



Original Article

Developing and evaluating a cancer communication picture book for children, families, and health care professionals: A mixed-methods feasibility study



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ABSTRACT

Objective: Effective communication about cancer with children is a significant challenge for healthcare professionals and families. This study aimed to create a picture book as a tool for facilitating communication about cancer and to assess its feasibility. It also demonstrated the use of mixed methods and convergent designs for intervention development.

Methods: The study included healthcare professionals ($n = 14$), children without cancer (aged 4-8 years; $n = 21$) and their families ($n = 18$), as well as children with various types of cancer, undergoing maintenance therapy or follow-up (aged 4-12 years; $n = 3$) and their families ($n = 3$). Quantitative and qualitative data were separately analyzed, and meta-inferences were made using a joint display. The picture book was refined based on feedback from healthcare professionals, and a similar iterative process was carried out with children and their families.

Results: Over 85% of the participants considered the picture book, along with a side book, feasible. The picture book was found to be helpful for discussing the topic of cancer with children. It also significantly improved the knowledge of children without cancer ($P < 0.01$). Most children expressed interest in reading it and believed it was useful for talking to others about cancer. However, some concerns were raised regarding the context and expressions in the picture book.

Conclusions: This study successfully assessed the feasibility of the developed picture book using a mixed methods approach, offering valuable insights into its implementation and refinement. Further research is needed to evaluate the effectiveness of its use and gather user feedback.

Introduction

The impact of childhood cancer is significant, and cancer remains a leading cause of death in children in Japan.¹ Children with cancer face health threats, and their lives change immediately after diagnosis because they perceive cancer as a stressful and traumatic experience.^{2,3} Previous research has suggested that cancer-related information is necessary for children with cancer to understand their situation correctly and adopt actions that support their goals.⁴⁻⁶ Appropriate communication of medical information at the time of diagnosis has been reported to facilitate coping with illness, decrease stress and anxiety, and create good

relationships between children, their parents, and health care professionals (HCPs).⁶⁻⁸ However, despite the potential benefits of effective communication, disclosing the diagnosis to children remains a daunting challenge for families and HCPs.⁷

Since the 1970s, clinicians have been obligated to communicate openly and directly with children with cancer. In recent years, however, there has been growing appreciation for the complexity of prognostic disclosure in children.⁹ In Japan, the perceptions of parents of children with cancer and the HCPs have changed from nondisclosure to disclosure in the last 20 years.^{10,11} Nevertheless, there remains an opinion gap regarding the disclosure of cancer diagnoses between children and

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parents.^{10,12} Despite children wanting to know about cancer diagnoses, parents sometimes hide the diagnosis or limit disclosure to protect their children from harmful and stressful information.^{10,12} Although many HCPs believe that children should have cancer information, they must decide whether to respect parents' perceptions or fulfill their own ethical obligations.^{10,13} Approximately 60% of physicians in Japan always or usually disclose the diagnosis to children aged 6–9 years.¹⁴

Although more practical guidance is needed to address these concerns,^{7,15} there is a lack of communication tools or guidelines developed to meet the needs of children and families that can be shared between children, families, and HCPs.¹⁶ Testing feasibility in real-world settings is necessary before beginning full-scale clinical trials.¹⁷ Children and their families must be involved in research, and their voices must be heard from the beginning to improve care and meet their needs. However, ethical and methodological concerns have been raised worldwide regarding the involvement of developing children in research.¹⁸ Few studies have evaluated programs for cancer communication with children that involve children in the development process.¹²

In summary, although studies have succeeded in involving children and extending the understanding of how to design, implement, and evaluate interventions by adopting a mixed-methods approach,¹⁹ few describe in detail the intervention program development processes, and most interventions do not include child insights. Therefore, we employed a mixed-methods design and aimed to create a picture book with a side book as a communication tool about cancer for children and to evaluate its feasibility. This study is expected to provide an in-depth understanding of the design, feasibility evaluation, and implementation of the picture book. In addition, the methodological purpose was to demonstrate how a mixed-methods, convergent design can be used for intervention development for children with cancer and their families.

Methods

Development of the picture book and side book

First, we developed the picture book as a tool for communication between children, families, and HCPs. The picture book was created following the framework developed by Jolly and Bolitho (2011) to understand and cope with cancer through communication with children at diagnosis. It comprises six steps: (1) identification of a need or problem; (2) exploration of the need or problem; (3) contextual realization; (4) pedagogical realization; (5) production of materials; and (6) use and evaluation.²⁰ In Steps 1 and 2, we conducted research to understand the information needs and problems of children with cancer and their families. Children require understandable information to cope with cancer including that pertaining to treatment, hospitalization, and the benefits of hospitalization. However, parents sometimes withhold information because of their own beliefs and psychological conditions.¹²

In Step 3, we conducted a content analysis of existing cancer-related picture books to determine the appropriate content. The contents of the developed picture book were divided into (1) cancer-related knowledge, (2) the impact of cancer, and (3) dealing with cancer.²¹ Next, we created a context that included a theoretical framework, aims, target population, and content and constructed a plot. We created the plot including the three above contents and the elements of the information–motivation–behavioral skills (IMB) model.²² In Step 4, the plot was reworked many times to align with the needs of children with cancer and their families that were identified in the previous interview study.¹² We also received feedback from the picture book authors regarding whether it would be accepted by children, and we made revisions based on their opinions. In Step 5, drafts for the picture book and side book were created. Throughout these steps, HCPs, picture book authors, editors, and illustrators were involved in the production of the picture book. An overview of the picture book is as follows:

- Aims: To encourage children and their families to cope with cancer through communication.
- Target population: Children who were diagnosed with cancer and were at least 4 years old at the time of diagnosis.
- The theoretical framework of cancer-related information (disease-specific and behavior-specific information), motivation (individual motivation and social motivation), and behavioral skills to enhance the behavior of children and their families was based on the IMB model. For example, we included general information, such as etiology, symptoms, treatments, procedures, and hospitalization; motivation, such as treatment goals and social supports; and behavioral skills, such as coping with side effects and suffering and asking for support.

The side book explains children's perceptions as a guide for families and HCPs to communicate cancer-related information with children.

Study design

In Step 6 of the framework for development, we conducted a feasibility test between September 2020 and December 2021 (feasibility survey for HCPs: September 2020–January 2021; revision of the picture book: January–March 2021; feasibility survey for children and their families: March–December 2021). Fig. 1, a flow diagram, shows the study procedure. The convergent mixed-methods approach was adopted to use appropriate qualitative and quantitative methods following the guide provided by Creswell and Clark,²³ to answer the research question, “Is the use of the picture book as a communication tool about cancer feasible in communication with children?” We used this approach to integrate the perspectives of HCPs, children, and families with the feasibility assessment (quantitative data) and the reasons for the assessment (qualitative data). We used quantitative data to evaluate “the extent to which the picture book is feasible for communicating with children” and qualitative data to determine “the reason why it is feasible or unfeasible to use the picture book in communication with children” from the perspectives of HCPs, children, and their families. Data from both strands were considered to have equal weight and merged for comparison and elaboration. First, we had the feasibility and validity of the picture book assessed by HCPs and revised it based on their feedback. We then repeated the same methods to assess the views of the children and their families. This manuscript follows the Checklist of Mixed Methods Elements in a Submission for Advancing the Methodology of Mixed Methods Research developed by Fetters and Molina-Azorin²⁴ (Supplementary files 1).

Eligibility criteria

Participants were HCPs (physicians, nurses, and child life specialists [CLSs]) who had experience taking care of children with cancer; children without cancer aged 4–8 years, their families; and children who were (1) diagnosed with cancer, (2) aged 4–12 years, and (3) on maintenance therapy or follow-up and their families. Following Piaget's theory of cognitive development,²⁵ children begin engaging in logical thinking during the intuitive thought substage. Thus, we included children without cancer aged 4–8 years to evaluate responses at first receiving cancer-related information. We included children with cancer during the operational stage to evaluate the picture book by sharing their opinions based on their treatment experiences. HCPs were recruited from 10 institutions including hospitals, a school, and a visiting nursing station. We included children without cancer and their families from urban and rural areas to avoid regional bias. Children with cancer and their families were recruited at the oncology outpatient clinic of a general hospital.

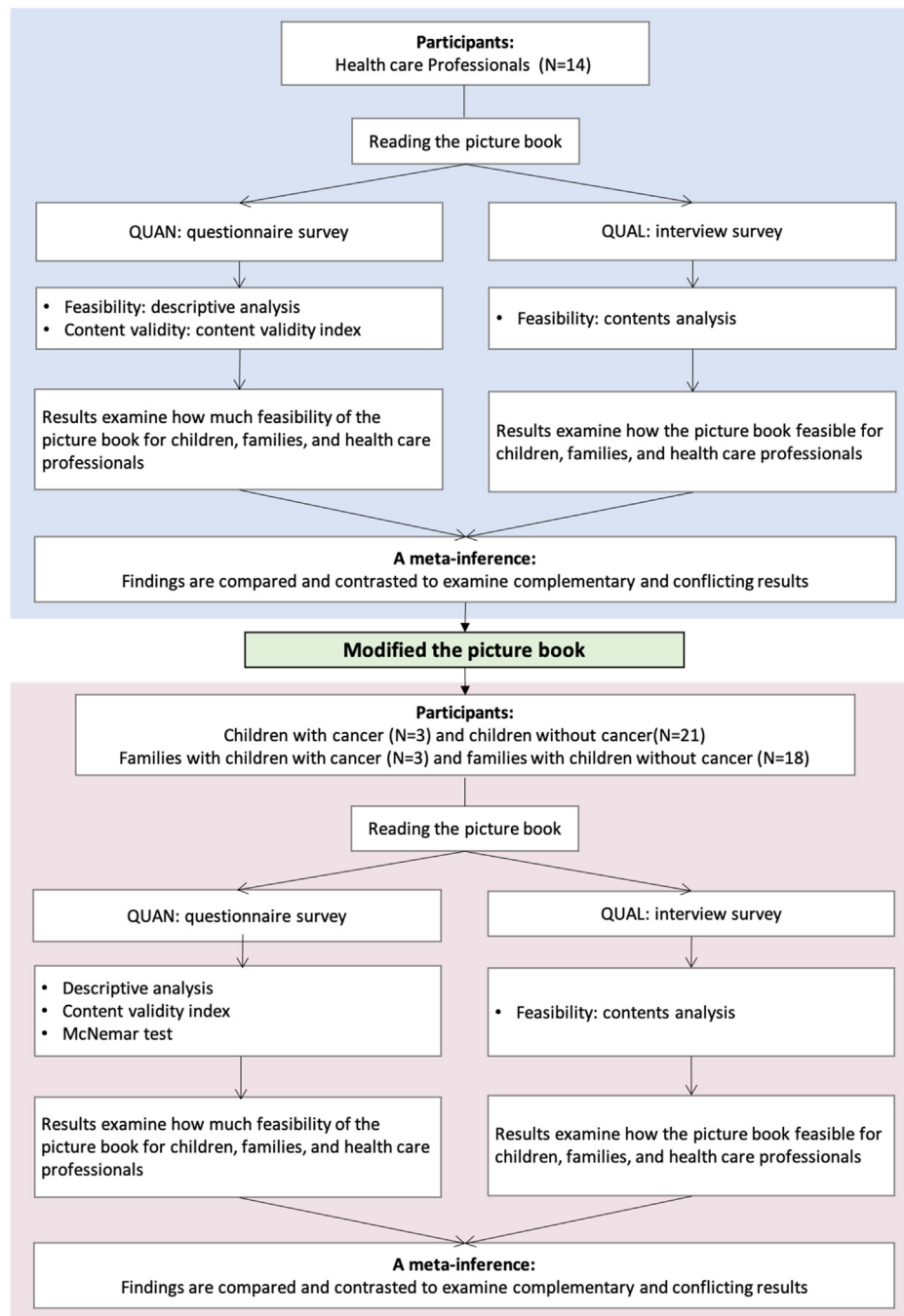


Fig. 1. Process flow diagram of the study procedures.

Procedure

In this study, the sample size was calculated to be ideal for qualitative research. Francis et al. reported the 10-plus-three principle of data.²⁶ They suggested that after 10 interviews, data would be saturated if there were no new findings in the next three consecutive interviews.²⁶ Therefore, the sample size was set at approximately 13 for each group. Recruitment was conducted to collect quantitative and qualitative data. We recruited HCPs ($n = 14$), children without cancer ($n = 21$), and their families ($n = 18$) using snowball sampling. Children with cancer ($n = 3$) and their families ($n = 3$) were recruited from a pediatric oncology unit in Japan. We could not recruit a sufficient number of children with cancer and their families because of the coronavirus disease 2019 pandemic. Although we could not confirm data saturation for the group of children with cancer and their

families, we compared their data with those of children without cancer and their families to identify similarities or unique characteristics. Participants were assured of confidentiality and informed of their right to withdraw from the study at any time without affecting their health care using informed consent and assent forms. All children provided assent, and families provided their own and the child's consent.

HCPs and families completed a self-report web questionnaire, and children completed a paper questionnaire for collecting quantitative data. The questionnaire surveys and interviews were conducted simultaneously. Quantitative data were collected to identify the rate of feasibility. The first author conducted semi-structured interviews to understand the reasons for the questionnaire responses. Then, we analyzed both data separately and integrated the results obtained from each analysis.

Ethical considerations

Ethical approval was granted by the St. Luke’s International University Research Ethics Committee (IRB No. 20-A058). This study was conducted in accordance with the Declaration of Helsinki^{27,28} and the Convention on the Rights of the Child.²⁹ First, we explained the study to the families using the informed consent form and obtained their consent to participate. Informed assent forms were created for appropriate developmental stages (aged 4–6; 7–9; 10–12). After acceptance from guardians, we provided the study explanation verbally to each child using the assent form and obtained the children’s and guardians’ signatures.

Outcome measures

Quantitative data

The primary outcomes were the feasibility of the picture book required for this study, specifically acceptability, adaptability, practicality, and demand, among the eight general areas of focus in feasibility studies (Table 1).¹⁷ In the absence of an existing instrument relevant to this study, we developed a questionnaire rated on a 4-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree). The secondary outcome was the content validity of the developed picture book, also rated on a 4-point Likert scale (1 = strongly unrelated, 2 = unrelated, 3 = related, and 4 = strongly related). The knowledge test was developed to assess understanding of cancer among children without cancer aged 4–8 years according to Piaget’s theory of cognitive development.²⁵ This questionnaire is an eight-item measure of knowledge rated on a 3-point Likert scale (0 = I do not know, 1 = no, and 2 = yes) based on the picture book’s contents. Three HCPs involved in pediatric cancer care (one doctor, one nurse, and one nursing faculty) evaluated the content validity of these questionnaires.

Qualitative data

Online semi-structured interviews were conducted to determine the reasons for the responses; these were recorded. Interviews were

Table 1
Evaluation matrix of the feasibility of the picture book.

Dimensions	Subdimensions	Indicators
Perspectives of health care professionals	Acceptability	Perceived appropriateness Perceived content validity
	Adaptation	Perception of the picture book to improve communication about cancer with children
	Demand	Fit within the organizational culture Perceived positive or negative effects on the organization
	Practicality	Adequate: the picture book can be used in clinical practice
Perspectives of children	Acceptability	Satisfaction Intent to continue use Perceived appropriateness
	Adaptation	Ability of the participants to carry out intervention activities: Knowledge Perception of the picture book as effective to improve communication with children
	Demand	Expressed interest or intention to use Perceived demand Recommendations of the picture book to children with cancer
Perspectives of families	Acceptability	Satisfaction Intent to continue use Perceived appropriateness
	Adaptation	Perception of the picture book as effective to improve communication with children
	Demand	Expressed interest or intention to use Perceived demand Recommendations of the picture book to children with cancer
		Perception on work overload due to the intervention

conducted by the first author, who had been working in pediatric oncology units for 12 years and has a master’s degree in nursing science.

Analysis methods

We performed quantitative and qualitative data analyses separately and merged them to better understand participants’ perspectives about using the picture book.

Quantitative data analysis

We used descriptive statistics to assess participants’ acceptance of the feasibility of the picture book using Microsoft Excel and SPSS. The responses from the knowledge test were categorized as 0 (“do not know” and incorrect answers) and 1 (correct answers) and analyzed using McNemar test.³⁰ A p-value less than 0.05 was considered statistically significant. For the secondary outcome, we calculated the item-level content validity indexes (I-CVIs) and scale-level content validity indexes (S-CVIs). The I-CVI scores were calculated by dividing the number of participants who provided ratings of 3 or 4 (3: related, 4: strongly related) by the total number of participants. The S-CVI/Ave score was calculated as the average of the total I-CVI scores. S-CVI/universal agreement (UA) scores were calculated by dividing the number of items rated as 3 or 4 by the total number of items. According to the criteria proposed by Shi et al., excellent validity is indicated by an I-CVI rate of 0.78 and above, an S-CVI/UA rate of 0.80 and above, and an S-CVI/Ave rate of 0.90 and above.³¹

Qualitative data analysis

Qualitative data were analyzed using content analysis to investigate how participants assessed the feasibility of the picture book, following Erlingsson and Brysiewicz³² and using NVivo software. This method is appropriate for evaluating participants’ perspectives without imposing preconceived or theoretical perspectives.^{32,33} The recorded data were saved as text, and all word lists were read and segmented into meaningful contexts. Similar contexts were coded using an inductive approach. The codes were grouped into subcategories, categories, and increasing levels of abstraction depending on similarity. During content analysis, we asked experts in pediatric health care to validate the analysis. Any disagreements were resolved through a discussion with the supervisor (E.O.) and the pediatric specialists. Finally, we divided the approvals and disapprovals for each domain, including acceptability, adaptability, practicality, and demand, and analyzed the data.

Data transformation integration procedures

Meta-inference was performed to integrate the qualitative and quantitative data.²³ This was done using a side-by-side joint display. The joint display presented quantitative results for each variable (acceptability, adaptability, practicality, and demand) used to evaluate feasibility, as well as response rates for groups that had judged feasibility to be appropriate or inappropriate. The CVI results indicated excellent validity and were listed in the appropriate column. Additionally, as children’s knowledge test results were expected to improve through the use of the picture book, we listed them in the appropriate column. Qualitative results were organized by dividing the categories and related quotes obtained from the qualitative analysis into appropriate and inappropriate groups to transform into quantitative results. Then, we looked at the joint display and considered how the qualitative results complemented the quantitative results in order to provide complete insights into our research question.

Results

Characteristics of participants

The participants’ characteristics are presented in Table 2. We included 14 HCPs: three physicians, eight nurses, two CLSs, and one

Table 2
Characteristics of participants.

Health care professionals (n = 14)			
#	Professions	Licenses related to the care of childhood cancer patients	Years of work experience at the pediatric oncology ward
A	Physician	Pediatric hematologist/oncologist	> 10 years
B	Physician	–	> 10 years
C	Physician	Pediatric hematologist/oncologist	> 10 years
D	Nurse	Certified nurse specialist	1–5 years
E	Nurse	Cancer chemotherapy nursing	> 10 years
F	Nurse	Cancer chemotherapy nursing	> 10 years
G	Nurse	Family health nursing	> 10 years
H	Nurse	Cancer pain management nursing	> 10 years
I	Nurse	–	> 10 years
J	Nurse	–	> 10 years
K	Nurse	–	> 10 years
L	School nurse	–	5–10 years
M	Child life specialist	–	> 10 years
N	Child life specialist	–	> 10 years

Children without cancer (n = 21)					
#	Age (years)	Gender	Having sibling(s)	Having older sibling(s)	Experience in hospitalization
A	4	Male	✓	✓	–
B	4	Female	–	–	–
C	4	Female	✓	✓	✓
D	4	Male	✓	✓	–
E	4	Male	✓	–	–
F	4	Male	✓	✓	–
G	4	Female	✓	–	–
H	4	Female	✓	✓	–
I	5	Male	–	–	–
J	5	Female	✓	✓	–
K	5	Male	✓	✓	–
L	5	Female	✓	✓	–
M	6	Female	✓	✓	–
N	6	Female	✓	✓	✓
O	6	Female	✓	–	–
P	7	Male	✓	–	✓
Q	7	Female	✓	✓	–
R	7	Female	✓	–	✓
S	7	Female	✓	–	–
T	8	Male	–	–	–
U	8	Male	✓	–	–

Children with cancer (n = 3)						
#	Age (years)	Age at diagnosis (years)	Gender	Treatment status	Years from diagnosis (years)	Experienced types of treatments
V	8	4	Male	Follow-up	1–5	Chemotherapy
W	8	3	Male	Follow-up	1–5	Chemotherapy
X	10	6	Female	Follow-up	1–5	Chemotherapy

Families with children without cancer (n = 18)				
#	Relationship with child	Age (years)	Age of children (years)	Employment status
A	Mother	38	4, 7	Employed (full-time)
B	Mother	34	6	Employed (full-time)
C	Mother	36	5	Unemployed
D	Grandmother	65	4	Unemployed
E	Grandfather	65	4	Employed (full-time)
F	Mother	34	4	Unemployed
G	Mother	40	7	Unemployed
H	Mother	44	8	Employed (full-time)
I	Mother	35	4, 7	Employed (full-time)
J	Mother	36	4, 8	Unemployed
K	Mother	37	5	Unemployed
L	Mother	43	6	Employed (part-time)
M	Mother	39	5	Employed (full-time)
N	Mother	37	4	Employed (full-time)
O	Mother	40	4, 6	Employed (part-time)
P	Mother	31	4	Unemployed
Q	Mother	33	5	Employed (full-time)
R	Mother	35	4, 7	Employed (full-time)

Families with children with cancer (n = 3)				
#	Relationship with child	Age (years)	Age of children (years)	Employment status
S	Mother	42	8	Unemployed
T	Mother	43	10	Employed (full-time)
U	Mother	39	8	Employed (full-time)

✓, Yes, –, No.

school nurse. Most had been caring for children with cancer for more than 10 years, and half had licenses related to the care of childhood cancer patients. For the assessment of children and families, we included 21 children, aged 4–8 years, without cancer and 18 family members. Of these children, 43% were boys and 52% had older sibling(s). Furthermore, 71% of the children were preschoolers. We included three children with cancer, 8–10 years of age, and their mothers. All the children were in the follow-up treatment period.

Perspectives of health care professionals (results of quantitative/qualitative analysis)

All HCPs agreed on the feasibility of acceptability, adaptation, and practicality, while the two CLSs disagreed on demand; however, the majority agreed (85.7%). The I-CVIs ranged from 0.93 to 1.0, the S-CVI/Ave was 0.99, and the S-CVI/UA was 0.81. The CVI of the picture books was assessed as excellent.

Qualitative data analysis yielded five categories. Of these, three were favorable: (1) suitable for communicating about cancer with children; (2) helpful for facilitating communication about cancer with children; and (3) convenient in practical settings. Two of these were unfavorable: (4) issues related to context and (5) issues related to expression.

Meta-inference about health care professionals' assessment of feasibility of the picture book

The quantitative and qualitative data were presented on the visual joint display (Table 3). HCPs rated the picture book highly for all feasibility items: acceptability, adaptation, demand, and practicality. However, concerns were raised regarding context and expression such as the use of the term “cancer” and gender differences.

Acceptability

Acceptability was assessed based on whether HCPs perceived the picture book as appropriate. All HCPs evaluated the picture book as suitable for communicating about cancer with children. They responded favorably that the medium of the picture book was accessible and that the picture book visually appealed to children, making it easy for them to understand. HCPs also said that while communicating about cancer with younger children is often difficult, using a picture book could ease the process. HCPs responded positively to the content of the picture book, which covered topics they wished to convey to children. The liaison reacted favorably to the fact that there were expressions affirming the children's emotional expressions. However, one HCP was concerned about the usage of the picture book because many HCPs and families were reluctant to use the word “cancer.”

Adaptation

Adaptation was assessed based on whether HCPs perceived that the picture book improved communication with children. All HCPs recognized that the picture book's content effectively improved communication about cancer with children. They expected that the picture book could be used not only at the time of diagnosis but also for explanations in actual situations such as examinations and treatments. They said this was an excellent method to communicate with children about cancer, treatments, and examinations. In contrast, they suggested that it would be difficult for boys to relate to the content of the picture book because the main character is a girl.

Demand

Demand was assessed based on HCPs' perception of the picture book's fit within their organizational culture and their perception of a positive or negative impact on the organization. Two HCPs (14.3%) assessed demands as inappropriate because they wished to provide more individualized explanations to children with cancer. However, they also reported that the picture book could be used to inform siblings in general

and that it could be used to partially explain treatment and procedures. There was no reported negative impact on the organization. HCPs showed favorable reactions in that the picture book provided a common-language understanding of the goal of overcoming cancer. Few hospitals used these tools to communicate with children about cancer, and none used a tool with verified validity. Creating new tools requires time and effort, and existing picture books are easy to incorporate into clinical practice. Therefore, they indicated that this picture book is worthy of clinical use. HCPs said that reading the picture book would help confirm children's reactions, express emotions, ask questions, and improve communication with children.

Practicality

Practicality was assessed based on HCPs' perceptions of the picture book's usage in clinical practice. All HCPs indicated that the picture book could be used in clinical practice, while some expressed concerns about context and expression. The picture book provides an overview of childhood cancer, even for younger children, and the book's gentle atmosphere does not scare the child. It was assumed that the picture book could be shared with HCPs at the time of diagnosis in clinical practice. HCPs also said that the picture book was cost-effective and easy to incorporate into clinical practice. However, although the picture book focuses on overcoming cancer, one HCP worried that children who had a recurrence after using it would see it as their responsibility. In addition, as pages five to eight are reminiscent of leukemia, there was an opinion that it would be better to be more inclusive so that children with tumors could use it. A suggestion was made to simplify sentences to facilitate comprehension for young children.

Modifications based on feedback from health care professionals

HCPs pointed out some contextual and expressive issues, based on which we revised the picture book, such as to include illustrative representations of cancer and verbal expressions (Supplementary files 2). Although one HCP expressed concern about using the term “cancer,” it has previously been reported that children want to be informed of the name of their disease for better understanding and coping.¹² Therefore, the term “childhood cancer” is used in the picture book. In response to the issue of considering gender differences, we planned to later create a picture book with a boy as the main character.

Perspectives of children (results of quantitative/qualitative analysis)

Families read the picture book to their children at least once. It was up to the children to reread the picture book, and most children read it up to four times. Although most children reread it with their families, some who understood *hiragana* (the Japanese phonetic lettering system) read it themselves. One child reported feeling sad while reading the picture book; however, this feeling did not persist. No adverse effects or psychological burdens were reported. Some children without cancer (aged 4–5 years) could not understand the meaning of some questions, leading to missing data. Over 85.7% of children without cancer and all children with cancer agreed on the picture book's feasibility. The results of the McNemar test showed that the picture book improved children's knowledge of all content related to cancer information ($P < 0.01$).

Five categories were identified in this study. Of these, three were favorable: (1) appealing, (2) helpful in understanding cancer, and (3) useful for communication. Two of these were critical opinions: (4) issues related to context and (5) requests for changing some expressions.

Meta-inference children's evaluation of feasibility of the picture book

The quantitative and qualitative data are presented in a visual joint display (Table 4). Children rated the picture book based on three feasibility items: acceptability, adaptation, and demand. However, concerns were raised regarding context and expression.

Table 3
Joint display of health care professionals' picture book feasibility assessment ($N = 14$).

Variables	Quantitative data		Qualitative data		Meta-inference
	Agreement	%	Categories	Quotes	
Acceptability					
Perceived appropriateness	Appropriate	100	Suitable for communicating about cancer with children Helpful for facilitating communication about cancer with children	"I think children will find it easier to visualize and understand." (HCP K) "I often feel that it is difficult to communicate about childhood cancer to children in their early years, but I felt that this picture book was easy to use at the time of introduction because it summarized the main points." (HCP D)	The picture book was perceived as appropriate in the following points: <ul style="list-style-type: none"> • illustrations make children easy to understand, • provides opportunities to communicate about cancer, • clinically accessible. However, using the term "cancer" might reduce the picture book's usage.
	Contents Validity Index				
	S-CVI/Ave	0.99	Convenient in practical settings	"Picture books are a familiar tool, so I think the picture book is easy to use." (HCP N)	
	S-CVI/UA	0.81			
	Inappropriate	0	Issues related to expression	"It's hard for me to tell the children that they have childhood cancer, and I also have some resistance." (HCP D)	
Adaptation					
Perceived content validity	Appropriate	100	Suitable for communicating about cancer with children Convenient in practical settings	"Correct information is portrayed in a way that is easy for children to understand." (HCP M) "It's something that's realistically easy for a ward to implement, and it's not expensive, so it's easy to buy." (HCP L) "Picture books are a familiar tool for children." (HCP N)	The picture was book perceived as appropriate in the following points: <ul style="list-style-type: none"> • contents are appropriate, • clinically accessible. It was also expected to improve communication with children about cancer. However, it is necessary to consider gender differences.
	Inappropriate	0	Issues related to context	"Since the main character was a girl, I thought it would be nice to have a picture that could be used by boys as well." (HCP N)	
Perception of the picture book to improve communication about cancer with children	Appropriate	100	Helpful for facilitating communication about cancer with children	"It would also make it easier to explain each test. It's also a good opportunity to talk about the disease and how it's perceived through picture books." (HCP L)	
	Inappropriate	0	Not applicable	No opinions	
Demand					
Fit within the organizational culture	Appropriate	85.7	Suitable for communicating about cancer with children Convenient in practical settings	"I think everyone, including family members, can share the same perspective on the treatment." (HCP L) "When explaining to children, we can use the same expressions and be consistent in our perceptions. For example, on a different note, I once described a kidney as "Mr. Bean. In this way, I think it is possible for the child, families, and healthcare professionals to use the same expression." (HCP L) "If a nurse were to create a tool, we would have to go through many different places, such as the nursing department and the doctors. It is too difficult to make, and it is impossible to make. That's why it's really good to have a tool like this." (HCP E)	The picture book was perceived as having positive effects, and it was expected to fit the organizational culture in the following points: <ul style="list-style-type: none"> • shares the same goal of overcoming cancer, • clinically accessible, • improves communication with children.
	Inappropriate	14.3	Not applicable	No opinions	
	Appropriate	85.7	Helpful for facilitating communication about cancer with children	"I thought it was easy to see where the kids wanted to know about the book. I thought it would be great to be able to do this while watching the children's reactions." (HCP H)	
	Inappropriate	14.3	Issues related to context	"The bad cells destroy this in the bloodstream and cause this situation, but I think it's hard for children to understand." (HCP D) "It may be good for explanations to siblings or for the time being, but I would like to give more personal explanations to patients. However, I did want to use the	
Perceived positive or negative effects on the organization					

(continued on next page)

Table 3 (continued)

Variables	Quantitative data		Qualitative data		Meta-inference
	Agreement	%	Categories	Quotes	
Practicality Adequate the picture book can be used in clinical practice	Appropriate	100	Issues related to expression	<p>pages partially such as the pages explaining the tests." (HCP M)</p> <p>"Lumbar puncture is more common when the patient's head is on the left side." (HCP A)</p>	<p>The picture book was perceived to be used in clinical practice in the following points:</p> <ul style="list-style-type: none"> • helps children understand about cancer with warming illustrations, • provides opportunity to communicate about cancer with children. <p>However, the following concerns were listed:</p> <ul style="list-style-type: none"> • needs to consider the children who are recurrent or do not cure, • needs to consider the children who have a tumor, • needs to consider font size, color scheme, and expression of the sentences.
			Suitable for communicating about cancer with children	<p>"It describes the whole process of treatment and contains enough information to correct the child's misunderstandings." (HCP G)</p> <p>"The pictures are drawn with a very gentle touch, and I think it is a wonderful picture book." (HCP N)</p> <p>"For children with immature language development, the picture book can promote understanding and emotional expression." (HCP N)</p> <p>"The points are organized in a way that makes it easy to use as a starting point for explaining diseases to children without spending too much time." (HCP K)</p> <p>"I think it would be useful in a place like pediatrics, because I don't think they have that kind of tool for explanation." (HCP H)</p> <p>"I have seen various preparation tools, but I have the impression that none of them are widely used. I think that individualization is necessary, depending on the disease, family background, etc. If there is a book like this, I think that doctors and nurses who are not familiar with childhood cancer or new nurses will be able to give the same explanations." (HCP L)</p>	
	Inappropriate	0	Issues related to context	<p>"It would be good if the explanation of cancer (on pages 3–6) could also include solid tumors, since it is easy to imagine leukemia." (HCP A)</p> <p>"The main character is a girl, so if a boy reads this book, he might feel a little disconnected from himself. I thought it was a waste of time. I think it would have been better if the main character had been portrayed as a neutral child, so that it could have been taken either way." (HCP M)</p>	
			Issues related to expression	<p>"I think the text is a little small." (HCP G)</p> <p>"The pictures should be a little clearer." (HCP C)</p> <p>"In response to the fact that we cannot give away illnesses, I think it would be better for children to understand that cancer is not contagious." (HCP E)</p>	

S-CVI, scale-level content validity index; HCP, health care professionals.

Table 4
Joint display of children's picture book feasibility assessment (children with cancer $N = 3$, children without cancer $N = 21$).

Valuables	Quantitative data		Qualitative data		Meta inference
	Agreement	%	Categories	Quotes	
Acceptability					
Satisfaction	Appropriate	95.8	Appealing	"Because it was fun. I read it twice (with my mother). I read it (even by myself)." (Child G, aged 4) "She read it to herself." (Family P with a child without cancer, aged 4)	The picture book was satisfying, and the children wanted to read it again for the following points; <ul style="list-style-type: none"> • attractive, • can share knowledge about cancer.
Intent to continue use	Inappropriate	4.2	Issues related to context	"It was boring because it was long." (Child J, aged 5)	It was appropriate to understand cancer. However, the picture book was not interesting for some children.
	Appropriate	87.5	Useful for communication	"We might be able to read (the picture book) with the people around us. Such as friends." (Child R, aged 7) "(In response to the question, "Do you want to read the picture book again?") My daughter did not agree at all, probably because she was sad." (Family L with a child without cancer, aged 6)	
Perceived appropriateness	Appropriate	100	Helpful in understanding childhood cancer	"I liked the page that showed (the main character) felt vomiting and hair loss. Because I knew she could transform." (Child X, aged 10)	
	Inappropriate	0	Requests for changing some expressions	"(The main character) did not have the eye." (Child W, aged 8)	
Adaptation					
Ability of the participants to carry out intervention activities: Knowledge	Appropriate	100	Helpful in understanding childhood cancer	"Everyone probably does not know what kind of disease childhood cancer is, so they do not know what the cancer cells are doing, and they do not even know what is interfering with normal cells, so they could teach (after reading the picture book)." (Child P, aged 7)	Children over the age of four have the ability to read the picture book in the following ways: <ul style="list-style-type: none"> • helps children understand cancer. However, children might not be able to understand cancer-related information correctly after reading it once.
	Question 1-8	P-value < 0.01**			
Perception on the picture book as effective to improve communication with children	Appropriate	95.5	Useful for communication	"It was difficult because there was nothing put here (on the microscope), but it was reflected here (So, I did not know what the main character was looking at)." (Child J, aged 5) "When we read the picture book, my child asked me. for example, "What is a lumbar puncture?" and "How different is blood?" (Family J with the children without cancer, aged 4 and 8)	
	Inappropriate	0.5	Issues related to context	"My child had only had the experience of being unilaterally talked to by the doctor. I always hear from his doctor. I think he may not understand the image (of talking to the doctor)." (Family N with a health child, aged 4)	
Demand					
Expressed interest or intention to use	Appropriate	100	Appealing	"(Regarding the side effect page) How does the hair loss happen? Does it hurt if I lose my hair? I prefer a wig to a hat." (Child P, aged 7) No opinions	The picture book was attracting and perceived demand in following points: <ul style="list-style-type: none"> • appealing, • useful for communication to share knowledge about cancer.
Perceived demand	Inappropriate	0	Not applicable	"I want to teach my brother and sister (about childhood cancer using this picture book). And I want to teach it understandable." (Child J, aged 5) No opinions	However, some children requested to change some expressions.
	Appropriate	100	Useful for communication	"You like the page that it is okay to spoil by families, do not you?" (Family J with the children without cancer, aged 4 and 8) "You want to tell the friends who have cancer that, do not you?" (Family J with the children without cancer, aged 4 and 8) "Yes. I want to tell them too." (Child U, aged 8)	
Recommendations of the picture book to children with cancer	Inappropriate	0	Not applicable	"If a wig looks like a grandma, I do not want to wear it. I think the wig should be a little blacker." (Child X, aged 10)	
	Appropriate	100	Helpful in understanding childhood cancer		
	Inappropriate	0	Requests for changing some expressions		

Acceptability

Acceptability was assessed based on whether children perceived the picture book as satisfactory and appropriate and intended to continue using it. Although two children without cancer aged 4–5 years did not want to read it again as the picture book was boring and it was sad to be hospitalized away from family, most children were attracted to it. All children agreed that the picture book was appropriate for understanding childhood cancer. In most categories, children with and without cancer had similar opinions. Both groups wanted to be informed about cancer, how to cope with it, and the possibility of recovering from it. They showed favorable reactions to the picture book containing this information because it reassured them. Children without cancer were satisfied that they could read the picture book repeatedly and share information about childhood cancer with people close to them.

Adaptation

Adaptation was assessed based on children's knowledge about cancer and their perception that the picture book would effectively improve communication. The picture book improved children's knowledge of childhood cancer through reading and discussing it with their families. All children reported that the picture book was easy to understand because of the illustrations. Children without cancer gained an overview of childhood cancer such as that it is a disease for which children must be hospitalized for treatment and examination. Although they never knew about cancer, they could correctly grasp the information that children are prone to misunderstanding including that cancer is not contagious and is not a child's fault. By reading the picture book aloud, children asked questions about cancer, initiating communication with their families. In contrast, some children were confused about the differences between the picture book's content and their previous experiences or family rules.

Demand

Demand was assessed based on whether children expressed interest in and an intention to use the picture book, as well as their willingness to recommend it to children with cancer. All children wanted to use the picture book to understand childhood cancer. They wanted to share their new knowledge about childhood cancer with those around them. Moreover, they expressed their perceptions of recommending the picture book to children recently diagnosed with cancer. The picture book would help affected children believe that they could recover from cancer and ask questions. We also found similarities and differences based on age. Children of all ages preferred pages that showed the cells inside the body. Children aged 4–5 years empathized with the content expressing that it is acceptable to be angry or cry owing to pain or sadness. Children aged 7–8 years said it was reassuring to understand what cancer is and what would happen if they had childhood cancer. One child requested the illustrations be revised to make them more attractive.

Perspectives of families (results of quantitative/qualitative analysis)

All family members, including families of children without cancer ($n = 18$) and mothers of children with cancer ($n = 3$), answered the questionnaire, and all agreed on acceptability, adaptation, and demand. The I-CVIs for the 16 questionnaire items ranged from 0.95 to 1.0. The S-CVI/Ave was 0.99, and the S-CVI/UA was 0.88. The I-CVI rate was over 0.78, and all contents of each page were assessed to have excellent validity. The S-CVI/UA rate and S-CVI/Ave ratios were > 0.80 and 0.90 , respectively. Thus, the picture book's content validity was assessed as excellent.

One family member of a child without cancer reportedly cried while reading the picture book because it made her imagine that her children had cancer. However, she replied that it was not too stressful and that it was a good opportunity for her to understand cancer. No adverse effects or psychological burdens were reported. The interview asked families who had boys for their opinions about the gender differences between their children and the main character in the picture book, and there were

no adverse reactions. Five categories were identified. Of these, three were favorable: (1) suitable for communicating about cancer with children; (2) helpful in understanding childhood cancer; and (3) helpful in facilitating communication about cancer with children. Two were critical opinions: (4) issues related to context and (5) issues related to expression.

Meta-inference about families' assessment of feasibility of the picture book

Quantitative and qualitative data were displayed jointly (Table 5). All families assessed the picture book as feasible for three items: acceptability, adaptation, and demand. However, concerns were raised regarding context and expression. In most categories, families of children without cancer and families of children with cancer expressed similar opinions. However, each group had specific opinions in some respects.

Acceptability

Acceptability was assessed based on whether families perceived the picture book as satisfactory and appropriate and intended to continue its use. Mothers of children with cancer stated that the picture book contained what they wanted to convey to their children at diagnosis and what was challenging to explain to them. Based on their experiences at the time of their child's diagnosis, they felt that the picture book would help guide and deepen their understanding of childhood cancer for both themselves and their child. Families of children without cancer also responded positively, stating that the picture book was suitable and helpful. However, families of children without cancer stated that interests and understanding vary by individual and that whether the picture book can attract children's attention may change.

Adaptation

Adaptation was assessed based on whether the families perceived the picture book as effective in improving communication with children. Families communicated cancer-related information with their children by reading the picture book and felt that this communication helped their children gain an appropriate understanding of cancer. Although most families of children without cancer felt that their children could understand childhood cancer by reading the picture book, families, especially those with young children aged 4–5 years, expressed concern that there may be individual differences in understanding. Families of children with cancer expressed that they would share information about cancer with their children using the picture book.

Demand

Demand was assessed based on whether children expressed interest in and intention to use the picture book, as well as their willingness to recommend it to children with cancer and the burden of reading the picture book. All families assessed that the picture book was required, and demand was rated almost the same as the other feasibility domains. All families read the side book before reading the picture book to their children. The side book helped them better understand how to communicate with their children about their illness. None of the families felt the physical or psychological burden of reading the picture book. Families of children without cancer imagined panic at diagnosis. Mothers of children with cancer experienced psychosocial burden because they only perceived cancer as an incurable disease and were uncertain. Both groups expected the picture book to help children with cancer communicate with their families. Each family gave their opinions on the size of the picture book and the layout of the text. Two families of children without cancer said that the outdoor play ending did not fit every child's situation and that the picture book should end differently on a more hopeful note.

Discussion

Globally, the importance of child- and family-centered care has been increasing. HCPs should respect children and families as unique individuals with their own perspectives, experiences, and needs.³⁴

Table 5
Joint display of families' assessment of picture book feasibility (families with children with cancer $N = 3$, families with children without cancer $N = 18$).

Valuables	Quantitative		Qualitative		Meta inference
	Agreement	%	Category	Quotes	
Acceptability					
Satisfaction	Appropriate	100	Helpful for facilitating communication about cancer with children	<i>"I did not have the idea that there was something fun. I only had the image of being difficult. I think it is more important to expand the image that there are such fun and good things."</i> (Family Q with a child without cancer, aged 7)	The picture book was satisfying, perceived as appropriate, and intended to continue use based on: <ul style="list-style-type: none"> • supports communication about cancer with children, • helps families and children understand cancer, • suitable tool including, valuable content. However, using the picture book needs to consider children's interests and understanding.
Intent to continue use	Inappropriate	0	Not applicable	No opinions	
	Appropriate	100	Helpful in understanding childhood cancer	<i>"When I heard about the diagnosis first, I was most worried that I did not know what would happen in the future. I did not know about the illness and wondered what would happen to my child's hospital stay. The picture book was written in an easy-to-understand style. So I thought it would have been better if there was a book like this at that time."</i> (Family S with a child with cancer, aged 8)	
Perceived appropriateness	Inappropriate	0	Issues related to expression	<i>"I think it would be easier to read if you changed the size or font types of sentences and dialogs."</i> (Family G with the children without cancer, aged 4 and 7)	
	Appropriate	100	Suitable for communicating about cancer with children	<i>"Regarding the pages that we did not know why the child got sick, I thought it was necessary to tell children that they would not get cancer from someone, and children would not give anyone cancer. Also, I could see that my child was wondering if she was at fault, so I thought it was necessary to say that it was not your fault or anyone's fault."</i> (Family U with a child with cancer, aged 10)	
	Content validity index S-CVI/Ave S-CVI/UA	0.99 0.88		<i>"(Regarding the usage of the picture book) I think it depends on whether children like or hate picture books."</i> (Family F with the children without cancer, aged 4 and 6)	
Adaptation	Ability of the participants to carry out intervention activities: Knowledge	Appropriate	100	Suitable for communicating about cancer with children	The picture book was perceived as adaptable based on: <ul style="list-style-type: none"> • Children can understand the picture book. However, using the picture book needs to consider children's developmental stages, especially for younger children.
		Inappropriate	0	Issues related to context	<i>"At the first question (pre-test), my child thought that cancer would be given from someone, and after reading the picture book, it seems that he understood (about the difference from the coronavirus)."</i> (Family K with a child without cancer, aged 5) <i>"My child went to the hospital only for taking vaccines, but not recently. Only when she was small. Do you know a doctor?"</i> (Family C with a child without cancer, aged 4) <i>"I do not know."</i> (child B, aged 4) <i>"Do you understand nurses?"</i> (Family C with a child without cancer, aged 4)
Demand					
Expressed interest or intention to use	Appropriate	100	Helpful in understanding childhood cancer	<i>"There may be various side effects. Of course, I think doctors will explain that, but I think it is a picture book that makes it possible to understand that this kind of thing happens by teaching such things through the picture book in advance. And we can understand that it is okay to do not worry about it."</i> (Family A with a child without cancer, aged 4)	The picture book showed demand based on: <ul style="list-style-type: none"> • helps explain cancer and communication with children, • no burden. However, the picture book should consider the book size, arrangement of the sentences, and story ending.
Perceived demand	Inappropriate	0	Not applicable	No opinions	
	Appropriate	100	Helpful in understanding childhood cancer	<i>"(The picture book about childhood cancer) is easy to convey concretely, and I think it can be used in the</i>	

(continued on next page)

Table 5 (continued)

Valuables	Quantitative		Qualitative		Meta inference
	Agreement	%	Category	Quotes	
Recommendations of the picture book to children with cancer	Inappropriate	0	Issues related to expression	future.” (Family O with a child without cancer, aged 6) “The child in this picture book loves playing outside, so I think the ending is going home and playing a lot outside. But I think it is difficult for a child who does not like the outside to understand. It is no problem that the reader will tell children, but I hope to tell children that they can do many things when they come home.” (Family I with the children without cancer, aged 4 and 7)	
	Appropriate	100	Suitable for communicating about cancer with children	“The picture book was written in a positive way, so we do not have to be negative, even when it is hard. There were a lot of things that make me happy, so I was wondering if I could communicate positively.” (Family H with the children without cancer, aged 4 and 7)	
	Inappropriate	0	Issues related to context	“I was worried because I thought (that not everyone would be cured) a little too much.” (Family C with a child without cancer, aged 5)	
Perception on work overload due to the intervention	Appropriate	100	Not applicable	“(Reading the picture book and the side book) is not a burden at all.” (Family S with a child with cancer, aged 10)	
	Inappropriate	0	Issues related to context	“Large picture book size makes it difficult to carry.” (Family K with a child without cancer, aged 5)	
Perception on the picture book as effective to improve communication with children	Appropriate	100	Helpful for facilitating communication about cancer with children	“With the Internet, it is one-way, but with this picture book, we can read together to talk while reading and communicate with each other.” (Family P with a child without cancer, aged 6)	
	Inappropriate	0	Not applicable	No opinions	

S-CVI/UA, scale-level content validity index/universal agreement.

Children's voices are critical for improving the quality of health care delivery they receive, as well as the consequent health outcomes.³⁵ There are many helpful cancer-related guides for children and families; for example, the Cancer Research UK's "Talking to Children About Your Cancer",³⁶ the Children's Oncology Group's "Family Handbook",³⁷ and Mack and Grier's "The Day One Talk"³⁸ demonstrate the importance of communicating with children with cancer and provide guidance on how to do so. These guides may help adult family members communicate with children, but are not intended to be used for children directly. There are also several cancer-related communication tools for children that include elements such as games. However, these aim to improve children's knowledge about cancer and their coping skills and lack an element of dialogue between children, families, and HCPs.¹⁶ The picture book developed in this study was to communicate with children about cancer directly, and it might support effective communication through dialogue between children with cancer, their families, and HCPs. Additionally, few tools are available for young children.¹⁶ This study involved children and their families to understand their needs, based on which we developed and modified a picture book with a side book (Supplementary files 2, 3). We also included them in the assessment phase and evaluated the feasibility of the picture book by integrating quantitative and qualitative data using the mixed-methods design. To the best of our knowledge, this is the first study to use a mixed-methods approach to inform the development of a communication tool designed for younger children aged 4 years and over about cancer.

Feasibility of the created picture book

Most children want to participate in health care discussions, and expressing their preferences improves their satisfaction.³⁵ They can also prepare themselves to participate in decision-making by receiving sufficient and understandable information.⁶ Nevertheless, one reason why communication with children with cancer has not improved is the lack of specific guides.⁷ The results of this study demonstrate the potential of the picture book to support communication with children over 4 years of age regarding cancer-related information. The picture book would serve as a guide for communicating about cancer with children. Regarding the implementation of the picture book, it is necessary to consider the factors listed by HCPs, children, and families that act as barriers and challenges to communication with children with cancer. For example, the lack of HCPs' knowledge, experience, and skills to communicate with and support children with cancer and their families has been pointed out.³⁹ Children are at different developmental stages, and communication needs to be tailored to their individual understanding abilities.⁷ Families struggle to communicate with their children about cancer and sometimes have limited cancer-related information to offer.^{12,40,41} Additionally, children may become unwilling to communicate if they are aware of their parents' negative emotions.⁴⁰ We evaluated the feasibility of using the picture book from multiple angles, including these three parties, from the perspectives of acceptability, adaptation, demand, and practicality. The HCPs, children without cancer and their families, and children with cancer and their families assessed the picture book as highly feasible.

Regarding acceptability, HCPs and families thought that the picture book included appropriate content and would relieve children and families with no increased adverse events or anxiety associated with reading the picture book. Although the contents of the picture book include cancer-related information, the gentle atmosphere and the recovery story attracted children's interest, and some of them repeatedly read it. Parent-centered communication might compromise children's empowerment, and it is necessary to promote child-centered communication and partnership to implement effective communication.⁴² In this study, children wanted to use the picture book to share information about cancer with their family and friends. Its use has the potential to encourage children's output and support child-led communication.

In terms of adaptation, children gained an overview of childhood cancer, even if they were young, and all participants admitted that the

picture book has the potential to improve communication. Interviews by Yamaji et al. indicated that children have difficulty connecting diseases to treatments and procedures and want to understand why they need treatments, procedures, and hospitalization.¹² This study showed that most children could understand the general flow of cancer and cope with it. If they can transfer their knowledge to the real world, it helps them cope with cancer. One of the purposes of sharing picture books educationally is for children to build knowledge that allows them to apply the information they gain from reading to their daily lives.⁴³ Further research is needed to investigate whether children can cope with cancer by adopting the knowledge gained from the picture book. As many participants reported, the picture book could facilitate communication about cancer with children. If children feel that HCPs address their information and developmental needs, they gain a sense of respect, safety, and control.⁴² This opportunity may facilitate conversations with children and enhance the relationships between children, HCPs, and families.

Regarding demand, all participants responded positively to using the picture book with a side book to communicate about cancer with children. It is essential that all participants agree to communicate with children with cancer because their beliefs and preferences influence communication with children.⁷ These results highlight the potential for wide usage of the picture book.

This picture book is likely to be used in clinical practices as it is cost-effective and accessible, as HCPs evaluated it as having high practicality.

Limitations

While we deeply understood participants' perspectives about the created picture book using the mixed-methods approach, this study had some limitations. First, no existing validated scales were available for assessment, and we developed a questionnaire for this study. Some children were unable to understand the questions correctly. Second, children with cancer and their families experience an extreme physical and psychological burden at diagnosis,^{44,45} and our efforts have focused on developing ways to avoid these burdens. Although the target population of the picture book was children with childhood cancer at the time of diagnosis and their families, we could include only children with cancer undergoing maintenance therapy or follow-up to avoid unnecessary intrusion as they are known to experience many problems and stressors. Thus, we could not assess the health and psychological outcomes of the children and their families. Third, the picture book narrates the story of the main character in remission through cancer treatment. However, some HCPs and families pointed out that some children with cancer may not be cured or may experience recurrence. Approximately 20% of children with cancer are not cured, and uncertainty, including that related to recurrence, causes psychological distress for children with cancer and their families.^{46,47} Further research must carefully select participants based on their prognoses and mental states. It is necessary to evaluate not only the effects of using the picture book but also the adverse effects such as anxiety and depression. Fourth, while the online interviews allowed participants to relax in a familiar location, some children found it difficult to concentrate during the interviews. Fifth, there is the possibility of selection bias, leading to limited generalizability. Only three pairs of children with cancer and their families were recruited, owing to issues related to the coronavirus disease 2019 pandemic. Although their opinions were similar to those of children without cancer and their families, the small number of children with cancer and their families may have led to a bias. In the future, it will be necessary to include a sufficient number of children with cancer and their families in the research.

Implications for practice and research

Based on the results of previous studies,^{12,48,49} it is desirable that children first have a physician explain the diagnoses and treatments using a picture book. Using it repeatedly would deepen common understanding between children, families, and HCPs and promote

communication. Previous studies have shown that interventions to enhance communication among children and adolescents with cancer might improve knowledge, self-efficacy,⁵⁰ and quality of life⁵¹ and reduce anxiety and depression.^{52,53} The picture book adopts the IMB model,²² and it is assumed that improving children's knowledge, motivation, self-efficacy, and stress coping leads to better coping with cancer.

Further research is needed to investigate the health outcomes of children and their families when the picture book is used as a communication tool. While the picture book was assessed as highly feasible, its appropriate usage is critical to implementing effective communication. Communication is the interaction between children, their families, and HCPs and requires support tailored to each individual's needs. Therefore, future research should assess health outcomes and user experiences using a mixed-methods approach. The picture book has a side book that explains its use to HCPs and families. However, communication is a two-way dialogue between patients and HCPs,⁵⁴ and simply distributing the picture book might not be adequate. As communication is interactional, it depends on the beliefs, cultural and religious background, knowledge, and experience of HCPs.^{7,8} While the picture book would help HCPs in communicating about cancer with children, HCPs' knowledge and skills are important to improve the six core functions of patient-provider communication identified by Epstein and Street: (1) responding to emotions; (2) exchanging information; (3) making decisions; (4) fostering healing relationships; (5) enabling self-management; and (6) managing uncertainty.⁵⁵ Currently, a lack of HCPs' skills and training in communication about life-threatening conditions with children has been pointed out,⁷ and it is necessary to provide training for HCPs on the importance of effective communication and how to communicate using the picture book.

Contribution to the field of mixed-methods research

The methodological purpose of this study was to demonstrate how a convergent approach can be used for intervention development in the field of children's research. This study contributes to the field of mixed-methods research in several ways. First, it presented a mixed-methods approach that addressed the daunting challenge of communicating about cancer with children. Bowen et al. suggested that only interventions judged as feasible should be tested for efficacy to avoid unnecessary harm.¹⁷ In mixed methods, combining quantitative and qualitative approaches provides a better understanding of the research problems and complex phenomena.²³ Fetters and Molina-Azorin⁵⁶ suggested that mixed methods could overcome the risks and shortcomings associated with human participation and dignity in intervention studies. This study focused on developing a picture book, evaluating its feasibility, and carefully carrying out the development and evaluation processes. As a result, we gained a deeper understanding of the feasibility and usage of the picture book in clinical practice, and specific future concerns from the perspectives of children, families, and HCPs became apparent. This study suggests an avenue for correcting these and proceeding to a subsequent effect-verification study. Second, this study showed that a mixed-methods approach is appropriate for the field of child health. Recently, children have been recognized as social actors with knowledge and views, and it is essential to involve them in research in order to understand their perspectives.⁵⁷ However, studying vulnerable populations has its own challenges;⁵⁸ for example, their lack of capacity to understand power dynamics makes it difficult to get children involved in a study. This study was carefully conducted to understand vulnerable participants' views. This mixed-methods approach may allow vulnerable populations, including children, to express their views, leading to child- and family-centered care-based research and care.

Conclusions

We developed a picture book to deepen communication about cancer with children. The feasibility of the picture book was evaluated by the

HCPs, children without cancer and their families, and children with cancer and their mothers. The quantitative results supported the idea that the picture book can be used to communicate with children diagnosed with cancer. Moreover, the responses of HCPs, children, and families obtained from qualitative data supported the picture book's role in increasing understanding of cancer and improving communication about cancer with children. Training for HCPs is necessary to use the picture book more effectively in clinical practice. Further research is needed to evaluate the health outcomes of children and their families, as well as the user experience when the picture book is used to communicate about cancer with children. Using the picture book, research should be conducted on each child, family, and HCP.

CRedit author statement

Noyuri Yamaji: Conceptualization, Methodology, Formal Analysis, Investigation, Resources, Data Curation, Writing – Original Draft. **Daisuke Hasegawa:** Resources and Writing – Reviewing and Editing. **Kyoko Kobayashi:** Validation, Writing – Reviewing and Editing. **Erika Ota:** Conceptualization, Methodology, Validation, Writing – Reviewing and Editing, Supervision. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

The authors declare no conflict of interest.

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Ethics statement

Ethical approval was granted by the St. Luke's International University Research Ethics Committee (IRB No. 20-A058). All participants provided written informed consent.

Data availability statement

Data availability is not applicable to this article as no new data were created or analyzed in this study.

Declaration of Generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.apjon.2023.100345>.

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