitations on selected treatments; (3) ward-based medical management without resuscitation or ICU transfer; or (4) comfort-focused care. Participants could also indicate that they were undecided or open to ongoing discussion. Decisional confidence regarding ICU-related decisions was assessed using a 10-item version of the Decisional Conflict Scale [32,33].

Although we did not prospectively measure the time required by the research coordinator or ICU physicians to develop and deliver the intervention, all patient-facing activities occurred during regular working hours. The only additional resources required for the intervention were a tablet device for video playback and printed workbook materials.

Data Collection

Study recruitment and data collection were conducted by a trained research coordinator. The ICU orientation provider communicated with patients' MRPs to confirm eligibility, obtain approval before approaching patients, and communicate the outcomes of goals-of-care discussions. Baseline data collected for all participants

included age, sex, residence prior to hospital admission, pre-admission functional status, and comorbidities. Information regarding the hematologic malignancy, including diagnosis, disease status, treatment history, and disease- or treatment-related complications, was also recorded. Hospital outcomes collected included length of stay, rapid response team consultation, ICU admission, palliative care consultation, and discharge status (alive or deceased).

Data Analysis and Sample Size

Continuous variables were summarized using means and standard deviations, while categorical variables were summarized using frequencies and percentages. Pre- and post-intervention ICU knowledge survey scores were compared using a paired Student's t-test. Statistical significance was defined as a p value <0.05, corresponding to a 95% confidence level. The planned sample size for this pilot study was 15 patients. This sample size was selected to balance feasibility considerations with the need to generate sufficient information to refine and optimize the intervention before conducting a larger-scale study.

Results

Of the 49 patients who met the inclusion criteria and were screened for participation, 15 consented and were enrolled between March 2025 and May 2025, yielding a recruitment rate of 31%. Participant demographic and clinical characteristics are presented in Table 1.

Feasibility Outcomes

All 15 patients (100%) completed the baseline ICU orientation knowledge questionnaire and viewed the ICU orientation video. Thirteen participants (87%) participated in a GOC discussion with a critical care physician 24–48 hours after viewing the video. One participant and their substitute decision-maker declined further contact with the study team after watching the video, while another participant was discharged home unexpectedly before follow-up could occur. Completion rates for the post-intervention questionnaire, workbook, and emotional impact survey are summarized in Table 2.

Effectiveness Outcomes

Twelve participants (80%) completed both the pre- and post-intervention ICU orientation knowledge questionnaires. The mean knowledge score increased significantly following the intervention, from 6.2/10 (standard deviation [SD] 1.7) before the intervention to 8.3/10 (SD

Table 1. Baseline characteristics of study participants

Age (mean±SD)	65±5
Sex	
Male, n (%)	8 (53%)
Female, n (%)	7 (47%)
Other, n (%)	0 (0%)
Primary hematologic diagnosis	
Acute myeloid leukemia (non-promyelocytic), n (%)	9 (60%)
Acute lymphocytic leukemia, n (%)	1 (6.7%)
Myelodysplastic syndrome, n (%)	4 (26%)
Other, n (%)	1 (6.7%)
HSCT, n (%)	9 (60%)
Charlson Comorbidity Index (median, IQR)	5 (4–6)
Reason for hospital admission	
Planned admission for chemotherapy or HSCT, n (%)	12 (80%)
Disease relapse, n (%)	1 (6.7%)
Suspected infection or febrile neutropenia, n (%)	1 (6.7%)
Other, n (%)	1 (6.7%)
Goals-of-care characteristics	
Previously documented GOC discussion, n (%)	15 (100%)
Full resuscitative measures documented at enrollment, n (%)	15 (100%)

GOC: Goals of Care; HSCT: Hematopoietic Stem Cell Transplant; IQR: Interquartile Range; SD: Standard Deviation.

1.9) after the intervention ($p=0.0003$). Detailed results of the ICU knowledge questionnaire are presented in Table 3. In particular, the proportion of participants correctly answering questions related to ICU therapies, the role of the SDM, the likelihood of hospital discharge following cardiac arrest, and the role of comfort-focused care increased after the intervention.

Table 2. Completion of study components

Study component	Participants completing component, n (%)
Baseline knowledge questionnaire	15 (100%)
Viewed orientation video in its entirety	15 (100%)
Post-intervention knowledge questionnaire	12 (80%)
Values and preferences workbook	11 (73%)
Emotional impact survey	12 (80%)
Follow-up discussion	13 (87%)

Table 3. ICU knowledge questionnaire results

Question category	Correct responses pre-intervention, n (%)	Correct responses post-intervention, n (%)
Components of advance care planning	11/12 (92%)	11/12 (92%)
ICU-level therapies	5/12 (42%)	11/12 (92%)
Ability to change decisions regarding LST	9/12 (75%)	8/12 (67%)
How a SDM is appointed	7/12 (58%)	9/12 (75%)
Role of the SDM	8/12 (67%)	12/12 (100%)
Likelihood of hospital discharge following cardiac arrest	2/12 (17%)	8/12 (67%)
Components of comfort-focused care	3/12 (25%)	9/12 (75%)
Components of CPR	8/12 (67%)	10/12 (83%)
Utility of LST	9/12 (75%)	10/12 (83%)
Default treatment approach when no GOCs are established	12/12 (100%)	11/12 (92%)

CPR: Cardiopulmonary Resuscitation; GOC: Goals of Care; ICU: Intensive Care Unit; LST: Life-Sustaining Therapies; SDM: Substitute Decision-Maker.

Following the intervention, four participants (27%) changed their GOC from “full code” to “admit to ICU but do not perform cardiopulmonary resuscitation. All four survived to hospital discharge. An additional two participants died in hospital without escalation to ICU-level care. Four participants (27%) were admitted to the ICU after receiving the ICU orientation intervention. All received treatments consistent with their previously documented goals of care, and all survived to ICU discharge. All participants who completed the workbook indicated that they would be willing to accept intubation as a potentially life-sustaining intervention.

Acceptability Outcomes

All 15 participants completed the video without stopping it prematurely. Twelve participants (80%) completed the emotional impact survey following the intervention. Results of the emotional impact survey are presented in Table 4. Fewer than one-third of participants who completed the survey agreed or strongly agreed that hearing about or discussing critical illness, ICU care, and death made them feel sad or anxious. In contrast, most participants agreed or strongly agreed that they were glad to have had the opportunity to learn about and discuss ICU care, found the information presented in the video help-

Table 4. Acceptability outcomes based on the emotional impact survey

Survey statement	Participants responding “agree” or “strongly agree”
“I felt sad or anxious hearing about or discussing critical illness, ICU care, and death.”	3/12 (25%)
“I was glad to have the opportunity to learn about and discuss ICU care.”	11/12 (92%)
“I found the information presented in the video helpful.”	11/12 (92%)
“I would recommend the video to other patients.”	10/12 (83%)
“I would recommend this type of conversation to other patients.”	10/12 (83%)

ICU: Intensive Care Unit.

ful, and would recommend both the video and this type of conversation to other patients.

Discussion

In this exploratory single-arm pilot study of hospitalized patients with HM at high risk of clinical deterioration, a brief video-based ICU orientation intervention combined with a facilitated GOC discussion was feasible, acceptable, and associated with improved ICU-related knowledge. Despite known challenges in implementing timely ICU-oriented ACP in this population, the intervention achieved high levels of engagement, generated positive patient feedback, and was associated with minimal emotional distress. To our knowledge, this is the first study to evaluate a structured, video-based ICU orientation intervention designed specifically to support decision-making regarding ICU care among patients with HMs.

Although patients with HMs face a substantial risk of sudden clinical deterioration, discussions regarding ICU care are often delayed or absent altogether [5]. In our study, 27% of participants were admitted to the ICU during their hospitalization, and all received care that was consistent with their documented preferences. While the single-arm design precludes causal inference, these findings are descriptively consistent with the delivery of goal-concordant care and highlight the potential value of proactively exploring patient preferences before decision-making capacity is compromised.

Although concerns about emotional distress are frequently cited as barriers to discussions regarding ICU care in patients with HMs, most participants reported being glad they had the opportunity to engage in these conversations. Only a minority reported increased feelings of sadness or anxiety, findings that are consistent with previous studies demonstrating that discussions about ICU interventions do not increase psychological distress among patients with serious illness^[34-36].

Several findings warrant further consideration. First, four participants chose to modify their resuscitation preferences after completing the intervention, suggesting that structured discussions regarding ICU care may facilitate more deliberate and value-concordant decision-making. Second, although most participants expressed a willingness to undergo intubation, the nuanced nature of their preferences, including interest in time-limited trials of life-sustaining therapies, underscores the importance of individualized discussions that extend beyond binary treatment decisions. These findings support the value of the ICU orientation workbook and facilitated discussions in exploring the complexity of patient values and preferences regarding critical care.

Despite these encouraging findings, important barriers remain. Only one-third of eligible patients agreed to participate, suggesting that readiness to engage in discussions about critical illness and ICU care may be a significant limiting factor. We did not collect demographic information on eligible patients who declined participation. Previous studies have identified clinician hesitancy, prognostic uncertainty, and a culture emphasizing curative treatment as important barriers to early ICU-related discussions in patients with HMs^[18,20]. Future interventions may benefit from integrating ICU orientation earlier in the disease trajectory as a routine component of care, thereby normalizing these conversations. Although the incremental material resources required for this pilot study were minimal, relying primarily on existing clinical workflows, printed workbooks, and a single tablet device, we did not prospectively measure the time commitment required of the research coordinator and ICU physicians involved in delivering the intervention. Future studies should evaluate these resource and staffing requirements to better inform scalability and implementation.

Our study has several limitations. First, as a single-center, non-randomized pilot study, it is susceptible to selection bias. Participants who agreed to enroll (or their surro-

gates) may have been more willing to engage in discussions about serious illness and end-of-life care than those who declined participation. Second, although informed by prior literature, the ICU orientation knowledge questionnaire was developed specifically for this intervention and has not undergone formal validation. Consequently, improvements in questionnaire scores should be interpreted cautiously. Third, restricting participation to English-speaking patients limits both inclusivity and the generalizability of our findings. Future work should focus on translating and culturally adapting study materials and incorporating professional interpretation services to support linguistically diverse patients and families. Finally, the short follow-up period precluded assessment of longer-term outcomes, including patient satisfaction, surrogate perceptions of end-of-life care quality, or substitute decision-maker burden. These outcomes should be examined in future studies. Future research should focus on integrating ICU orientation interventions earlier in the disease trajectory, refining educational content to address common misconceptions about critical care, and developing tailored strategies for patients with language barriers or limited readiness to engage in advance care planning discussions.

This pilot study provides important proof-of-concept evidence supporting the feasibility and acceptability of a video-based ICU orientation intervention among patients with HMs who are at high risk of developing critical illness. Facilitating meaningful discussions about ICU care with patients and their surrogates represents an important step toward improving goal-concordant care and supporting informed decision-making during episodes of critical illness.

Conclusion

A video-based ICU orientation intervention represents a promising strategy for standardizing the delivery of information about critical care, enhancing patient and surrogate understanding, and facilitating timely GOC discussions among hospitalized patients with hematologic malignancies. These findings support further evaluation of this approach in a larger multicenter study to better determine its impact on patient-centered outcomes and surrogate decision-making.

Ethics Committee Approval: Ethics committee approval was obtained from University Health Network Research Ethics Committee (Approval Number: 18-5317, Date: 03.05.2021).

Informed Consent: Written informed consent was obtained from all participants.

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