



Original Article

The Impact of Drug on Heart Problems in Children with a Family-Centered Care Approach

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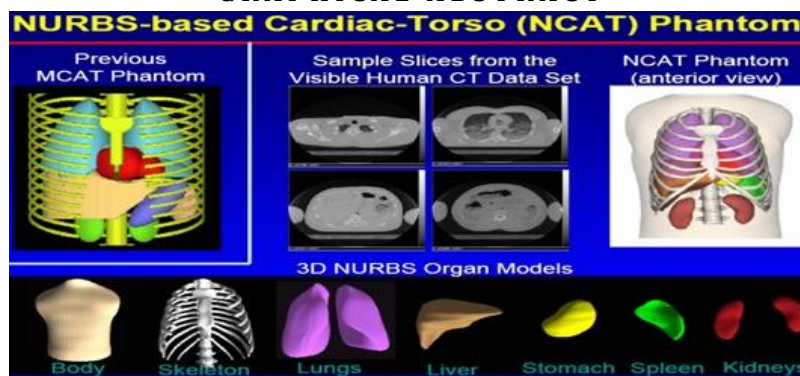
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ABSTRACT

The purpose of this study was to investigate the effects of the drug on children and their lifespan by compiling a clinical guide. The comparative method was multi-stage. The statistical population in this study was the people in the focus group and nurses working in the pediatric ward of hospitals affiliated to Mashhad University of Medical Sciences, Shahid Beheshti Medical Sciences of Tehran, Shiraz Medical Sciences, Isfahan Medical Sciences and Birjand Medical Sciences. Convenient and available sampling method was available as many as 100 people. The data collection instrument was a three-part questionnaire, including pre-mortem, in-child and post-mortem care. Responses were calculated using a round scale from inappropriate to appropriate with a score of one to nine. The content validity method was used to confirm the validity of the questionnaire and the round fit method technique was used for checking the reliability. The results of this study provided nurses with appropriate guidance to make more informed decisions regarding the challenges of providing nursing care in the later stages of children's lives and supporting parents and other family members, and to improve the quality-of-service delivery.

GRAPHICAL ABSTRACT



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Introduction

The main goal of the health care system is to provide the most appropriate type of care to meet the needs of patients [1]. Nursing force is one of the most important human resources and is the largest part of the staff in health care that strives to meet patients' special needs in specific situations and its ultimate goal is to provide quality care in line with improving the outcome of services for the patient and the community [2]. Research has shown that nurses who base their practice on scientific evidence and clinical guidelines have been able to make better decisions and provide better quality care, reduce hospitalization time and patient costs and bring better cost-effectiveness to the patient and the organization. Also, these nurses have been able to respond to the client professionally and have more self-confidence and a stronger professional identity. The good news is that the death rate

from heart disease is declining. Unfortunately, heart disease causes sudden death, and many patients die before reaching the hospital [3]. To help prevent and treat heart disease, mathematical modeling of the heart has become an important topic for researchers. A virtual model that can be used to make smart assistants for doctors. The use of software simulations and computational methods such as finite element analysis will be useful for investigating the structural-fluid interaction of the human heart. Creating a suitable computational model in accordance with the geometry and anatomy of the heart, modeling the mechanical properties of heart tissue and analyzing the structure-fluid interaction using the built-in model can be used as a useful tool in medical applications because performing this analysis on a computational model is like performing a real surgery (Figure 1) [4].



Figure 1: Medication for Children: Do Not Overdose

Mathematical modeling of the heart has become a significant field for researchers to help prevent cardiovascular disease [5-7]. Accordingly, research has been conducted on the heart and its components. Computational tools are used to build models of specific cardiovascular patients based on CT scan and MRI data, which can be used to help create a different treatment model

for specific patients. The comparative method was multi-stage [8-10]. The statistical population in this study was the people in the focus group and nurses working in the pediatric ward of hospitals affiliated to Mashhad University of Medical Sciences, Shahid Beheshti Medical Sciences of Tehran, Shiraz Medical Sciences, Isfahan Medical Sciences and Birjand Medical

Sciences [11-13]. Convenient and available sampling method was available as many as 100 people. The data collection instrument was a three-part questionnaire, including pre-mortem, in-child and post-mortem care. Responses were calculated using a round scale from inappropriate

to appropriate with a score of one to nine. The content validity method was used to confirm the validity of the questionnaire and the round fit method technique was used for reliability (Figure 2) [14-16].

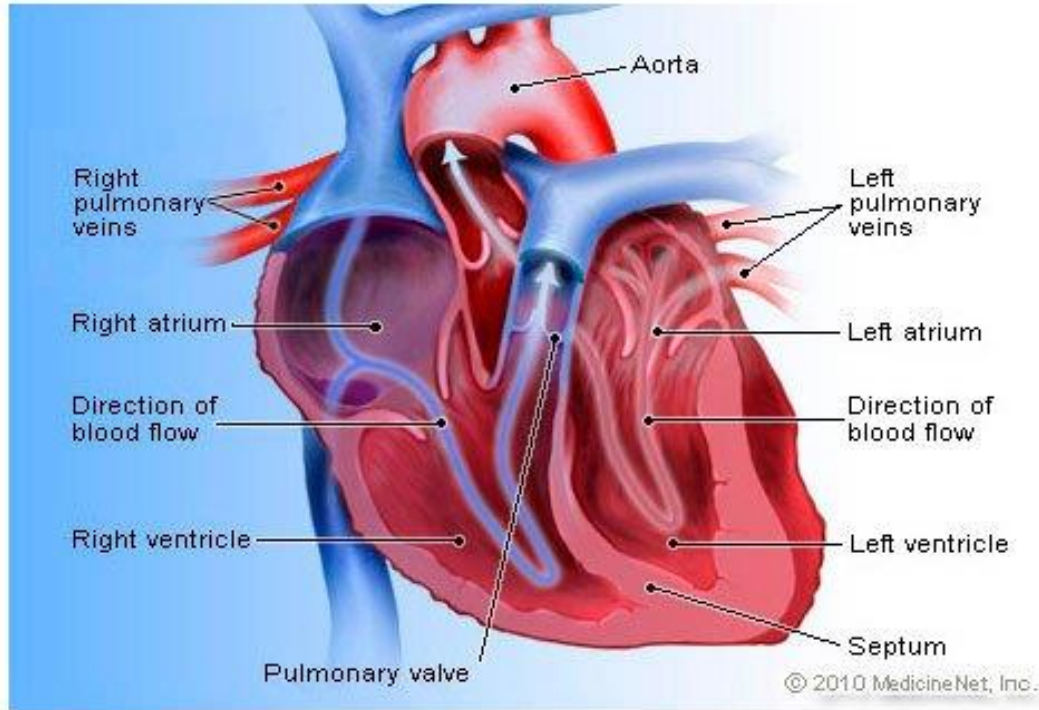


Figure 2: Heart Disease: Symptoms, Signs, and Causes

Shi *et al.* (2018) proposed a new model with focused parameters for cardiovascular dynamics. This proposal includes a new model of heart valve dynamics embedded in the overall model of four cardiac cavities and systemic and pulmonary rings [17-19]. In modeling heart valve dynamics, different factors that affect valve movement have been tested and the governing differential equations for heart valve movement have been obtained. The heart valve model includes the effect of the effects of blood pressure, the effect of tissue friction, and the movement of blood flow [20-22].

Van Loon *et al.* (2018) studied the model of fluid-solid interaction with rigid solid contact for heart valves. A computational method is proposed for places where the combination of fluid and solid interaction with solid contact is rigid [23-25]. This combination is especially important for studying the dynamics and heart rate of the valves. The Navier-Stokes equation is coupled with the Eulerian view and the new Hooke solid

model based on the Lagrangian description. Using the fact that there is no need to match the mesh between the fluid and the solid, it is shown that this model (solid-fluid interaction model) can be extended with the contact algorithm without introducing near-surface mesh difficulties [26-28]. Modeling a variable solid interaction with a rigid solid surface is not much different from modeling a fluid-solid interaction. The main difference is that the contact phenomenon is temporary. This is while solid and fluid are assumed to have a continuous interaction with each other [29-31]. The solid-fluid interaction model is increasingly used in medical engineering applications; a very controversial area related to the above model in the human body is the heart valves [32-34]. The major studies have been on mitral and aortic valves. This attention to the mitral valve is important because mitral valve softness is a very common disease in humans. On average, 35% of people suffer from this disease. If clinical practice is based on research evidence, it

will increase nurses' awareness and knowledge of child care, and the family will be in the final stages of life children [35-37]. Making appropriate decisions in this field used to design

programs appropriate to the culture of our country, the method of comparative research with a localization approach was used (Figure 3) [38].



Figure 3: FDA OKs first new ADHD drug in over a decade for children

It is hoped that this guide can be a step to improve the quality of nursing services and the quality of life and death of children by empowering nurses in end-of-life care of children, change the framework of the care team by increasing the awareness and knowledge of

nurses for end-of-life care, make family-centered care more creative and respectful, provide a platform for the treatment team to pay more attention to end-of-life care in Iran and to provide better care to children with life-threatening and dying illnesses (Figure 4) [39-41].



Figure 4: OxyContin Approved for Children as Young as 11

Material and methods

In this study, using the programs of other countries and asking for opinions from domestic experts using the Delphi technique in compiling a clinical guide to end-of-life care in children with a family-centered approach, a multi-stage comparative study was used to tailor a clinical guide considering the culture of our country in the field of end-of-life care in children with a family-centered approach. In this study, the Delphi method was used to compile the final questionnaire. First, the members of the focus group were selected according to their experience and expertise in relation to the

research topic, who were about 15 people, and the initial questionnaire was sent to them via email [42]. After 5 days, all questionnaires (100%) were returned to the researcher and the ambiguities and problems raised by the experts were resolved. Following the corrections made based on the experts' opinion regarding the problems and ambiguities, we sent the questionnaires again to confirm the service of the focus group, which were returned after 5 days (100%). According to the confirmation of the appropriateness of the questionnaire from the perspective of experts, the final questionnaire was developed. Nice is a part of the UK National

Health Service and a clinical guide organization that provides evidence-based advice for the care of people and, in some cases, due to a lack of

evidence, the clinical guide developers use it to develop it (Figure 5) [43-45].



Figure 5: What is heart disease? And Other Heart Disease Questions

Based on this model, four stages were implemented:

- 1- Information collection stage: In this stage, the data required for the research was collected;
- 2- Writing stage: In this stage, which was about the subjects, the researcher sought evidence and examined the evidence obtained from reputable sources and sites, as well as the formation of a group of researchers and specialists to begin the development and drafting of clinical guidance. The data collected in the previous stage were consulted and agreed upon by the expert group, and the cases with differences were identified and revised according to the recommendations;
- 3- To complete the clinical guide from the group of experts, the patients were invited to provide the required data; and
- 4- Dissemination stage: In this stage, the clinical guide was published after the defense and its approval by the university and provided to the nurses.

Sample size

In the first stage, the sample size was the number of selected articles, which reached 4344. In the second stage, the people who met the entry

requirements to participate in the focus group were included in the study, who were 15 people. And in the third stage, the faculty members of the Pediatrics Department of the School of Nursing and Midwifery of Mashhad University of Medical Sciences, the nurses working in the pediatric ward of the studied hospitals, were included in the study by non-probability and easy sampling method, who were 100 people (Figure 5) [46].

Data Collection instruments

- 1- Review of advanced texts including guides, standard clinical guidelines in the field of end-of-life care

We browsed advanced texts using articles, guidelines and standards in the world in the field of end-of-life care, related keywords to search among articles with similar topics to achieve research goals.

- 2- Final modification of the clinical guide based on the opinion of experts

After collecting the data, the clinical guide components were sent as separate items to review and confirm the service of the expert group to make the necessary corrections and complete the clinical guide (nominal group). In

the final stage, a group of specialists (professors) were invited during the meeting to discuss and conclude and approve the clinical guide. Using the opinion of experts, the final modification of the clinical guide was done and after the final approval, the clinical guide was developed (Focus group) [47].

Procedure

The first stage

Objective 1: To determine the components of clinical guidelines for end-of-life care in children.

Objective 2: To determine the degree of teachers' agreement on the components of clinical guidelines for end-of-life care of children.

In the first stage, the library and electronic methods were used, so the related keywords were considered according to the results in the databases. It is noteworthy that all the information was obtained from scientific research databases that were at a high level in terms of credibility; also, the research team checked the validity of articles obtained from the Internet and various databases. The texts were studied and the components of the clinical guide to end-of-life care were collected based on the information and categorized according to the conditions of the articles. Draft recommendations were prepared in the form of a questionnaire and general editing was done according to the professors' comments [48].

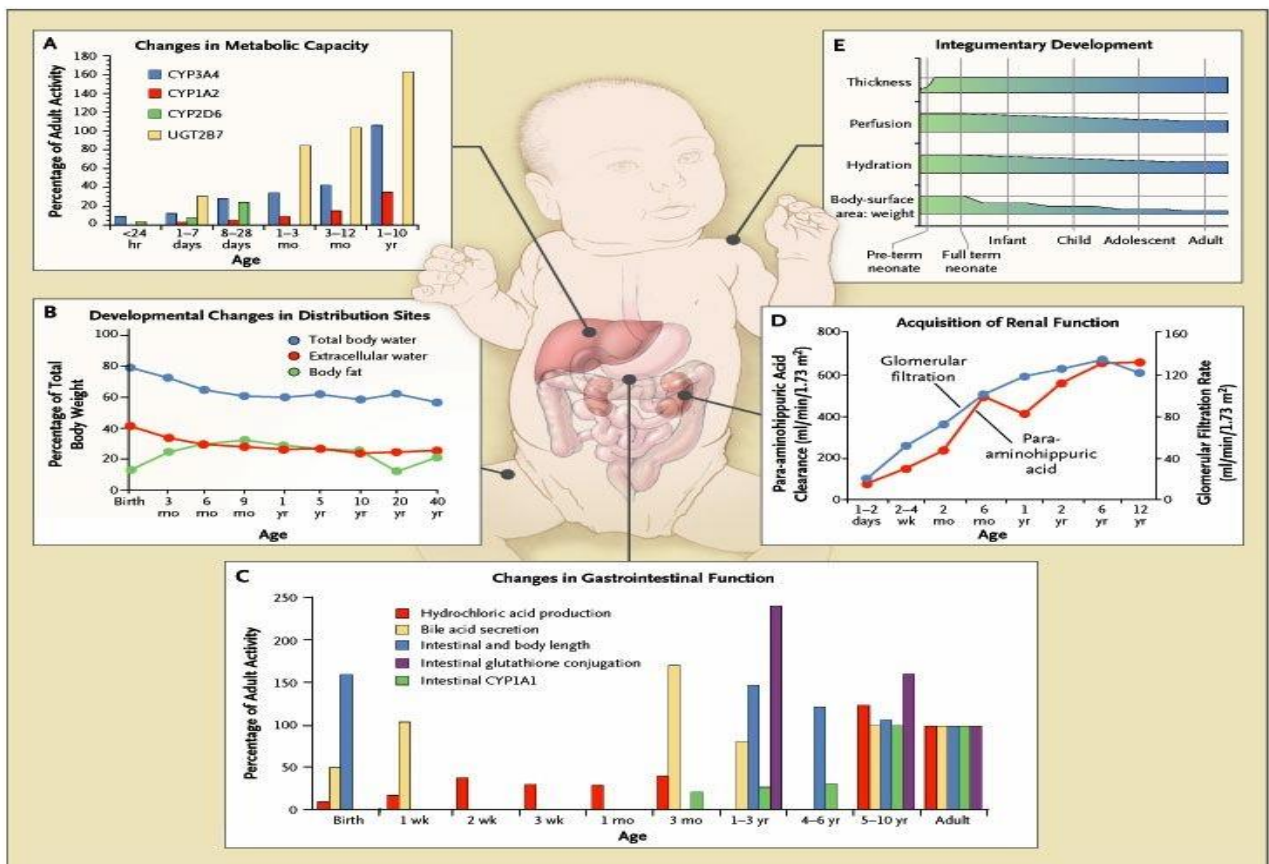


Figure 6: Drug Disposition, Action, and Therapy in Infants and Children

Second Stage

Objective 2: To determine the degree of agreement of teachers in the components of clinical guidelines for end-of-life care of children. Description of Objective 2: The survey was conducted in a group of specialists and professors by round method, in which the group presented

its recommendations and after discussion, the desired clinical guide was localized and finalized. The selection of members of the expert group was based on their background and shared experience on the topic of research. At this stage, localization, adapting the recommendations to the national laws and cultural, social and religious requirements of Iran, was done. For this

purpose, all the recommendations determined from the point of view of experts and specialists in terms of scientific validity, applicability, usefulness and strengths and weaknesses of the clinical guide were considered and the level of agreement of the expert group with each component of end-of-life care children was determined [49].

Then, on June 7, 2015, all the questionnaires were returned. The collected comments were analyzed and the items and recommendations that needed to be corrected and reviewed were identified. Then, on June 16, 2015, with the coordination and sending of a written invitation to 18 members of the focus group, a 3-hour meeting was held from 9 to 12 in Ibn Sina Hall of the Faculty of Nursing and Midwifery of Mashhad University of Medical Sciences.

Before the beginning of the session, the analysis of the previous stage was provided to the participants in the form of a questionnaire by identifying debatable items. At the beginning of the session, while welcoming the participants and introducing people to each other, the objectives of the research were explained. The process and results of the research up to this point were

explained. The recommendations and scores provided for each item were determined based on the round criteria.

The recommendations and scores provided to each recommendation were displayed visually (previously sent electronically to everyone) by identifying the recommendations with the most scoring differences. The recommendations were discussed and exchanged. The group of experts, while reviewing the recommendations, suggested that legal and jurisprudential issues be interviewed and consulted with experts. A meeting was held with a forensic doctor, as well as one with the Department of Education (Faculty of Theology and Islamic Studies, Ferdowsi University of Mashhad) and comments. The presentation was implemented in these meetings and the final clinical guide for the national survey was written and the level of recommendations was determined through consultation with supervisors and experts (Tables 1 to 3).

At this stage, the importance and feasibility of each component was first determined individually and based on that, a draft of clinical guidance was prepared.

Table 1: Level of Evaluation

Evidence extracted from clinical guidelines published by reputable centers	A++	A
Evidence extracted from clinical guidelines published by reputable centers that had been reviewed through a checklist	A+	
Evidence extracted from the text of the reference books or studies that had not been reviewed	B++	B
Evidence extracted from a randomized controlled study	B+	C
Evidence extracted from other articles	C+	
Items written based on the consensus of experts and thinkers	C++	
Cases written based on expert clinical experience	D+	D
Items written in correlation with the topic	D++	

Table 2: Degree of recommendations

Define the level of evidence	Insert a recommendation
The validity of the recommendation based on the evidence A and + A ++	A
Execution based on B ++ and B + evidence	B
Intermediate or arbitrary based on C + and C ++ evidence	C
Lack of sufficient evidence based on D + and D ++ evidence	D

Result and Dissection

Results of the first stage findings (Objective 1)

We intended to determine the components of the clinical guide for end-of-life care with a family-

centered care approach. At this stage, the components of the end-of-life care clinical guide were determined with a family-centered care approach. Therefore, in order to identify different

areas of child end-of-life care with a family-centered care approach as well as clinical guides in this field, the researcher decided to identify and extract the necessary databases and information sites in this field related to child end-of-life care with a family-centered care approach

around the world using related keywords according to findings in the world's databases. The changes made based on the suggestions of the experts in the nominal group in the field of child mortality care are shown in Tables 4 and 5.

Table 3: Number and percentage of studies in different countries

Percentage of studies	Number of studies	Country
4%	2	Iran
34%	17	America
18%	9	Australia
10%	5	England
2%	1	Russia
24%	12	Canada
4%	2	Brazil
4%	2	Germany

Table 4: End-of-life care child to investigate the drug for children

Final revised recommendations	Suggested recommendations	
Focus group discussion	Who makes the final decision in this regard?	Holding a joint meeting regarding the decision not to perform resuscitation and care based on providing comfort to the child and family (Meeting with the presence of the doctor and the responsible nurse and the child's family)
If possible, the family should be able to choose the location of their child's death and this should be facilitated	If possible, the family should be able to choose the location of their child's death and this should be facilitated	If possible, the family will be able to choose the location of their child's death
Focus group discussion	What aspect of death should be discussed?	Encourage parents to have open and honest discussions about death with the child, other children and other family members
Providing a favorable environment for the death of the child (adequate level of light, proper ventilation, privacy of the child and family)	Providing a favorable environment for the death of the child (adequate level of light, proper ventilation, privacy of the child and family)	Providing a favorable environment for the death of the child (adequate light level, proper ventilation)
Focus group discussion	Who will take care of the sick child?	Turning parents' attention to caring for healthy children (Reducing the deprivation of healthy siblings of regular parental attention)
Preparing the child and family to face the process of child death (explanation of the inevitability of death and dying)	Preparing the child and family to face the process of child death (explanation of the inevitability of death and dying)	Preparing the child and family to face the process of child death
Encouraging the family to meet and consult with their trusted religious and cultural figures (cleric and hospital family counselor)	Encouraging the family to meet and consult with their trusted religious and cultural figures (cleric and hospital family counselor)	Encouraging families to meet and consult with their trusted religious figures (Hospital Clergy)
Allowing the child to express their fears and worries about death, such as expressing the child's fears of leaving family and friends	Allowing the child to express their fears and worries about death, such as expressing the child's fears of leaving family and friends	Allowing the child to express his or her fears and worries about death, such as expressing the child's fears of leaving the family

Table 5: End-of-life care, post-mortem care of the child

Final revised recommendations	Suggested recommendations	
Helping the family to hold a funeral, getting acquainted with burial and burial preparations	Helping the family to hold a funeral, getting acquainted with burial and burial preparations	Helping the family with funerals, getting acquainted with burial and burial arrangements
Expressing empathy and sympathy with family and establishing intimate communication (sharing efforts by writing a letter or card)	Expressing empathy and sympathy with family and establishing intimate communication (sharing efforts by writing a letter or card)	Expressing empathy and sympathy with the family and establishing a sincere relationship (joint efforts)
Introducing the family to organizations to receive support and services, the ones based in the hospital or other support organizations (helper, family counselor)	Introducing the family to organizations to receive support and services, the ones based in the hospital or other support organizations (helper, family counselor)	Introducing the family to organizations to receive support and services, the ones based in the hospital or other support organizations (family counselor)
Care and treatment of the child's body after death should be done with respect	Care and treatment of the child's body after death should be done with respect	Treat the child's body with respect after death
Focus group discussion	Who should be told the news, when, to whom?	Providing and observing the necessary conditions for telling unpleasant news (Considering sufficient and appropriate time, saying unpleasant news in simple and understandable language and appropriate tone, not using incomprehensible and ambiguous sentences, appropriate eye contact)
Meeting with the presence of the doctor and the responsible nurse and the family, discussion to consider organ donation for the child (donation of child organs to other patients)	Meeting with the presence of the doctor and the responsible nurse and the family, discussion to consider organ donation for the child (donation of child organs to other patients)	Meeting with the presence of the doctor and the nurse in charge, discussion to consider organ donation for the child (Donation of child organs to other patients)
Preparing the child's body for transfer to the morgue (removing the connections of the devices, cleaning the corpse)	Preparing the child's body for transfer to the morgue (removing the connections of the devices, cleaning the corpse)	Preparing the child's body for transfer to the morgue (separating devices, cleaning the body)

In scoring the focus group on the recommendations before the death of the child, all the recommendations received an acceptable score in terms of desirability and applicability, except for item number 18, which had a low score in terms of desirability and feasibility allocated. In scoring the focus group on the recommendations during the death of the child, all the recommendations received an acceptable score in terms of desirability and applicability, except for items No. 4 and 19, which had a low score in terms of desirability and applicability.

In scoring the focus group (Table 6) on the recommendations during the death of the child, all the recommendations received an acceptable score in terms of usefulness and applicability, except for item number 11, which had a low score in terms of usefulness and applicability. After extracting the recommendations, they were classified into three areas of pre-mortem care, infant mortality care and post-mortem care. The analysis of research findings at this stage led to the preparation of end-of-life care components for children with a family-centered care approach and its initial draft in the form of a questionnaire.

In developing the initial draft of the clinical guide to end-of-life of children with a family-centered care approach in the form of a questionnaire, clinical guidelines and related articles were described. In the present study, focus group sessions were used [50].

Table 6: End-of-life care, post-mortem care of the child

Applicability	Desirability	Level of evidence	reference	Items	Row
A) End-of-life care, after the death of the child					
1	8	A	(Guideline to End of Life Care, 2012)	Creating an opportunity for the family to be with the deceased child and, if desired, to work together to prepare the body	1
		A	(Wong, 2011)		
		C	(Williams et al., 2010)		
2	8	A	(Guideline to End of Life Care, 2012)	Paying attention to all the reactions and feelings of the parents after the death of the child (expecting denial, anger, tears)	2
		C	(Covey, 2011)		
		C	(Lichtenthal <i>et al.</i> , 2011)		
2	8	A	(Guideline to End of Life Care, 2012)	Expressing empathy and sympathy with the family and establishing a sincere relationship (sharing efforts by writing a letter or card)	3
		C	(Coleman & Richmond, 2011)		
3	8	A	Guideline to End of Life Care, 2012)	Providing conditions for religious counseling with the clergy for the family (reducing pain and peace of mind)	4
		C	(Knight & Emanue, 2011)		

After analyzing the questionnaires and determining the priority and applicability and level of items, the items that had priority and applicability of more than 3 as well as the items that had low level were identified to be discussed in the focus group. And the necessary corrections were made with the grade of items A, B, C, D according to the localized clinical guide of female urinary incontinence, which was compiled by the Center for Management of Urological Knowledge of Tabriz University in August 2013. Also, the level of evidence and the level of items in this study and the main components of the guide are consistent with the Nursing Care Guide for End-of-Life Children, compiled by Cowie (2011).

Items related to care during infant mortality were more accepted than pre-mortem and post-mortem care, which are the reasons for the lack

of nursing staff, high workload, and lack of time. End-of-life care requires a medical team, and all people involved in child care are team members, including doctors, nurses, parents, and religious counselors.

It turned out that the person in charge and performer of most of the care was the nurse, suggesting the fact that more nurses than other team members and that nurses spend most of their time with the patient. The team was led by a doctor. Nurses have a role of support, education and direct care of the child in this regard. In addition, they should improve their performance and by combining knowledge and skills to expand the comfort of the child and family during the later stages of life. Religious counselor meets cultural, religious and social needs.

The social worker meets financial and welfare needs. The psychologist supports the spiritual and psychological needs. Parents have a pivotal role in child care and throughout the end-of-life care period of the child, the health care system provides an opportunity for the treatment team to improve family-centered care by developing partnerships and collaborations with parents.

As the results of the first phase of the research presented in the tables show, there was some ambiguity among some experts regarding these items, which were among the items discussed in the focus group. Also, the results of the second phase of the research in the tables of recommendations with a low score in terms of rank and applicability or a low level of recommendations were also among the items discussed in the focus group.

The group was asked to present their ideas according to local conditions and cultural contexts, community beliefs and current laws. The results of the analysis of the first and second stages of the study related to the focus group, the reason for the entry of the item into the discussion and the results mentioned and the cases that were discussed more are as follows:

In scoring the recommendations before the death of the child, the item "Establishing the possibility of the presence of the child's sister, brother or classmate at his bedside" had a low performance capability, which from the perspective of those present in the focus group, due to national laws to prevent Children under the age of 12 are not allowed to enter hospital wards due to nosocomial infections.

On the other hand, the biggest fear of the child at the end of life is separation from parents, sisters, brothers and classmates (friends), if possible, whose presence at the patient's bedside helps to provide psychological support to the child. According to a study conducted by Perrin and Shipman (2008) on the presence of teachers and classmates at the bedside of a hospitalized child in the later stages of life, their presence beside the child reduces the child's anxiety. Hence, the focus group agreed on this item.

In scoring the recommendations during the death of the child, the item "If possible, the family is able to choose the place of death of the

child and this should be facilitated" had a low applicability. Therefore, due to the specificity of the resuscitation room in the ward, and the protection of the privacy of the patient (child) and other children admitted to the ward, those in the focus group thought it would be better not to transfer the child to other rooms for resuscitation, but, if possible, to fulfill the parents' last wishes.

Wilkinson (2012) investigated improving the process of caring for children at the end of life and supporting their families, and reported paying attention to the last wishes of parents regarding the child at the end of life helps to improve the mental state of parents.

In scoring the recommendations after the death of the child, the item "If the family wishes, contact the family on special days such as the birthday or the anniversary of the death of the child" had a low desirability and applicability. Therefore, due to the uncertainty of the person in charge, lack of facilities, and high workload, the focus group thought the process would not usually be followed up in this area and the possibility of access to the family would be reduced. However, if a specific person is responsible for doing this in the hospital, if they contact the family and express sympathy with them, it will cause their psychological support and comfort. Working on the family adjustment process after the death of a child, Knight and Emmanuel (2011) showed that the sympathy of the medical staff in the following months with the family in connection with the death of the child helped to accelerate the family adjustment process. Therefore, it was agreed to accept this item in the focus group.

In the focus group, it was stated that the child and the family needed to receive accurate and honest information about the disease, treatments and prognosis. This information should be presented to them in a clear and simple language. In many cases, it is best to do this gradually, over time, and specifically by increasing open dialogue between parents, professionals, and the child. In fact, when and how to involve children in decisions about their own death process is a very individual matter. In general, parents need to decide whether they

want their child to be informed about the prognosis and to participate in the care plan. The focus group discussion suggested that some parents may want to keep the issue of death hidden from the child, even if the child asks a question. This often puts the treatment team in a more difficult position. Helping parents often recognize the importance of honesty and joint decision-making with the child will encourage them to allow the issue of death to be raised with the child. In this process, parents need professional support and guidance from the nurse who has a good relationship with the child and family. Principles and guidelines can help nurses and families determine how to present the truth about a possible death to a child in a way that increases trust and emotional support. Parents should be encouraged to have gradual discussions with the child about death. What is said is important, but how it is expressed is vital. The explanation should be given according to the child's ability to understand the reality of death. There is no clear standard for determining the exact time of such discussions, and the results of studies on how physicians decide when to shift the focus of health care to providing comfort to situations and physicians are highly variable. In addition, many families do not agree to transfer treatment to providing comfort and quality of life to the child when treatment is impossible. The final decision is made consciously by the parents. Having a child with an incurable disease exposes a person to a stressful event that leads to symptoms that may impair the physical and mental strength of parents and endanger the lives of children and parents. In the later stages of life, most treatments are stopped and physicians no longer continue treatment or start new treatments. On the other hand, the child and the family face many challenges during the treatment period, and most children experience physical side effects, unpleasant behavioral and emotional problems. Clearly, end-of-life child care affects the quality of life and functioning of the family and other family-related systems. The quality of life of the child in the later stages of life is closely related to nursing care, because

nursing care not only improves the quality of life of the child but also significantly improves the performance of parents and their role for other family members. Then, these items were developed as clinical guidelines. In this study, guides and articles in scientific databases that were closer to the research topic were used for the clinical guideline components of the model framework. In this regard, several studies were in line with our research process.

Medical Imaging Phantoms

One of the vital requirements of simulation is to have a realistic phantom or model of object anatomy. In the absence of these phantoms, the simulation results will be very different from the actual results. Phantoms are actually computer mannequins that are made according to the specifications of human tissues. These characteristics include radiation attenuation coefficients. The main advantage of using computer phantoms in simulation studies is that the phantoms are exactly like the real anatomy and the physiological activities of the phantoms are known. This provides a golden standard for evaluating and improving medical imaging tools, image processing, and reconstruction techniques. Another advantage is that computer phantoms can be used at any time and can easily be created for research and study, anatomy and various medical conditions. These phantoms greatly expand the research space and also do many things, including checking the performance of medical imaging equipment, measuring radiation dose, calibrating equipment, measuring system resolution, focal spot size, contrast, and beam control. Facilitate placement of image artifacts in radiology, research and education, and more. The MOBY and NCAT four-dimensional phantoms are examples of these phantoms. The MCAT Phantom is also a mathematical computer phantom and has no graphical mode. These phantoms are made available to the public free of charge from academic institutions. Figure 7 shows the NCAT phantom and its components.

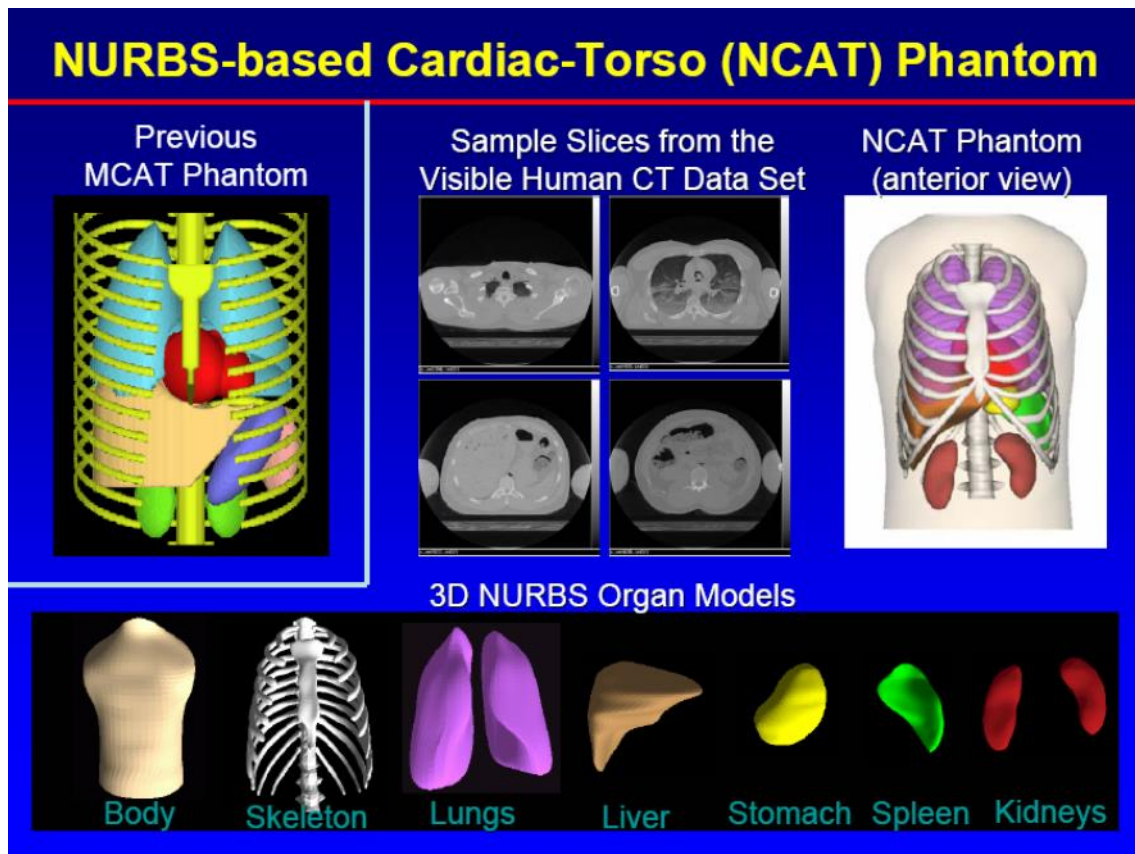


Figure 7: NCAT phantom and its components

NCAT four-dimensional phantom

The NCAT Heart Tissue Phantom is designed for use in nuclear medicine research (SPECT and PET). This phantom is based on four-dimensional NURBS surfaces. This phantom makes it easy to create a flexible and realistic model of the human heart.

Modeling Monte Carlo Nuclear Medicine Imaging

The effect of Monte Carlo simulations

The Monte Carlo method describes a vast field of science that includes many processes, physical systems, and events that are simulated by statistical methods using random numbers. The purpose of Monte Carlo analysis is to produce a model that is as similar as possible to the real physical system. System interactions in the environment are simulated based on known events. As the number of possible events (called histories) increases in the system, the quality of system performance improves. With a sufficient number of interactions, the average absorbed dose is obtained at desired points with acceptable uncertainties. Monte Carlo techniques

are one of the most common tools in medical physics. The Monte Carlo method is used in radiation protection, diagnostic radiology, radiotherapy and nuclear medicine. With the rapid development of computer technology, Monte Carlo-based reconstruction in emission tomography and treatment planning, this method was also applicable to radiation therapy.

Monte Carlo software packages

Many of Monte Carlo's programs are built on open-source nuclear imaging and internal dosimetry. There are generally two groups of bundles:

- a) General packages, and
- b) Special packages.

Using Monte Carlo codes, software packages and codes with specific purposes, including high-energy general medical physics work, have been produced that each group has its own advantages and disadvantages.

Monte Carlo general purpose programs

Most of the packages listed below are practically run-on different platforms and systems and are

available from developers or through official channels and NEA or IC (RS). One of the most commonly developed computer codes for medical physics is the gamma electron precipitation system (EGS). This package has the general purpose of transporting electrons and photons in a geometric circuit. Particles in this code have energies of a few kilovolts to several teraelectron volts. A number of scientists have written code using Monte Carlo simulations. Examples include Sim-SPECT based on MCNP, PET-EGS based on EGS4, and more recently GATE based on GEANT4 developed at CERN.

Conclusion

In this study, a comparative research method with a localization approach was used to develop a clinical guide for end-of-life care of children with a family-centered care approach. In Objective 1, to access clinical guidelines and articles on end-of-life care for children with a family-centered care approach around the world, we referred to databases. These databases were used in most studies. In this study, by combining them, the desired databases were selected for search. And in the group of experts, its scientific validity was confirmed using the opinions of experts, and the components of end-of-life care of children were determined with a family-centered care approach to develop a clinical guide. In this regard, several studies were in line with our research process, to develop nursing guidelines for cough management in children.

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Authors' contributions

All authors contributed toward data analysis, drafting and revising the paper and agreed to be responsible for all the aspects of this work.

Conflict of Interest

The authors declare no conflicts of interest.

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