DEVELOPMENT OF A PEDIATRIC ORIENTATION RESOURCE FOR NEW NURSES IN THE OPERATING ROOM

by © Rebecca Tompkins

A report submitted to the School of Graduate Studies in partial fulfillment of

the requirements for the degree of

Master of Science in Nursing

Faculty of Nursing

Memorial University of Newfoundland

December 2024

St. John's, Newfoundland and Labrador

Abstract

Background: Education on diverse patient populations is crucial for many unit orientations within nursing. Few units in acute care hospitals care for multiple populations; however, the operating room (OR) is a common one. Many ORs care for patients across their lifespans and should receive education on pediatric and adult populations. This is not the case at one acute care hospital. To address this issue, I developed a pediatric orientation for new nurses to the OR to increase their knowledge and competency when caring for pediatric patients. **Methods**: I completed a literature review, consultations with unit stakeholders, and an environmental scan to identify the impact of education on nursing practice, critical pediatric knowledge for OR nurses, and impactful delivery modalities for a pediatric orientation for new nursing hires to the OR. Utilizing the data from the literature review, consultations, and environmental scan, I created an OR pediatric orientation for new nursing hires. **Results**: Using the information from the literature review, consultations, and environmental scan, I created a one-day pediatric orientation. The foundational perioperative pediatric content covered in the orientation includes pediatric vital signs, airway and skin anatomy, thermoregulation, perioperative anxiety, parental presence for induction, developmental stages, and pediatric anesthesia and surgical considerations. This foundational content will be delivered by lecture using a PowerPoint presentation that will include text, videos, pictures, and gamification through knowledge checkpoints, rewards, and a crossword. Following the lecture, simulation and demonstration will be utilized to provide hands-on experience with parental presence for induction, mask induction, nasal and oral induction, and surgical instruments.

Keywords: operating room, pediatric orientation

Acknowledgements

I would like to acknowledge and thank all the individuals who assisted me in the completion of my Master of Science in Nursing and my practicum project, specifically:

- My supervisor, Dr. Renee Crossman, at Memorial University, for her continued support, encouragement, and excitement with my project. I am immensely grateful for your kindness and patience while completing the practicum project.
- My partner for his continued support, encouragement, and patience as I navigated going back to school.
- My colleagues and collaborators on this practicum project who provided valuable insights, support, and contributions that helped make the pediatric orientation a reality.

Table of Contents

Abstract ..... *ii*

Acknowledgements ..... *iii*

Objectives *2*

Overview of Methods *3*

Theoretical Frameworks *5*

Benner's Novice to Expert Theory **5**

Knowles' Adult Learning Theory **6**

Summary of the Literature Review *7*

Impact of Education on Nursing Practice **8**

Content of the Pediatric Orientation Resource **8**

Delivery Modalities of Pediatric Orientation Resource and Nursing Learning Styles **9**

Summary of Consultations and Environmental Scan *10*

Resource Content **10**

Delivery Modality **12**

Summary of Resource *12*

Resource Content **12**

Resource Delivery **14**

Resource Development and Nursing Frameworks **16**

Discussion of Advanced Nursing Practice (ANP) Competencies *17*

Education **17**

Consultation and Collaboration **17**

Leadership **17**

Next Steps *18*

Implementation **18**

Frequency **18**

Delivery Environment and Method **19**

Evaluation **19**

Continued Development **21**

Conclusion *22*

References *24*

Appendix A: Literature Review *30*

Appendix B: Literature Summary Tables *61*

Appendix C: Consultations and Environmental Scan Report 83

Appendix D: Pediatric Orientation..... 122

Appendix E: Demonstration and Simulation Facilitator Guide 270

Development of a Pediatric Orientation Resource for New Nurses in the Operating Room

The operating room (OR) is a nursing unit unlike any other. To provide safe, competent patient care, OR nurses must know human anatomy, physiology, psychology, pharmacology, and technical skills related to specific surgeries, equipment, and instrumentation. Due to this specialization, when a nurse starts in the OR they must receive a comprehensive orientation consisting of detailed education to aid them in their transition. The orientation provides new nurses with foundational knowledge and skills pertinent to the unit. In the OR, the orientation should provide content regarding OR policies and procedures (e.g., surgical attire and surgical counts), emergency procedures, and specific patient population that they will care for (e.g., adults or pediatrics) (Operating Room Nurses Association of Canada [ORNAC], 2023). Unfortunately, this is not always the case.

Many units within hospitals care for either adult or pediatric patients; however, in many perioperative units (e.g., day surgery, OR, and post-anesthesia care unit) they care for both populations; my current hospital's OR is no different. In fact, 23.4% of OR procedures at the hospital are pediatric patients (A. McVeigh personal communication, May 16, 2024). Our current OR orientation, although comprehensive, strongly focuses on adults and only briefly mentions pediatric patients as a unique population. Having pediatric content in the orientation is essential. This oversight must be addressed, as children are not tiny adults and have perioperative considerations (e.g., thermoregulation and mask inductions) that differ from adults (Derig, 2016; Mower, 2015).

Unfortunately, clinical practice scenarios such as this are not uncommon and may occur due to a lack of organizational resources, time and support, and thus limited training and education (Alatawi et al., 2020; Hosseinzadeh et al., 2022). This is similar to what has occurred

at the hospital in question, where there has been Clinical Educator turnover, increased workload, and minimal time to support staff and develop new educational materials. To mend the pediatric knowledge gaps, new nurses to this OR have been learning how to care for pediatric patients while practicing; this is alarming as many have little to no prior knowledge of pediatric patients. Although there have been no adverse patient events related to this lack of education, concerns have been raised regarding new nurses' pediatric expertise and competency in the OR.

To help address this issue, for my Master of Science in Nursing practicum project, I created a pediatric orientation for new nursing hires in the OR. The effects of enhanced, focused education (e.g., orientation) on nursing practice are impactful. Enhanced education has been shown to increase nursing knowledge, competency and confidence and subsequently positively affect patient outcomes (Abebe et al., 2018; Baroya et al., 2023; Crowe et al., 2019; Mohammed et al., 2021; Stevens et al., 2014). With this orientation, I anticipate that evidence-based knowledge, skill, and competency will inform OR nurses providing patient care in the local setting.

Objectives

The overarching goal of my practicum project was to construct an orientation resource for new nursing hires to the OR that will further their knowledge of the special considerations, OR requirements, and processes and procedures for pediatric patients. To achieve this goal, there were four practicum objectives:

1. To identify critical pediatric nursing knowledge (e.g., skills and assessments) to include in the orientation resource for new nursing hires in the OR through the completion of the literature review, consultations, and environmental scan.

2. To identify existing resources pertaining to the care of pediatric patients in the OR from Ontario and Canadian hospitals on content, delivery, and implementation methods (e.g., simulation, lecture). This was completed using an environmental scan.
3. To develop a pediatric resource for new nursing hires to the OR at LHSC.
4. To demonstrate advanced nursing practice competencies, including education, consultation and collaboration, leadership, and research (Canadian Nurses Association (CNA), 2019).

These objectives were met through the course requirements of NURS 6660 and NURS 6661 by completing a literature review, consultations, environmental scan, and resource development. I will outline my findings and progress through these course requirements in the following practicum report. I will discuss the theoretical frameworks used to guide the project, identify the advanced nursing practice competencies utilized, and discuss the next steps for the developed resource.

Overview of Methods

A pediatric orientation for new nurses to the OR has been necessary for some time at the hospital. However, development has not been a priority due to clinical educator turnover, increased hiring, and unit commitments. By creating a pediatric orientation as my practicum project, I could dedicate time and resources at work and outside of work to ensure completion. To meet the above objectives, I completed a literature review, consultations with key stakeholders, and an environmental scan to gather information about foundational pediatric knowledge and skills essential for new nurses to the OR and an ideal delivery modality that would create a positive, engaging learning environment.

For the literature review, I searched databases (e.g., PubMed, MUN library) for relevant published articles that would aid in determining the educational needs of new nurses to the OR, foundational pediatric knowledge to include in the orientation, effective delivery modalities, and theoretical frameworks to assist in the creation of the orientation. All types of articles were considered, including quantitative, qualitative, and non-research. Non-research articles (grey literature) were included as research-based articles on resource content were difficult to find, and numerous non-research articles covered information pertinent to the topic of the practicum project. The information from the literature review provided a foundation for the practicum project and was used to help guide the subsequent consultations with key stakeholders and an environmental scan.

I consulted with personnel in the OR for which the pediatric orientation is being developed. I consulted current OR nurses, pediatric surgeons, pediatric anesthesiologists, OR managers, and the OR practice consultant. I emailed the OR nurses a Microsoft Forms survey inquiring about their experiences working with pediatric patients and new nurses while caring for them, essential pediatric knowledge for new OR nurses, and the ideal delivery modality. The surgeons and anesthesiologists were also sent a Microsoft Forms survey but were asked about their experiences with nursing caring for pediatric patients, as well as essential pediatric knowledge that the nurses should have. Instead of a survey, I completed semi-structured interviews with the OR managers and the practice consultant to explore their experiences of nurses caring for pediatric patients (e.g., adverse events) and if they had any feedback on content to include or the development of the orientation. All consultations provided information that helped create the pediatric orientation.

I completed the environmental scan concurrently with the consultations. For the environmental scan, I consulted pediatric clinical educators outside of the OR at my hospital and other OR educators from across Canada. I emailed the educators a list of questions to explore knowledge and skills for pediatric care and understand how other pediatric ORs conduct their orientation. I also explored guidelines and resources from professional organizations, such as the American Association of periOperative Registered Nurses (AORN), ORNAC, Canadian Anesthesiologists' Society, and American Society of Anesthesiologists. These guidelines and resources provided insights into the resource's content through their recommendations.

In the next section, I will discuss the theoretical frameworks I used to guide the creation of the pediatric orientation for new nurses hired to the OR.

Theoretical Frameworks

I drew on two theoretical frameworks to guide the development of the pediatric orientation: Benner's Novice to Expert Theory and Knowles' Adult Learning Theory. I chose these frameworks to increase my understanding of adult learning and how nurses develop knowledge, skills, and expertise in new clinical settings.

Benner's Novice to Expert Theory

Benner's Novice to Expert Theory provides a foundational understanding of how nurses develop knowledge, skill, clinical competence, and comprehension through training and experiential learning (Benner, 1982; Davis & Maisano, 2016; Ozdemir, 2019). With training and experience, nurses progress through five stages of proficiency: novice, advanced beginner, competent, proficient, and expert (Benner, 1982). Each stage of proficiency has key indicators of a nurse's expertise (Benner, 1982). For example, a novice nurse is task orientated with minimal context to their actions and has difficulty in new situations they have not encountered before

(e.g., deteriorating patients) (Benner, 1982; Davis & Maisano, 2016; Ozdemir, 2019). In contrast, an expert nurse is like a chess master (Benner, 1982). They can provide holistic care with reasoning for their actions and can apply prior knowledge and intuition to critical clinical situations (Benner, 1982; Davis & Maisano, 2016; Ozdemir, 2019).

The OR is a unique environment with a distinct set of knowledge and skills rarely acquired or necessary in other nursing settings (e.g., knowledge about surgical instrumentation, surgical implants, and care of a patient under anesthesia). Due to this, even the most experienced nurses new to the OR start at a novice level. The current adult-focused OR orientation does not consider prior knowledge of the learners, even if they have prior OR experience. In the pediatric orientation, I want to acknowledge the learner's prior experiences and expertise. By recognizing prior knowledge, I can create a resource and educational delivery that complements and builds on this prior expert knowledge (e.g., prior adult OR experience or pediatric experience). Further, Benner's theory refers to the expertise and understanding that occurs when nurses have the education, knowledge, and experience required to provide competent, expert care for patients (Benner, 1982). The resource will also provide OR-specific educational background and knowledge for new nursing hires to build clinical skills and expertise. By being mindful of prior experiences and the importance of education on the transition from novice to expert, I will be able to create a resource that can be adaptable to the learners and assist in furthering the learner's knowledge.

Knowles' Adult Learning Theory

According to Knowles' Adult Learning Theory, adult learners learn differently than children (Knowles, 1978). Adults bring prior experiences to their learning and learn best when the learning applies to their work or responsibilities (Collins, 2004; Knowles, 1978; Teaching

Excellence in Adult Learning [TEAL] Centre, 2011). Adult learning is further enhanced when the content is self-directed, presented collaboratively, respectfully, and adaptable, and allows learners to put the teachings into practice through clinical scenarios, problem-solving, or simulation (Collins, 2004; TEAL Centre, 2011).

Drawing on the Adult Learning Theory motivated me to build a resource that was adaptable, collaborative, and pertinent to the new environment where learners would be working. By doing this, I hope to be able to engage adult learners. I also hope to engage learners by choosing delivery modalities that encourage active participation, such as gamification and simulation, to allow learners to practice the foundational content. Lastly, the resource was created to build on the prior nursing knowledge of learners (e.g., prior OR or pediatric experience) to give value to the learners' previous experiences.

Both theoretical frameworks provided a foundation for adult learning and resource development.

Summary of the Literature Review

Through the literature review, I explored published literature to provide a foundation to guide the subsequent aspects of pediatric orientation development. I explored quantitative, qualitative, and non-research articles to meet the following objectives:

1. Identify why educational resources are essential to newly hired nurses in the OR (e.g., increased competency and improved patient outcomes).
2. Identify crucial pediatric knowledge for new nurses to the OR.
3. Identify the most effective delivery modality for the pediatric orientation.

All quantitative and qualitative literature was appraised using either the Public Health Agency of Canada (PHAC) Critical Appraisal Kit or the Joanne Briggs Institute (JBI) Checklist for

Qualitative Research (JBI, 2020; PHAC, 2014). Non-research literature was appraised for relevancy to the objective of developing a nursing pediatric orientation for the OR (e.g., content to include and delivery modalities), publication journal, references, and year of publication. In the following section, I will present the findings of the literature review. The literature review can be found in Appendix A, and a literature summary table of all articles is found in Appendix B.

Impact of Education on Nursing Practice

Nursing practice is influenced by practice-based, relevant education (e.g., instructional and resources) that nurses receive. Nurses who participated in education showed post-education increases in knowledge, competency, and confidence (Abebe et al., 2018; Baroya et al., 2023; Crowe et al., 2019; Mohammed et al., 2021; Stevens et al., 2014). This is impactful because increases in these factors resulted in positive changes to the quality of patient care, early identification of deteriorating patients, and overall patient outcomes (Baroya et al., 2023; Crowe et al., 2019; Mohammed et al., 2021). The above findings are significant as they demonstrate the importance of education for nurses and those to whom they provide care.

Content of the Pediatric Orientation Resource

There was limited research-based literature on pediatric orientations for the OR and content that could be included. Due to this, I utilized non-research literature to guide what foundational nursing knowledge is necessary for OR nurses to care for pediatric patients. I found only two articles discussing pediatric knowledge for OR nurses (Derig, 2016; Mower, 2015). Utilizing these articles, the following topics were determined to be necessary content to include in the pediatric orientation:

- Anatomical differences and vital signs

- Developmental stages and age-specific care
- Family-centered care
- Pre-operative anxiety
- Procedural difference for induction
- Anesthesia complications
- Thermoregulation (Derig, 2016; Mower, 2015).

These specific topics highlight special considerations and procedures that pose the highest risk to pediatric patients while in the OR and that can be managed by the nurses and perioperative teams with proper education and understanding (Bräuer et al., 2024; Dave, 2021; Derig, 2016; Leuhmann et al., 2019; Mower, 2015; Nemeth et al., 2021; Panella, 2016; West et al., 2020).

Delivery Modalities of Pediatric Orientation Resource and Nursing Learning Styles

When determining the correct modality for the pediatric resource, one needs to consider the learning style of nurses (Mangold et al., 2018). Nurses have many different learning styles, such as visual, sensing, active, reflective, sequencing, and global (Mangold et al., 2018). This information was considered when choosing a delivery modality for the pediatric orientation.

Through the literature review, I examined five delivery modalities: independent learning, simulation, gamification, lecture, and multi-modal. Each modality had advantages and disadvantages. For example, learners preferred simulation to lectures because of increased motivation, enthusiasm to learn, and an increased understanding of the subject matter (Solheim & Flo, 2023; Tawfik et al., 2020). However, simulation was not more effective than lecture when assessing knowledge retention (Tawfik et al., 2020). The two modalities of gamification and multi-modal were well received by learners, with reports of increased knowledge development

and retention, clinical decision-making, nursing competence, and quality of patient care (Ma et al., 2021; Mohammed et al., 2021; Razaghpoor et al., 2024).

Following the literature review, I consulted with unit stakeholders and conducted an environmental scan to supplement the information gathered from the literature. The information from the literature review was used to inform the consultations and environmental scan methodology. A summary of the consultations and environmental scan is presented in the next section.

Summary of Consultations and Environmental Scan

I conducted the consultations and environmental scan simultaneously. I consulted with key unit stakeholders who could provide insights into the nursing care of pediatric patients in the OR. Specifically, I consulted current OR nurses, pediatric surgeons, pediatric anesthesiologists, OR managers, and the OR professional practice consultant via surveys or semi-structured interviews. I engaged with personnel and resources outside the unit through the environmental scan. I consulted with other pediatric clinical educators at my organization and other pediatric OR clinical educators across Canada. I also reviewed resources from the AORN, ORNAC, Canadian Anesthesiologists' Society and American Society of Anesthesiologists. The consultations and environmental scan objectives were to gain insights into essential pediatric content to include in the pediatric orientation and the ideal delivery modality. In the following section, I will summarize the consultations and environmental scan findings. The full report on the consultations and environmental scan can be found in Appendix C.

Resource Content

The topics of essential content I identified in the consultation and environmental scan were similar to those found in the literature review. A few foundational knowledge and skills not

noted in the literature review were identified, such as pediatric surgical equipment, individualized care, and communication with pediatric patients. The following are the identified essential content:

- Neonatal and pediatric anatomy and vital signs (including skin development and precautions, airway anatomy, and neonatal vital signs)
- Assisting anesthesia (including difficult airways, emergency management and equipment, and induction)
- Family-centred care (including Child Life Specialists, parental presence for indication, and incorporating parents into the child's care)
- Growth and development (including developmental stages, age-specific care, communication skills for different pediatric ages, and how to interact with pediatric patients)
- Pediatric surgical equipment (including specialized surgical equipment and correct selection of instruments based on patient size)
- Thermoregulation (including warming techniques for pediatric patients at different ages and developmental stages and education regarding the risks and consequences of hypothermia for pediatric patients)

The surveys and semi-structured interviews in the consultations yielded significant foundational knowledge and skills that should be included in the pediatric orientation. In comparison, the resources identified in the environmental scan provided minimal assistance in determining content. The ORNAC and AORN nursing resources did not specifically provide recommendations for nursing orientation but provided recommendations and guidelines on practice. Despite this, ORNAC and AORN guidelines and recommendations were helpful when

developing the resource to provide best-practice recommendations on select included content (e.g., thermoregulation).

Delivery Modality

During the consultations, I asked current OR nurses about their preferred delivery modality, and 90.9% of respondents identified multi-modal. This was further emphasized by the clinical educators contacted during the environmental scan. The clinical educators highlighted providing multiple delivery methods to ensure the pediatric orientation appeals to the different learning styles of the new nurses in the OR. They also emphasized hands-on/simulation education with equipment and procedures before entering their buddied shifts with an experienced nurse. This emphasis on multi-modal delivery aligns with what I found in the literature review (Crowe et al., 2018; Mohammed et al., 2021). Many educators utilized a lecture or classroom component for foundational knowledge with simulation to foster skill development.

In the next section, I will summarize the developed pediatric orientation resource created with the information gained through the literature review, consultations, and environmental scan.

Summary of Resource

The literature review, consultations, and environmental scan provided information regarding essential content and ideal delivery modalities to enhance learning. In the following section, I will outline the content of the pediatric orientation and describe the proposed delivery modality. The resource can be found in Appendix D.

Resource Content

The literature review provided a strong foundation for the content I included in the resource, with many topics reiterated during the consultations and environmental scan. The content selected for the pediatric orientation complements the adult content that learners will have

already learned during the previous four-day adult OR orientation. The following is the pediatric content that will be included in the pediatric OR orientation:

- anatomic differences and vital signs (including differences in pediatric airways and vital signs when compared to adults, skin anatomy and ways to minimize damage)
- assisting anesthesia (including difficult airways, emergency management and equipment, and induction and extubation)
- family-centered care (including Child Life Specialists, parental presence for indication, and incorporating parents into the child's care)
- growth and development (including developmental stages, age-specific care, and how to interact with pediatric patients)
- pediatric surgical equipment (including specialized surgical equipment and correct selection of instruments based on patient size)
- strategies to assist with pre-operative anxiety
- thermoregulation (including warming techniques for pediatric patients at different ages and developmental stages and education regarding the risks and consequences of hypothermia for pediatric patients)

The lecture content is adaptable depending on the learners' prior pediatric experience and knowledge. For example, if the learners have prior pediatric experience, less time and emphasis may be spent on pediatric vital signs and developmental stages and more time on content specific to the OR, such as anesthesia and surgical considerations.

The content will be presented in different areas of the orientation to allow for repetition, the ability to have both oral and text content along with hands-on opportunities with the equipment

and procedures. The specifics of how the resource will be delivered are presented in the next section.

Resource Delivery

The pediatric orientation will be a one-day session added to the current four-day adult-based lecture-based orientation. It will be delivered multi-modality to ensure that content is presented in various formats that appeal to varying learning styles (Mangold et al., 2018). The modalities used will be:

- lecture that is collaborative and adaptable based on the experience level of the learners (e.g., prior pediatric or OR experience)
- simulation (and demonstration) to put the new knowledge into practice
- gamification (e.g., a crossword, skill testing questions, and rewards) that is incorporated into the lecture content

The plan is to have the morning be lecture-based, with some hands-on experience with the equipment and gamification, and the afternoon be simulation-based, with some demonstration of procedures. Breaks are not formally built into the pediatric orientation, as timing may change depending on the learners' prior pediatric experience. However, natural break times could be within the lecture section between topics and between the lecture and simulation components of the orientation.

The entire pediatric orientation has been developed to create a collaborative and adaptable learning environment based on the needs of the learners. To create this environment, the orientation will be delivered in a manner that encourages open dialogue and learner questions. This will allow for continuous assessment of the learners' understanding of the content and adaptability of content to meet the learners' needs and prior pediatric nursing experience.

The lecture will provide a foundation for the content identified in the literature review, consultations, and environmental scan. I developed a Microsoft PowerPoint presentation to display the information and incorporated text, tables, pictures, and videos to ensure the content was in multiple formats (see Appendix D). Gamification elements were also incorporated as knowledge checkpoints throughout the PowerPoint. The gamification features are a mix of multiple-choice, true-false, and short-answer questions. If learners get the checkpoint question(s) correct, they will receive a prize or reward (e.g., treats or items) (Huang et al., 2020; Vranesic et al., 2019). Additionally, at the end of the lecture content, a crossword will be distributed to further test the knowledge gained by the learner.

Demonstrations and simulations of equipment and procedures will follow the lecture. The demonstration and simulation will build upon the content covered in the lecture. For example, the lecture will cover the anatomy and reasoning of nasal intubations, whereas the demonstration and simulation will cover the specific equipment and hands-on procedures for nasal intubation. Every skill and procedure will be demonstrated before the learner can complete it. Then, the procedure will be simulated to put the skill into a real-life scenario. Specific equipment and procedures that will be reviewed are:

- pediatric anesthesia cart
    - This cart is brought into the OR for all pediatric cases. To ensure safe patient care, it contains the necessary anesthesia equipment (e.g., oral endotracheal tubes, pediatric blood pressure cuff).
- vital signs monitoring and required equipment
- pediatric surgical equipment
    - e.g., laparoscopic equipment, Addison forceps

- mask induction with oral intubation
- mask induction with nasal intubation
- pediatric simulation

To ensure consistency, an instructor guide was created (see Appendix E) to help guide facilitation. The guide outlines the equipment/supplies needed and offers instructions on how to facilitate. This guide can be used by myself or somebody else (e.g., another educator) to ensure consistency and accuracy in instruction.

Resource Development and Nursing Frameworks

I considered Benner's Novice to Expert Theory and Knowles' Adult Learning Theory when choosing multi-modal delivery (Benner, 1982; Collins, 2004; Davis & Maisano, 2016; Ozdemir, 2019; TEAL Centre, 2011).

When creating the pediatric orientation, I wanted a resource that could be adaptable based on the learner's prior knowledge and experiences and would recognize the differing learning styles among nurses (Mangold et al., 2018). This aligns well with Benner's theory regarding nurses' differing learning needs resulting from increased experience (e.g., progressing from novice to expert) (Benner, 1982; Davis & Maisano, 2016; Ozdemir, 2019). This further aligns with Knowles' Adult Learning Theory as by adapting the content, I can ensure that the content presented directly applies to the learners' practice in the OR (Collins, 2004; TEAL Centre, 2011). I further considered Knowles' theory when choosing the modalities of gamification and simulation, as these components will allow the learner to put the lecture content into practice through problem-solving and active participation (Collins, 2004; TEAL Centre, 2011).

Knowles' Adult Learning Theory strongly emphasizes self-directed learning; however, a lecture was selected over self-directed learning (Collins, 2004; TEAL Centre, 2011). The lecture

was chosen for the foundational pediatric knowledge related to the ability to assess the learner's understanding of the content in the moment and adapt the content based on learners' needs.

Discussion of Advanced Nursing Practice (ANP) Competencies

Throughout the completion of this practicum project, I demonstrated advanced nursing practice competencies, such as education, research utilization, leadership, consultation and collaboration (Canadian Nurses Association (CNA), 2019). I will describe meeting these competencies in more detail in the following section.

Education

The education competency is about identifying the learning needs of nurses and developing resources to support them (CAN, 2019). In developing the pediatric orientation, I completed a literature review, consultations, and environmental scan that highlighted the pediatric knowledge gaps amongst new nurses in the OR and ensured that the developed pediatric orientation was based on literature, best practices, and guidelines.

Consultation and Collaboration

In healthcare, there is constant interprofessional collaboration. With this project, I had to collaborate and consult with the interdisciplinary team in the OR, professional practice, and clinical educators both at my organization and across Canada to gather information about the current state, ways to improve pediatric education in the OR, and gather resources to help inform the development.

Leadership

This competency relates to identifying a problem and initiating change to help resolve the issue (CAN, 2019). In taking on this project, I identified a lack of pediatric knowledge among new nurses in the OR. I completed a literature review, consultations, and an environmental scan

to develop a pediatric orientation for these new nurses. I will also be the facilitator and instructor of the pediatric orientation upon its implementation.

Research Utilization

Multiple aspects of research utilization were demonstrated in this practicum project. The project started with a literature review to gain a foundation for the project that involved the identification and appraisal of research and non-research-based literature. Next, I completed consultations and an environment scan, which involved analyzing and synthesizing the information using a methodology by Elo & Kyngäs (2008). The information from the literature review, consultations, and environmental scan were synthesized to develop a pediatric orientation for new nurses to the OR.

Next Steps

My practicum project involved the creation of the orientation resource but did not include the implementation and ongoing evaluation. In this section, I will discuss my planned implementation, assessment of the resource, and how I plan to ensure ongoing updating of the resource.

Implementation

Frequency

My unit offers orientation for new staff approximately four times a year, depending on staffing needs in February, May, September or November. We also provide orientation in January for Western University nursing students completing their final nursing placement in the OR. The pediatric orientation will be added to all orientations for the OR moving forward, with the first offering occurring in January 2025 for Western University nursing students.

Delivery Environment and Method

The delivery environment and method must be adaptable depending on space and resource availability. The course combines lecture, gamification, simulation, and demonstration. The lecture component can occur in any office or classroom space if there is seating for all learners and a projector and laptop are available. The hands-on demonstration and simulation delivery is a bit more challenging. The preferred environment is the pediatric simulation facility at the hospital, but due to increased use by other units and limited resources, this space will not always be available. This facility has pediatric mannequins that allow oral and nasal intubation, a simulation anesthesia machine. When the simulation facility is unavailable, the demonstration and simulation will occur in an available OR or OR classroom with equipment being brought into the classroom (e.g., anesthesia machine, OR bed, etc.). In the OR and OR classroom, we will also use an adult mannequin for oral and nasal intubation until funding can be acquired to purchase an equivalent pediatric mannequin. Any declining patient scenarios must be done utilizing the existing mannequins and an online simulation vitals system (e.g., ResusMonitor, https://resusmonitor.com/).

Evaluation

There will be two forms of evaluation for the pediatric orientation resource: assessing learner knowledge and learner's feedback on the resource (i.e., feedback on aspects they like and aspects to improve). All evaluations will be created on Microsoft Forms and distributed to learners before (i.e., pre-knowledge evaluation) or post (i.e., post-knowledge evaluation and feedback) orientation via email and QR code that can be completed on a computer or the learner's smartphone. These evaluation tools are still in development.

Knowledge Assessment

Learners' knowledge acquisition will be assessed pre- and post-orientation through a knowledge assessment. The assessments will utilize multiple-choice and true-false questions. The knowledge assessment will provide valuable insights into knowledge acquired related to the pediatric orientation, but it cannot say for sure that the knowledge development is solely related to the orientation. Many factors affect learning in the workplace, such as motivation to learn, prior knowledge and skill, and learning styles (Sambrook, 2005).

The per-orientation knowledge assessment will be utilized to understand learners' prior nursing and pediatric experience (e.g., in the OR and elsewhere) and pediatric knowledge. This assessment will be given to learners before the pediatric orientation. It will be sent to all learners via email 1 week before the pediatric orientation day. Pediatric knowledge to be assessed includes typical vital signs in pediatric patients, pediatric anatomical differences, developmental care, and surgery and anesthesia considerations (e.g., instrument selection, mask induction, and airway anatomy) for pediatric patients. The information from this assessment will be used to tailor the orientation to the learners. For example, if all the learners have prior pediatric experience (e.g., from inpatient units), little time will need to be spent on pediatric vital signs or developmental stages and care.

Opposed to assessing prior knowledge, the post-orientation knowledge assessment will test pediatric knowledge after the pediatric orientation. All learners will be given the same evaluation. The pediatric knowledge assessed will be vital signs, anatomical differences, developmental care, pediatric intubations, and surgery and anesthesia considerations for pediatric patients.

The pre-and post-orientation knowledge assessment results will be compared after the pediatric orientation to assess knowledge growth in learners. The results will be used to adapt the pediatric orientation to ensure information is being presented in a manner conducive to learning and delivered in a modality that encourages and supports learning. For example, if learners are consistently answering a question regarding developmental stages incorrectly the manner that that content is delivered will be changed or expanded (e.g., including a video).

Resource Feedback

The learner's feedback on the resource will be completed after the pediatric orientation. The evaluation will utilize a 5-point Likert scale and short answer questions. It will ask learners about their overall feelings about the orientation, knowledge development, and their opinions and ideas for improvement on the pediatric orientation's lecture, games, demonstration and simulation components.

The results of the learners' feedback will be used to improve the resource and ensure it evolves to meet the needs of the learners. The feedback will be reviewed after every pediatric orientation to ensure regular improvements in the orientation.

Continued Development

As noted in the above section, continued development will come from the knowledge assessment and resource feedback. In addition to these two methods, I plan on further investigating some topics I identified as I developed the resource.

When researching specific topics for the resource, I noted that some historical practices did not have an explanation. The two practices identified involved restrictions to the parental presence for induction (PPI) program by Child Life. The first restriction pertains to the child's age. Only children one to eight years old are considered for the PPI program. After contacting

someone from Child Life, they could not provide me with the details regarding this age restriction. I have since reached out to another person at the hospital, hoping to get more clarity, but I have not heard back from them. The second restriction is that parents who participate cannot be pregnant. Again, I contacted Child Life, and they could not provide me with the reason for this restriction. They noted that it was likely related to an incident, and the restriction has been present ever since. I have contacted someone else regarding this and am awaiting a response. It is important to explore these restrictions as these historical practices are not evidenced-based as children older than 8 years old have been shown to benefit (e.g., decreased anxiety) from PPI programs. Therefore, this restriction can be limiting to families (Sadeghi et al., 2017).

Conclusion

Continued education is essential in nursing, especially when starting on a new unit. Guiding by Benner's and Knowles' theoretical frameworks and information gathered from a literature review, consultations, and environmental scan, I created a pediatric orientation for new nurses in the OR. The pediatric orientation will be a one-day addition to the current adult-focused orientation. It will consist of a lecture, gamification, simulation, and demonstration to present the foundational knowledge of pediatric nursing and allow the learners to have hands-on experience with the skills. The covered content will include anatomical differences (e.g., airway and skin), anesthesia considerations (e.g., mask and nasal intubations), family-centered care, and developmental stages. With the addition of the pediatric orientation to the unit's new hire education, I am hopeful that new nurses will have a better understanding of pediatric care and be able to provide enhanced, competent, evidence-based care to our pediatric patients. Ultimately, I

hope implementing this pediatric OR orientation will foster improved patient, family, and nurse outcomes.

References

Abebe, L., Bender, A., & Pittini, R. (2018). Building the case for nurses' continuous professional development in Ethiopia: A qualitative study of the Sick Kids-Ethiopia paediatrics perioperative nursing training program. *Ethiopian Journal of Health Sciences*, *28*(5), 607–614. https://doi.org/10.4314/ejhs.v28i5.12

Alatawi, M., Aljuhani, E., Alsufiany, F., Aleid, K., Rawah, R., Aljanabi, S., & Banakhar, M. (2020). Barriers of implementing evidence-based practice in nursing profession: A literature review. *American Journal of Nursing Science*, *9*(1), 35-42. https://doi.org/10.11648/j.ajns.20200901.16

Association of periOperative Registered Nurses. (2023). Guidelines for perioperative practice. 2023 Edition. AORN, Inc.

Baroya, J., Ramos, S., O' Neill, K., MacDonald, R., & Krenzischek, D. (2023). Effectiveness of pediatric competency-based orientation (PCBO) on knowledge, confidence, and manifestation of early recognition of nursing expertise among PACU nurses. *Journal of PeriAnesthesia Nursing: Official Journal of the American Society of PeriAnesthesia Nurses*, *38*(5), 782–786. https://doi.org/10.1016/j.jopan.2023.01.015

Bräuer, A., Nemeth, M., Fazliu, A., Eberhardt, I.M., Stein, D., & Miller, C. (2024). Perioperative thermalmanagement in children. *Anästh Intensivmed,* 65, 28–37. DOI: 10.19224/ai2024.028

Benner, P. (1982). From novice to expert. *The American Journal of Nursing*, *82*(3), 402-. https://doi.org/10.2307/3462928

Canadian Nurses Association (2019). *Advanced practice nursing: A Pan-Canadian framework.* Ottawa, ON: Author. Available at: https://hl-prod-ca-oc-download.s3-ca-central-1.amazonaws.com/CNA/2f975e7e-4a40-45ca-863c-5ebf0a138d5e/UploadedImages/documents/nursing/Advanced_Practice_Nursing_framework_e.pdf

Collins, J. (2004). Education techniques for lifelong learning: Principles of adult learning. *RadioGraphics,* 24 (4),1483–1489. Available at: https://doi.org/10.1148/rg.245045020

Committee on Pediatric Anesthesia. (2021). Statement on practice recommendations for pediatric anesthesia. *American Society of Anesthesiologists'*. https://www.asahq.org/standards-and-practice-parameters/statement-on-practice-recommendations-for-pediatric-anesthesia

Crowe, S., Ewart, L., & Derman, S. (2018). The impact of simulation based education on nursing confidence, knowledge and patient outcomes on general medicine units. *Nurse Education in Practice*, *29*, 70–75. https://doi.org/10.1016/j.nepr.2017.11.017

Dave, N. M. (2019). Premedication and induction of anesthesia in paediatric patients. *Indian Journal of Anaesthesia*, *63*(9), 713–720. https://doi.org/10.4103/ija.IJA_491_19

Davis, A., & Maisano, P. (2016). Patricia Benner: Novice to expert - A concept whose time has come. *The Oklahoma Nurse*, *61*(3), 13-15. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_gale_infotracmisc_A463514607

Derieg, S. (2016). An overview of perioperative care for pediatric patients. *AORN Journal*, *104*(1), 4–10. https://doi.org/10.1016/j.aorn.2016.05.001

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115. https://doi.org/10.1111/j.1365-2648.2007.04569.x

Hosseinzadeh, T., Tabrizi, K. N., Fallahi-Khoshknab, M., Khankeh, H., & Shokooh, F. (2022). Barriers to the development of cinical reasoning skills among coronary care nurses: A qualitative study. *Iranian Journal of Nursing and Midwifery Research*, *27*(6), 567–574. https://doi.org/10.4103/ijnmr.ijnmr_164_21

Huang, R., Ritzhaupt, A. D., Sommer, M., Zhu, J., Stephen, A., Valle, N., Hampton, J., & Li, J. (2020). The impact of gamification in educational settings on student learning outcomes: A meta-analysis. *Educational Technology Research and Development*, *68*(4), 1875–1901. https://doi.org/10.1007/s11423-020-09807-z

JBI Global. (2020). *Checklist for qualitative research*. https://jbi.global/sites/default/files/2020-08/Checklist_for_Qualitative_Research.pdf

Joshi, G. P., Abdelmalak, B. B., Weigel, W. A., Harbell, M. W., Kuo, C. I., Soriano, S. G., Stricker, P. A., Tipton, T., Grant, M. D., Marbella, A. M., Agarkar, M., Blanck, J. F., & Domino, K. B. (2023). 2023 American Society of Anesthesiologists practice guidelines for pre-operative fasting: Carbohydrate-containing clear liquids with or without protein, chewing Gum, and pediatric fasting duration-A modular update of the 2017 American Society of Anesthesiologists practice guidelines for pre-operative fasting. *Anesthesiology (Philadelphia)*, *138*(2), 132–151. https://doi.org/10.1097/ALN.0000000000004381

Knowles, M. S. (1978). Andragogy: Adult Learning Theory in perspective. *Community College Review*, *5*(3), 9–20. https://doi.org/10.1177/009155217800500302

Luehmann, N. C., Staubach, M. E., Akay, B., Collier, P. J., Han, R. E., Riggs, T. W., & Novotny, N. M. (2019). Benefits of a family-centered approach to pediatric induction of anesthesia. *Journal of Pediatric Surgery*, *54*(1), 189–193. https://doi.org/10.1016/j.jpedsurg.2018.10.015

Ma, D., Shi, Y., Zhang, G., & Zhang, J. (2021). Does theme game-based teaching promote better learning about disaster nursing than scenario simulation: A randomized controlled trial. *Nurse Education Today*, *103*, 104923–104923. https://doi.org/10.1016/j.nedt.2021.104923

Mangold, K., Kunze, K. L., Quinonez, M. M., Taylor, L. M., & Tenison, A. J. (2018). Learning style preferences of practicing nurses. *Journal for Nurses in Professional Development*, *34*(4), 212–218. https://doi.org/10.1097/NND.0000000000000462

Mohammed, F. I., Al Sharkawi, S. S., Sabaq, A. G., & Abd-Elaziz, S. M. (2021). Improve nurses' competency level regarding care of children undergoing intestinal obstruction surgery: An educational program. *International Journal of Novel Research in Healthcare and Nursing*, *8*(1), 662-678.

Mower, J. (2015). Incorporating age-specific plans of care to achieve optimal perioperative outcomes. *AORN Journal*, 102(4), 369–388. https://doi.org/10.1016/j.aorn.2015.07.014

Nemeth, M., Miller, C., & Bräuer, A. (2021). Perioperative hypothermia in children. *International Journal of Environmental Research and Public Health*, *18*(14), 7541. https://doi.org/10.3390/ijerph18147541

Ozdemir, N. G. (2019). The development of nurses' individualized care perceptions and practices: Benner's novice to expert model perspective. *International Journal of Caring Sciences*, *12*(2), 1–7. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_journals_2303666905

Panella, J. J. (2016). Preoperative care of children: Strategies from a child life perspective. *AORN Journal*, *104*(1), 11–22. https://doi.org/10.1016/j.aorn.2016.05.004

Public Health Agency of Canada. (2014). *Infection and prevention control guidelines: Critical appraisal toolkit.* https://publications.gc.ca/collections/collection_2014/aspc-phac/HP40-119-2014-eng.pdf

Razaghpoor, A., Taheri-Ezbarami, Z., Jafaraghaee, F., Maroufizadeh, S., & Falakdami, A. (2024). The effect of serious game and problem-based learning on nursing students' knowledge and clinical decision-making skill regarding the application of transfusion medicine in pediatric nursing. *Journal of Pediatric Nursing, 76*, e1–e8. https://doi.org/10.1016/j.pedn.2024.01.010

Sadeghi, A., Khaleghnejad Tabari, A., Mahdavi, A., Salarian, S., & Razavi, S. S. (2017). Impact of parental presence during induction of anesthesia on anxiety level among pediatric patients and their parents: a randomized clinical trial. *Neuropsychiatric disease and treatment, 12*, 3237–3241. https://doi.org/10.2147/NDT.S119208

Sambrook, S. (2005). Factors influencing the context and process of work-related learning: Synthesizing Findings from two research projects. *Human Resource Development International*, *8*(1), 101–119. https://doi.org/10.1080/1367886052000342591

Solheim, E., & Flo, J. (2023). Nurses' experiences of simulation-based learning, 12–18 months after the simulation: A qualitative study. *Nordic Journal of Nursing Research*, *43*(1). https://doi.org/10.1177/20571585211032774

Stevens, B., Donkor, E. S., Goka, B. Q., Odame, I., Langins, M., Riahi, S., De Young, S., Walters, D., Eliason, C., Fleming-Carroll, B., Barnes, G., Ekey, F. V., Hubley, P., Nyanteh, F., Mensah, E., & Sackey, I. (2014). Impact and sustainability of an accredited paediatric nursing training programme in Ghana. *Journal of Nursing Education and Practice*, *4*(12), 142–142. https://doi.org/10.5430/jnep.v4n12p142

Teaching Excellence in Adult Learning Centre. (2011). Adult learning theories. *U.S. Department of Education*. Available at: https://lincs.ed.gov/sites/default/files/11_%20TEAL_Adult_Learning_Theory.pdf

Tawfik, M. M. R., Fayed, A. A., Dawood, A. F., Al Mussaed, E., & Ibrahim, G. H. (2020). Simulation-based learning versus didactic lecture in teaching bronchial asthma for undergraduate medical students: A step toward improvement of clinical competencies. *Medical Science Educator*, *30*(3), 1061–1068. https://doi.org/10.1007/s40670-020-01014-y

Vranesic, P., Aleksic-Maslac, K., & Sinkovic, B. (2019). Influence of Gamification Reward System on Student Motivation. *2019 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)*, 766–772. https://doi.org/10.23919/MIPRO.2019.8756848

West, N., Christopher, N., Stratton, K., Görges, M., & Brown, Z. (2020). Reducing pre-operative anxiety with child life preparation prior to intravenous induction of anesthesia: A randomized controlled trial. *Paediatric Anaesthesia*, *30*(2), 168–180. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_miscellaneous_2330331606

Appendix A: Literature Review

Development of a Pediatric Education Resource for New Nurses in the Operating Room

The operating room (OR) is a unique area unlike any other clinical area found in nursing. Due to the specialized care needs of surgical patients, the OR nurse must utilize basic and advanced knowledge of anatomy, physiology, psychology, and pharmacology, as well as technical skills related to specific surgeries and instrumentation. Most basic skills that OR nurses require are learned through a post-graduate OR certification program, and the nurse will then specialize based on the hospital in which they are employed upon completion. Part of this specialization training is completed in unit orientations (e.g., in class and clinical practice) to ensure new hires to the OR have the necessary knowledge, skills, and judgement to provide safe, competent patient care (College of Nurses of Ontario [CNO], 2023).

As an OR clinical educator for a pediatric and adult trauma hospital in Southwestern Ontario, I am responsible for providing new staff to the OR with the necessary education and essential skills to practice safely and competently. There is a gap in my current practice: the orientation for new OR hires at my hospital does not include a pediatric component despite being the children's hospital in the area. Having specialized pediatric training is essential, as children are not small adults and have their own perioperative requirements (e.g., thermoregulation and mask inductions) (Derig, 2016; Mower, 2015). One way to ensure that new nursing hires to the OR acquire the necessary pediatric knowledge and skills is to develop a specific OR pediatric educational resource.

Through this literature review, I hope to better understand the most effective content and delivery method(s) for a pediatric OR educational resource for new nurses hired to the OR. Objectives of this literature review are to explore why educational resources are essential to new nurses hired to the OR (e.g., increased competency and better patient outcomes), determine the

pediatric educational needs of new nurses hired to the OR, and determine the most effective delivery and implementation method(s) of education resources. Additionally, I will explore two theoretical frameworks, Knowles' Adult Learning Theory and Benner's Novice to Expert Theory, to guide the development and implement the education resource. These frameworks are necessary to enhance nursing knowledge uptake and skill development.

Methods of Literature Review

To conduct this literature review, I searched four main resources: Memorial University Libraries' One Source search tool, PubMed (Medline), CINAHL (Cumulative Index of Nursing and Allied Health Literature), and Google Scholar. Similar keywords and MeSH terms were used in each database, such as pediatric/paediatric, operating room, intraoperative, perioperative, nursing, orientation, education, resources, delivery, and pediatric considerations. Some searches required narrowing or expanding the search terms. To narrow the search further, the following keywords were used: pain, anxiety, simulation, lecture, developmental stages, and age. To expand the search, the following keywords were used: intensive care unit, critical care, post-anesthetic care unit (PACU), specialty, medicine, and student. Initial search criteria were limited to the last ten years but were extended to 15 years when appropriate articles proved challenging to find. I also found articles using systemic reviews and referenced articles from relevant publications using the above keywords and MeSH terms.

I selected and critically appraised articles using the Public Health Agency of Canada (PHAC) Critical Appraisal Kit and the Joanne Briggs Institute (JBI) Checklist for Qualitative Research (JBI, 2020; PHAC, 2014). Literature summary tables are provided in the Appendices: quantitative literature summary tables are in Appendix A, and qualitative literature summary tables are in Appendix B. Non-research literature was also used in this review if relevant to the

objectives. These articles were appraised based on the year of publication, publication journal, references, and critical information. Non-research literature appraisals can be found in Appendix C. Throughout the following sections, in-text citations for publications included in Appendix A, B, and C will be bolded the first time they appear.

Significance of the Problem

Current OR Orientation and Education

The current unit orientation and education for new nursing hires to the OR is adult-specific, despite the expectation that nurses will care for patients across the lifespan (i.e., pediatric and adult patients). The current education introduces OR policies and procedures, including surgical counts, special perioperative considerations, patient positioning, electrical surgical safety, and codes in the OR. There is little mention of pediatric patients and the covered content only identifies differences but does not go into detail. As far as I understand, there has never been a pediatric OR orientation; this is unacceptable! How can we expect OR nurses to provide high-quality patient care to pediatric patients without the knowledge and skills to do so?

The needs of the pediatric population can vary tremendously from adults within the OR (e.g., development stages, induction requirements and procedures, vital signs, and common surgical procedures) (**Derig, 2016;** McDermott & Liang, 2021; **Mower, 2015**). As nurses in the OR, we are fortunate always to have physicians readily available to assist with patient care. However, this is also a shortcoming as it causes us to become reliant on them for assessment and knowledge for the pediatric population. Without perioperative pediatric knowledge and skills, nurses may have low competency unless they seek information themselves.

There are two types of learners hired to the OR: those with no OR experience or certification (e.g., new nursing graduates and experienced nurses from other clinical settings

[e.g., medicine, surgical]) and those who come with OR experience and/or certification. There is no hiring requirement for new nurses to the OR to have pediatric experience, nor do interview questions have a pediatric focus. Due to this, many nurses come to the OR with no pediatric knowledge and are required to care for children with minimal education. One of the ways to improve this is to provide new nursing hires with an educational resource about the intraoperative needs of pediatric patients. In the following sections, I will discuss the impact that enhanced education can have on nursing competence and knowledge, and subsequently, patient outcomes.

Impact of Enhanced Education on Nursing Practice

Increased Nursing Competency and Knowledge

To provide safe and ethical patient care, nurses need to demonstrate competency through the integration of their knowledge, skills, abilities, and judgement (CNO, 2019). Educational instruction and resources for nurses on practice-based topics has been shown to assist with increasing competency ($p<0.000$) by providing knowledge and skills relevant to practice (**Abebe et al., 2018**; **Baroya et al., 2023**; **Mohammed et al., 2021**; **Stevens et al.; 2014**).

In two qualitative studies of medium credibility, researchers demonstrated how pediatric nursing education programs in Ghana and Ethiopia could increase knowledge and competence among nurses (Abebe et al., 2018; Stevens et al., 2014). Study participants (e.g., nurses and physicians) reported that the educational programs helped with new knowledge and skill development through improvements in patient assessments, emergency management, and knowledge of their patients' condition. These education programs also motivated nurses to correct poor practices and arrange education for their peers, thus further increasing knowledge and competence in nursing units (Abebe et al., 2018; Stevens et al., 2014).

These results are further demonstrated in two uncontrolled before and after quantitative studies of medium quality (Baroya et al., 2023; Mohammed et al., 2021). In both studies, nursing knowledge significantly increased ($p<0.05$) after the planned educational interventions. However, Baroya et al. (2023) also noted non-significant increases in knowledge (p0.05) for portions of their intervention with limited provided insights as to the causes (e.g., prior nursing knowledge on content). This noted increase in knowledge was mirrored by a significant increase in demonstrated competence (total competency increase from a mean score of 1295 ± 157 to 2850 ± 174; *t*-test=47.13; $p<0.000$), and confidence amongst learners (total confidence increase by 12% compared to pre-intervention; $p<0.001$) (Baroya et al., 2023; Mohammed et al., 2021). When nursing competency related to education increases, patient care outcomes (e.g., quality) also improve (Mohammed et al., 2021).

Patient Outcomes

Education positively impacts nursing competency and influences patient outcomes (**Crowe et al., 2019**; Mohammed et al., 2021). In one quantitative study, researchers found that simulation-based education affected medical unit nurses' assessment of deteriorating adult patients (Crowe et al., 2019). Researchers noted that after education there was a 59% decrease in pulseless cardiac arrests ($p<0.05$), a 52% increase in recognition of deteriorating patients ($p<0.05$), and a 16% increase in the success rate of spontaneous cardiac circulation return on the medical unit where nurses were trained (Crowe et al., 2018). These results indicate increased nursing understanding of deteriorating patients and the importance of early recognition ($t=4.48$; $p<0.001$). This understanding and early recognition, fostered by simulation education, is crucial to improving patient outcomes in medical emergencies.

Similarly, Mohammed et al. (2021) assessed post-education quality of nursing care (i.e., low, medium, or high quality) for pediatric patients with an intestinal obstruction. These researchers noted an increase in quality of care after providing detailed education to nurses (pre-education, 56% of nurses provide low quality of care, and post-education, 94% of nurses provided high quality of care; $x^2=64.96$; $p<0.000$). Further, this increase in quality of care was positively correlated with nurses' competence levels ($R=0.929$; $p=<0.000$ [2-tailed]), indicating that education increases nursing competency and thus patient care.

In summary, enhanced education increases nurse competency and subsequently patient outcomes. In the next section, I will discuss the content necessary for an OR educational resource specific for the pediatric population.

Content of Pediatric Education Resource

When searching the literature, I found limited resources on pediatric education for OR nurses. There was also minimal, concise literature on special considerations for pediatric patients while in the OR. I found only one article of pediatric perioperative education, but researchers did not go into detail about the education content. It was unclear if the education provided covered pediatric specific content for the OR, or basic principles on how to be an OR nurse (Abebe et al., 2018). Otherwise, the only nursing-specific literature mentioning pediatric-specific care required for the perioperative period was non-research based and was published by The Association of periOperative Registered Nurses (AORN) (Derig, 2016; Mower, 2015). Using these articles, the following considerations are noted as essential content topics for the proposed pediatric education resource for new OR nurses.

Anxiety

Pediatric perioperative anxiety is a common occurrence related to parental separation, the new environment, misconceptions, and the unknown (Derig, 2016; Mower, 2015**; Panella, 2016**). Pediatric preoperative anxiety has been linked to poor postoperative patient outcomes such as increased pain (r-0.26; p=0.004), postoperative maladaptive behaviours (e.g., sleep disorders, separation anxiety, temper tantrums) (r=0.25; p=0.006), and poor compliance with future medical procedures (**Dave, 2021; Fortier et al., 2010**; Panella, 2016). To help reduce pediatric perioperative anxiety, perioperative nurses can enlist the help of Child Life Specialists (CLS), if available, or adopt similar practices. CLS partner with children and their families during health care interactions (e.g., surgery, IV insertions, medical imaging) to help cope with the stress and uncertainty caused by hospitalization (LHSC, n.d.; SickKids, n.d.). To reduce anxiety, CLS utilize developmentally appropriate techniques (e.g., distraction techniques, play therapy, education, coping techniques) and teachings about medical procedures to familiarize patients with their current or upcoming medical care (Dave, 2021; LHSC, n.d.; SickKids, n.d.; **West et al., 2020**).

Developmental Stages and Age-Specific Care

In children and adolescents, how we interact with patients depends on their age and developmental stage (Mower, 2015). How a perioperative nurse cares for and interacts with an infant is drastically different than a 10-year-old and even more different than a 17-year-old. The perioperative nurse needs to assess the patient's unique needs, understanding of events, level of communication, and desired outcomes to ensure safe, efficient, and effective nursing care (Mower, 2015). This is particularly important as providing developmentally appropriate care can decrease anxiety and improve patient outcomes (Derig, 2016).

The techniques utilized by CLS have been shown to help with decreasing pediatric perioperative anxiety (West et al., 2020). These techniques are dependent on the developmental stage of the child or adolescent and can range from distractions with toys to explanation and demonstration of medical procedures through role-play with the pediatric patient, or demonstration on a toy (e.g., doll, stuffed animal), When addressing and interacting with pediatric patients, OR nurses can incorporate these techniques into their practice.

Similarly, OR nurses need to be mindful of how they address pediatric patients (e.g., tone of voice and body language), and ensure they include the patient in the assessment and decision-making in the OR (Derig, 2016; Mower, 2015). This is particularly important for adolescents and teenagers who can contribute to their own healthcare decisions. We can establish a therapeutic relationship built on trust and comfort by addressing the patient directly and not relying on the parent for assessment information.

Family-Centred Care

Family Centered Care has become increasingly more popular for pediatric patients due to the impact parents, family, or a primary caregiver can have as a source of strength and support for the child and its positive impact on expectation management, satisfaction, and compliance (**Leuhmann et al., 2019**). Family Centered Care, or family involvement in preoperative and intraoperative stages, can also help reduce pediatric and parental/familial perioperative anxiety by creating realistic expectations (Dave, 2021; Panella, 2016). Therefore, it is essential that OR nurses incorporate the family when possible. A common way to incorporate Family Centered Care is parental presence for induction (PPI) (Dave, 2021; Panella, 2016).

PPI is when a parent or caregiver accompanies the pediatric patient into the OR for the initial stages of induction. This process has been shown to decrease pediatric anxiety and

decrease the use of preoperative anti-anxiety medications (e.g., midazolam) (71% decrease in midazolam use with PPI; aOR 0.29, CI 0.16 to 0.52; p<0.0001) (**Luehmann et al., 2019**).

Anatomical Differences and Vital Signs

Due to their size, growth, and development, pediatric patients have differing anatomy and vital signs when compared to adult patients (Derig, 2016; Mower, 2015). Due to these anatomical differences, OR nurses need to have the knowledge and skill to monitor a patient's vitals, and respond appropriately to emergencies such as airway obstruction, hypoxia, and intravenous (IV) access difficulty (Derig, 2016; Mower, 2015).

Some examples of these differences include an increased risk of obstruction and respiratory tract infections related to their narrow airway; increased utilization of oxygen compared to adults, resulting in quicker and poorly tolerated episodes of hypoxia and respiratory stress; and difficult IV access related to small, fragile, hard to locate veins (Derig, 2016; Mower, 2015). A basic understanding of these anatomical differences will assist OR nurses in anticipating patient needs more effectively and responding faster and more appropriately to emergent issues.

Procedural Differences for Induction and Complications

There are two ways to administer anesthesia to pediatric patients, IV induction or inhalation induction (also called mask induction) (Dave, 2019). IV induction is utilized when the child already has an IV. Medications, such as propofol, are administered intravenously with this technique. IV induction can be a preferred method for induction as it is faster causing the child to pass through the phases of anesthesia at a faster rate than mask induction. IV induction is also safer for children if there is a high risk of aspiration (e.g., recently ate or drank), or a history of respiratory issues as airway irritation is minimal (Dave, 2019). However, many children are

needle-phobic and have small veins, making IV insertion difficult. Therefore, IV insertion pre-operatively on an awake pediatric patient can be increasingly traumatic and difficult (Dave, 2019). In those children without an IV, pre-operative inhalation induction is preferred. Inhalation induction is where a mask covering the mouth and nose is placed on or near the child's face, and an anesthetic gas (e.g., sevoflurane) is administered and inhaled by the child. Once the patient is sedated via mask induction, the anesthesiologist can safely put in the IV, and administer IV medications (e.g., propofol) for safe intubation of the patient, and anesthesia maintenance (Dave, 2019). In addition to those with needle-phobia, inhalation induction may be a preferred method for children with a difficult airway (i.e., anatomy abnormalities within the airway making intubation difficult) as it allows the anesthesiologist to maintain spontaneous ventilation, and it is easily reversable if they are unable to properly intubate the patient (Dave, 2019).

When intubating a pediatric patient, there is an increased risk of difficult intubation and laryngospasms due to the difference in airway anatomy compared to adults; those under five years of age are at an increased risk (Derig, 2016). Both events are respiratory emergencies and require immediate action by the OR nurse. The OR nurse needs to understand the necessary actions (e.g., the delivery of positive pressure 100% oxygen, or moving the patient to the left lateral position) and needed equipment (e.g., glideslope) to assist the anesthesiologist in maintaining the patient's airway (Derig, 2016).

Thermoregulation

The ability to maintain or regulate body temperature is called thermoregulation (Merriam-Webster, n.d.). Infants and children (i.e., younger pediatric patients) have difficulty thermoregulating (i.e., maintaining adequate core temperature) related to increased body-to-surface ratio, less subcutaneous fat, a larger head in relation to the rest of the body, and the

inability to shiver when hypothermic (Bräuer et al., 2024; Derig, 2016; Mower, 2015**; Nemeth et al., 2021).** Adequate thermoregulation is important in the OR environment as the environment poses a risk for hypothermia due to low room temperature and the physiological effects of general anesthetic (Bräuer et al., 2024; Nemeth et al., 2021). Further, the child is at greater risk the longer the procedure, the more invasive the procedure, and if there is high blood loss (Bräuer et al., 2024). For neonates' hypothermia can lead to hypoxemia, metabolic acidosis, and hypoglycemia, and is associated with increased morbidity (e.g., infection, ventilator dependence, apnea, poor neurological outcome), and prolonged hospitalization (Bräuer et al., 2024). The effects hypothermia can have on infants and children are poorly researched, yet studies are showing it can lead to wound infections, higher blood loss, prolonged stays in the recovery room, prolonged post-operative ventilation requirement, admission to critical care, and longer hospitalizations (Bräuer et al., 2024).

Due to the mentioned risk factors and outcomes of perioperative hypothermia in pediatric patients, there are necessary preventative measures that can be done by the OR nurses. Two effective methods include increasing the overall OR temperature prior to patient entering the OR, and active warming of the patient prior to induction and throughout the procedure (Bräuer et al., 2024; Derig, 2016; Nemeth et al. 2021). High OR temperatures can help reduce the drop in core temperature of the pediatric patients. For neonates, a room temperature of 32 °C is considered appropriate, and a room temperature of 24 °C for infants and older (Bräuer et al., 2024). During induction and throughout the procedure the patient can be actively warmed with a Bair hugger, a convective air warmer (Bräuer et al., 2024). These warmers blow warm air through a specially designed blanket that can be on top of the patient (e.g., common in older pediatric patients), or under the patient (e.g., common in younger pediatric patients), The warming blankets come in

limited sizes, and are not customizable, therefore when selecting an appropriate blanket nursing and physicians consider the ability to visualize and access the patient (e.g., IVs, surgical site) during the procedure. Younger children have limited surface area, and it is easier to visualize and access them with an underbody warmer. Another type of active warmer is warming of irrigation fluids (Bräuer et al., 2024). Anesthesia can utilize an infusion warmer to warm fluids given through the patient's IV, and surgery can use irrigation fluids (e.g., normal saline) that have been warmed preoperatively in a heating device (e.g., heated cabinet, or incubator) (Bräuer et al., 2024).

In summary, necessary content for pediatric orientation includes consideration for anxiety, developmental and age-specific care, family centered care, anatomical differences in pediatric patients, procedural differences for induction and complications, and thermoregulation. In the following section, I will turn to a discussion of the possible delivery modalities (e.g., lecture, simulation) for the educational resource.

Delivery Modalities of Pediatric Educational Resource and Nursing Learning Styles

There are numerous possible delivery modalities for the pediatric educational resource, such as lecture, simulation, independent learning, gamification, problem-based learning, or multi-modal. Each modality has advantages and disadvantages. In this section, I will highlight some modalities that may benefit pediatric OR educational resources.

Lecture

In many healthcare educational institutes and clinical settings, lecture is a commonly utilized modality. It is a great delivery method for facilitating large group education and is easily deliverable with minimal resources (e.g., computer, screen, projector). Compared with other modalities, such as simulation, post-education knowledge is comparable (**Tawfik et al., 2020**).

Knowledge gained immediately and retained three months post-education via lecture is less than simulation, but not significantly less ($p>0.05$), and thus lecture should not be discounted as an effective tool (Tawfik et al., 2020). The difference between participants in this study was their overall satisfaction and motivation to learn. Those who took part in the lecture education reported less overall satisfaction (59.4% vs 23.3, $p = 0.002$) and motivation (71.9% vs 10%, $p < 0.0001$) when compared to those from the simulation group (Tawfik et al., 2020).

The quality of a lecture is heavily dependent on the lecturer and educational content (Tawik et al., 2020). A great lecturer is someone who sets learning objectives, presents information in an organized manner, and can maintain the interest of the learner (Tawfik et al., 2020). When presented in an engaging manner, with relevant and updated information, there is merit to lecture as a delivery modality.

Independent Learning

Independent learning is when the information package (e.g., textbook, course manual) is given to the learner, and they are responsible to complete it without or with minimal assistance; the accountability is on the learner. In two quantitative studies there was significant knowledge gains after independent learning, one utilizing textbook chapters grouped into three sections (Chapter section 2: $p<0.022$) and the other a developed e-manual ($p<0.001$) (Baroya et al., 2023**; Oliver, 2017**). However, Baroya et al. (2023) also noted insignificant knowledge gains for some of the chapter sections (Chapter section 1: $p=0.423$; Chapter section 3: $p=0.158$). Researchers gave no insight into the insignificant knowledge gains. Other notable results of independent learning were an increase in confidence ($p<0.001$) related to assessment, communication, and self-management ($p<0.01$) (Baroya et al., 2023; Oliver, 2017).

Possible limitations to independent learning that may affect the learner's knowledge gain could be participants not completing the learning package or not having the opportunity to ask questions in the moment to further understanding (Oliver, 2017).

Simulation

Simulation learning is a great learning tool as it allows students to apply knowledge utilizing real scenarios in a safe environment; it bridges the gap between education and clinical practice. In a qualitative study, nurses from a medicine unit took part in two 10-to-15-minute emergency simulation scenarios on anaphylactic shock and hypoglycemia (**Solheim & Flo, 2023**). Post-training participants reported enthusiasm about the experience, stating it was an exciting, positive rewarding way to learn, and helped them prepare for the unexpected. They also valued the small group, and teamwork environment that created a culture of trust (Solheim & Flo, 2023). This was also reflected in a quantitative study comparing simulation and lecture (Tawfik et al., 2020). When asked for feedback, participants in the simulation group reported higher general satisfaction (59.4% vs 23.3, $p = 0.002$), learning motivation (71.9% vs 10%, $p < 0.0001$), comfort with teaching method (59.4% vs 13%, $p < 0.0001$), better learning ability (56.3% vs 13.3%, $p = 0.001$), and understanding of subject matter (59.4% vs 20%, $p = 0.0007$). In this same study, the researchers found that simulation learning, although effective at knowledge growth and retention (3 months post-education), was not significantly more effective than lecture (immediately post-education: $p=0.04$; 3 months post-education: $p=0.5$) (Tawfik et al., 2020). Despite these insignificant results, the feedback from the learner is important to note, as the learner's opinion will assist in their engagement and active learning, and ultimate knowledge growth.

Gamification (Game-Based Learning)

Game-based learning utilizes gaming elements to enhance learning through motivation and learner engagement (University of Waterloo Center for Teaching and Excellence, n.d.). In two quantitative studies of strong design, researchers compared game-based learning to simulation and problem-based learning (**Ma et al., 2021; Razaghpoor et al., 2024**). Researchers found a positive significant difference between the intervention group and comparison group for knowledge ($p<0.001$), clinical decision making ($p=0.013$), cognition ($p=0.004$), skill (0.008) and affective response ($p=0.010$). These results demonstrated that game-based learning caused greater outcomes then the comparison modality (Ma et al., 2021; Razaghpoor et al., 2024). Another form on gamification is an escape room. In a weak quantitative study by Frederick et al. (2020), an escape room was utilized as part of an exam review session for a OR course covering the essentials of OR nurses. Researchers found that the group of learners who participated in the escape room had a higher incidence of passing the exam on the first attempt (control group: 44% passed on first attempt; intervention group: 75% passed), and with a higher score (control group average test score: 79.7%; intervention group: 84%). The researchers did not complete any statistical analysis (**Frederick et al., 2020**).

Gamification allows for the application of knowledge in a dynamic and engaging environment (Frederick et al., 2020; Ma et al., 2021; Razaghpoor et al., 2024)

One of the limitations to gamification is the cost associated when technology (e.g., smart phones, computer) is used. Razaghpoor et al. (2024) utilized an application (i.e., an app) that participants were required to download onto their personal devices. This makes this type of game-based modality inaccessible to some, and not inclusive. However, Ma et al. (2021) and Frederick et al.

(2020) utilized a more accessible methodology that did not require technology, but required an abundance of time over the five sessions students participated in.

Multi-Modal

Multi-modal education utilizes multiple different teaching modalities. In two quantitative studies, multi-modal education showed significant knowledge gains amongst participants, and thus influenced patient outcomes (Crowe et al., 2018; Mohammed et al., 2021). Mohammed et al. (2021) incorporated in-person lecture, simulation, handouts, and audio-visual delivery to educate nurses on pediatric intestinal obstruction. They found this delivery modality to be successful in increasing nursing knowledge (Fisher exact test=65.37; $p<0.000$), nursing competence (t-test=47.13; $p<0.000$), and quality of nursing care (Fisher exact test=64.96; $p<0.000$) (Mohammed et al., 2021). Crowe et al. (2018) found similar results with a 40-minute-didactic lecture and a 40-minute simulation on a deteriorating patient. Crowe et al. (2018) noted an increase in overall confidence in caring for deteriorating adult patients immediately post-education ($t(41) =-7.156$; $p<0.001$) and 3 months after ($t(41) = -5.616$, $p < 0.001$). Further, they found a significant increase in knowledge gains immediately post-intervention ($t(41) = - 2.57$, $p < 0.001$) and 3 months post ($t (41) =- 4.48$, $p < 0.001$) compared to baseline

A possible reason why multi-modal delivery may be successful is the variety of delivery modalities ensures that every participant can have their learning styles met, and each learner will see the content multiple ways throughout the education (Mohammed et al., 2021). Additionally, by incorporating simulation or a hands-on learning component as one of the modalities, the learners are given the opportunity to apply the learned knowledge, thus increasing knowledge retention (Crowe et al., 2018).

Learning Styles

When discussing how education will be delivered, it is important to also consider the learning styles of those receiving the education. One's learning style can be defined as how one gathers, sorts, interprets, organizes and stores learned information (Chick, 2010). When choosing a delivery modality, an educator needs to consider not only the learning style of the learner(s) but also the modalities appropriateness for the topic (Chick, 2010; **Mangold et al., 2018**). Through utilizing the Index of Learning Styles (ILS), Mangold et al. (2018) was able to determine the learning styles of nurses. The ILA has 4 subscales that capture a variety of learning styles: active-reflective, visual-verbal, sequential-global, and sensing-intuitive (Mangold et al., 2018). The different types of learners are as follows:

- Active learner: enjoys learning by trying things and enjoy working in groups.
- Reflective learner: learns by thinking things through, and prefers to work along, or with a familiar, single partner.
- Visual learner: learns through visual methods such as pictures, diagrams, or flow charts.
- Verbal learner: prefers information to be written or spoken.
- Sequential learner: has a linear thinking process and learns best in small increments.
- Global learner: has a holistic thinking process.
- Sensing learner: is a concrete thinker, who is practical, and focused on facts and procedures.
- Intuitive learner: is an abstract thinker, focused on theories and underlying meanings, and is innovative.

Mangold et al. (2018) found that nurses have a variety of preferred learning styles. In each subscale, nurses either had a preference or there was a balance between the two learning styles, indicating that nurses did not have strong preferences for either learning style. Nurses had strong preferences for sensing (84.54% chose sensing over intuitive) and visual learning (74.68% chose visual over verbal) and were balanced for active-reflective (57.99% had a weak preference for both active and reflective learning) and sequencing-global (52.09% had a weak preference for sequential and global learning) (Mangold et al., 2018). Mangold et al. (2018) also found significant associations between learning styles and demographic information. Nurses with <26 years of had a 6%-13% stronger preference for visual learning than those with more experience ($p<0.001$). Additionally, males had a 24% stronger preference for intuitive learning ($p<0.001$), and 17% stronger preference for visual learning ($p<0.002$). There were no significant findings for an association between learning style and clinical area (Mangold et al., 2018). These findings are interesting, as they demonstrate that there is no overall preference for learning style amongst nurses and assist in supporting the use of a multi-modal delivery method (Mangold et al., 2018).

To further assist in determining an appropriate delivery modality of this pediatric educational resource, in the next section I will explore theoretical frameworks to support adult learning.

Supporting Theoretical Frameworks

I will draw on two theoretical frameworks to guide the development of the pediatric OR educational resource: Knowles' Adult Learning Theory and Benner's Novice to Expert Theory. I chose these frameworks to gain a better understanding of the adult learner to facilitate my understanding of how nurses develop their skills and expertise in a new clinical setting. This

understanding will aid in both the thorough development as well as effective implementation of a pediatric educational resource for nurses new to the OR.

Benner's Novice to Expert Theory

Benner's Novice to Expert theory helps one understand how nurses develop knowledge, skill, clinical competence, and comprehension through training (e.g., orientation, education) and experiential learning (Benner, 1982; Davis & Maisano, 2016; Ozdemir, 2019). With this training and experiential learning nurses progress through the five stages of proficiency: novice, advanced beginner, competent, proficient, and expert (Benner, 1982). A novice nurse is someone with no experience. They are task-focused with little context or individualization to their actions, and have difficulty when situations are outside of what they have learned (e.g., deteriorating patient) (Benner, 1982; Davis & Maisano, 2016; Ozdemir, 2019). As the nurse progresses through advance beginner, competent, and proficient stages they begin to prioritize based on patient presentation and needs and can cope with unpredictable situations. As nurses progress, they also start taking on more leadership and mentorship roles and become a valued resource for their nursing peers (Benner, 1982; Davis & Maisano, 2016; Ozdemir, 2019). The last stage of Benner's theory is expert. Expert nurses provide holistic care and can easily make critical clinical decisions based on prior experience and intuition (Benner, 1982; Davis & Maisano, 2016; Ozdemir, 2019). Benner describes expert nurses as chess masters; they deeply understand the situation and know what to do because it "feels right" (Benner, 1982).

The OR is a unique environment as nurses require a distinctive set of skills and knowledge not pertinent to other clinical areas, such as knowledge about surgical instrumentation, surgical implants, the complex procedural steps, and care of a patient under anesthesia. New nursing hires to the OR come from varying backgrounds (e.g., community,

surgical units, critical care areas) and experience levels (e.g., new nursing graduates to nurses with years of experience). Due to this, all nurses who come to the OR with no prior OR experience start as novice nurses. This is very intimidating for many new nurses to the OR, as many come with years of experience from other clinical areas (e.g., medicine, surgery, critical care) where they were competent, proficient, or expert nurses. Currently, the unit orientation and education are the same regardless of previous nursing experience in the OR or other clinical areas. Therefore, when developing the pediatric OR educational resource, I need to be mindful of the experience nurses bring to the OR and ensure that the resource complements and builds on previous knowledge. I also need to consider nurses who do not come with any experience. I also need to be empathetic as these nurses start as novice nurses in the OR and will be very task-focused, with little anticipatory knowledge. It will take them time and experience to become competent and progress through Benner's stages.

Knowles' Adult Learning Theory

Malcolm Knowles popularized the term *andragogy* to describe the study of how adults learn, and to distinguish it from *pedagogy* the study of how children learn (Collins, 2004; Knowles, 1978). This distinction is important as the adult learner is one who brings life experiences to their learning, is intrinsically motivated, and needs to have learning applicable to their work or responsibilities (Collins, 2004; Teaching Excellence in Adult Learning [TEAL] Centre, 2011). Further, adults learn best through self-directed learning, where the learning environment is collaborative and respectful, adaptable based on learning needs and objectives, and allows them to put the teachings into practice (e.g., active participation through simulation and problem-based learning) (Collins, 2004; TEAL Centre, 2011). Through active participation

and engagement learning in adults is enhanced and the retention of new concepts is greater (Collins, 2004).

By following the concepts of the Adult Learning Theory, I can develop the pediatric OR educational resource to best reflect the requirements of adult learners. The delivery modality could be self-directed and incorporate simulation or game-based learning. A multi-modality delivery may be beneficial in allowing for multiple delivery methods to increase engagement and get the learner hands-on experience with relevant OR skills. As the resource pertains to safe, competent care of pediatric patients in the OR, and is directly relevant to their practice, many nurses may be self-motivated to complete the self-directed learning. The resource can also build on prior nursing and life experiences to aid in learning of pediatric content, such as developmental stages and anatomical differences.

Summary of State of Evidence

Finding pediatric OR nursing literature for this literature review was difficult. In my literature search, I found minimal research-based literature on pediatric education and orientation for nurses in the OR or the perioperative environment. Due to the lack of OR nursing-specific literature, I expanded the search to include other areas of nursing (e.g., critical care, medical, surgical), adult patient populations, and non-research literature. This provided more literature, although the number of relevant articles identified in my literature search was still small. The lack of literature on pediatric-specific OR nursing education is noteworthy and concerning given the important intraoperative considerations for pediatric patients.

The literature found in this review provides a basis for the development of a pediatric educational resource for new nurses hired to the OR. There is demonstrated recommendations and research in support of important nursing considerations for resource content. These include

pediatric anxiety, thermoregulation, anatomical differences, and procedural differences in induction. Further, it is clear that the patient and family are impacted when nurses tailor their care to the patient and family while considering the developmental stage and age of the patient. By including these topics in the educational resource, new nursing hires to the OR will have a better understanding of the intraoperative care of a patient, and thus be able to provide safe patient care.

When addressing how the resource should be presented to new nursing hires, I was able to find multiple articles that demonstrate the impact of different delivery modalities. I considered five modalities: lecture, independent learning, simulation and gamification, and the use of multiple modalities (multi-modal). Although all have advantages and disadvantages, multi-modal aligns the most with Adult Learning Theory and the variety of learning styles of nurses (Collins, 2004; Mangold et al., 2018; TEAL Centre, 2011). Multi-modal will be able to provide all learners with content that is presented in a modality that is not only impactful for their learning style, but it presents the educational material multiple times in different ways. It will allow presentation of the content (e.g., lecture, independent learning) and application of the newly learned material (e.g., simulation, gamification) in a way that facilitates learning and knowledge retention.

Conclusion

Quality education is essential for nurses entering into new clinical areas to ensure competency and positive patient outcomes. This is especially important for those entering clinical areas with new patient populations (i.e., pediatrics). The current lack of pediatric OR education for new OR nurses within the OR is alarming and needs to be improved. Through this literature review, I explored necessary content, delivery modalities, and learning styles to assist

in developing a pediatric educational resource for new nurses hired to the OR. Further, I demonstrated key components of Knowles' Adult Learning Theory and Benner's Novice to Expert Theory. These theoretical frameworks will be utilized when developing the educational resource to ensure it is effective for adult learners and nurses entering the OR to enhance nursing competency and the delivery of safe, high-quality care.

References

Abebe, L., Bender, A., & Pittini, R. (2018). Building the case for nurses' continuous professional development in Ethiopia: A qualitative study of the Sick Kids-Ethiopia paediatrics perioperative nursing training program. *Ethiopian Journal of Health Sciences*, *28*(5), 607–614. https://doi.org/10.4314/ejhs.v28i5.12

Baroya, J., Ramos, S., O' Neill, K., MacDonald, R., & Krenzischek, D. (2023). Effectiveness of pediatric competency-based orientation (PCBO) on knowledge, confidence, and manifestation of early recognition of nursing expertise among PACU nurses. *Journal of PeriAnesthesia Nursing: Official Journal of the American Society of PeriAnesthesia Nurses*, *38*(5), 782–786. https://doi.org/10.1016/j.jopan.2023.01.015

Benner, P. (1982). From novice to expert. *The American Journal of Nursing*, *82*(3), 402-. https://doi.org/10.2307/3462928

Bräuer, A., Nemeth, M., Fazliu, A., Eberhardt, I.M., Stein, D., & Miller, C. (2024). Perioperative thermalmanagement in children. *Anästh Intensivmed,* 65, 28–37. DOI: 10.19224/ai2024.028

Canadian Nurses Association (2019). *Advanced practice nursing: A Pan-Canadian framework.* Ottawa, ON: Author. Available at: https://hl-prod-ca-oc-download.s3-ca-central-1.amazonaws.com/I/2f975e7e-4a40-45ca-863c-5ebf0a138d5e/UploadedImages/documents/nursing/Advanced_Practice_Nursing_framework_e.pdf

Chick, N. (2010). Learning styles. *Vanderbilt University Center for Teaching.* Retrieved July 11, 2024, from https://cft.vanderbilt.edu/guides-sub-pages/learning-styles-preferences/

Colleges of Nurses of Ontario. (2019). *Entry-to-practice competencies for registered nurses*. Available at: https://www.cno.org/globalassets/docs/reg/41037-entry-to-practice-competencies-2020.pdf

Collins, J. (2004). Education techniques for lifelong learning: Principles of adult learning. *RadioGraphics*, 24 (4),1483–1489. Available at: https://doi.org/10.1148/rg.245045020

Crowe, S., Ewart, L., & Derman, S. (2018). The impact of simulation based education on nursing confidence, knowledge and patient outcomes on general medicine units. *Nurse Education in Practice*, *29*, 70–75. https://doi.org/10.1016/j.nepr.2017.11.017

Dave, N. M. (2019). Premedication and induction of anaesthesia in paediatric patients. *Indian Journal of Anaesthesia*, *63*(9), 713–720. https://doi.org/10.4103/ija.IJA_491_19

Davis, A., & Maisano, P. (2016). Patricia Benner: Novice to expert - A concept whose time has come. *The Oklahoma Nurse*, *61*(3), 13-15. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_gale_infotracmisc_A463514607

Derieg, S. (2016). An overview of perioperative care for pediatric patients. *AORN Journal*, *104*(1), 4–10. https://doi.org/10.1016/j.aorn.2016.05.001

Fortier, M. A., Del Rosario, A. M., Martin, S.R., & Kain, Z. N. (2010). Preoperative anxiety in children. *Paediatric Anaesthesia*, *20*, 318-322. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_gale_infotracacademiconefile_A220543984

Frederick, A. N., & Reed, J. A. (2021). Operation outbreak: A Periop 101 exam review escape room. *Simulation & Gaming*, *52*(1), 88-95. https://doi.org/10.1177/1046878120948922

Hong, Q.N., Pluye, P., Fabregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.C., & Vedel, I. (2018). The mixed methods appraisal tool (MMAT) version 2018 for information professionals and researchers. *McGill University, Department of Family Medicine*. http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127916259/MMAT_2018_criteria-manual_2018-08-01_ENG.pdf

JBI Global. (2020). *Checklist for qualitative research*. https://jbi.global/sites/default/files/2020-08/Checklist_for_Qualitative_Research.pdf

Knowles, M. S. (1978). Andragogy: Adult Learning Theory in perspective. *Community College Review*, *5*(3), 9–20. https://doi.org/10.1177/009155217800500302

London Health Sciences Centre. (n.d.). *Welcome to Child Life Services*. Available: https://www.lhsc.on.ca/child-life/welcome-to-child-life-services

Luehmann, N. C., Staubach, M. E., Akay, B., Collier, P. J., Han, R. E., Riggs, T. W., & Novotny, N. M. (2019). Benefits of a family-centered approach to pediatric induction of anesthesia. *Journal of Pediatric Surgery*, *54*(1), 189–193. https://doi.org/10.1016/j.jpedsurg.2018.10.015

Ma, D., Shi, Y., Zhang, G., & Zhang, J. (2021). Does theme game-based teaching promote better learning about disaster nursing than scenario simulation: A randomized controlled trial. *Nurse Education Today*, *103*, 104923–104923. https://doi.org/10.1016/j.nedt.2021.104923

Mangold, K., Kunze, K. L., Quinonez, M. M., Taylor, L. M., & Tenison, A. J. (2018). Learning style preferences of practicing nurses. *Journal for Nurses in Professional Development*, *34*(4), 212–218. https://doi.org/10.1097/NND.0000000000000462

McDermott, K. & Liang, L. (2021). Overview of operating room procedures during inpatient stays in U.S. hospitals, 2018. *Agency for Healthcare Research and Quality.* https://hcup-us.ahrq.gov/reports/statbriefs/sb281-Operating-Room-Procedures-During-Hospitalization-2018.jsp

Merriam-Webster. (n.d.). Thermoregulation. https://www.merriam-webster.com/dictionary/thermoregulation

Mohammed, F. I., Al Sharkawi, S. S., Sabaq, A. G., & Abd-Elaziz, S. M. (2021). Improve nurses' competency level regarding care of children undergoing intestinal obstruction surgery: An educational program. *International Journal of Novel Research in Healthcare and Nursing*, *8*(1), 662-678. https://fnur.stafpu.bu.edu.eg/Pediatric%20Nursing/1845/publications/Amaal%20Gharieb%20%20Sabbaq_sixth.pdf

Mower, J. (2015). Incorporating age-specific plans of care to achieve optimal perioperative outcomes. *AORN Journal*, 102(4), 369–388. https://doi.org/10.1016/j.aorn.2015.07.014

Nemeth, M., Miller, C., & Bräuer, A. (2021). Perioperative hypothermia in children. *International Journal of Environmental Research and Public Health*, *18*(14), 7541. https://doi.org/10.3390/ijerph18147541

Oliver, C. (2021). Increasing perioperative outpatient nurses' knowledge of pediatric anxiety through use of a developed clinical guide (4178) [Doctoral dissertation, University of Las Vegas]. http://dx.doi.org/10.34917/25374071

Ozdemir, N. G. (2019). The development of nurses' individualized care perceptions and practices: Benner's novice to expert model perspective. *International Journal of Caring Sciences*, *12*(2), 1–7. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_journals_2303666905

Panella, J. J. (2016). Preoperative care of children: Strategies from a child life perspective. *AORN Journal*, *104*(1), 11–22. https://doi.org/10.1016/j.aorn.2016.05.004

Public Health Agency of Canada. (2014). *Infection and prevention control guidelines: Critical appraisal toolkit.* https://publications.gc.ca/collections/collection_2014/aspc-phac/HP40-119-2014-eng.pdf

Razaghpoor, A., Taheri-Ezbarami, Z., Jafaraghaee, F., Maroufizadeh, S., & Falakdami, A. (2024). The effect of serious game and problem-based learning on nursing students' knowledge and clinical decision-making skill regarding the application of transfusion medicine in pediatric nursing. *Journal of Pediatric Nursing*, *76*, e1–e8. https://doi.org/10.1016/j.pedn.2024.01.010

SickKids. (n.d.). *Child Life at SickKids*. Available: https://www.sickkids.ca/en/care-services/support-services/child-life/

Solheim, E., & Flo, J. (2023). Nurses' experiences of simulation-based learning, 12–18 months after the simulation: A qualitative study. *Nordic Journal of Nursing Research*, *43*(1). https://doi.org/10.1177/20571585211032774

Stevens, B., Donkor, E. S., Goka, B. Q., Odame, I., Langins, M., Riahi, S., De Young, S., Walters, D., Eliason, C., Fleming-Carroll, B., Barnes, G., Ekey, F. V., Hubley, P., Nyanteh, F., Mensah, E., & Sackey, I. (2014). Impact and sustainability of an accredited paediatric nursing training programme in Ghana. *Journal of Nursing Education and Practice*, *4*(12), 142–142. https://doi.org/10.5430/jnep.v4n12p142

Tawfik, M. M. R., Fayed, A. A., Dawood, A. F., Al Mussaed, E., & Ibrahim, G. H. (2020). Simulation-based learning versus didactic lecture in teaching bronchial asthma for undergraduate medical students: A step toward improvement of clinical competencies. *Medical Science Educator*, *30*(3), 1061–1068. https://doi.org/10.1007/s40670-020-01014-y

Teaching Excellence in Adult Learning Centre. (2011). Adult learning theories. *U.S. Department of Education*. Available at: https://lincs.ed.gov/sites/default/files/11_%20TEAL_Adult_Learning_Theory.pdf

University of Waterloo Center for Teaching and Excellence. (n.d.). *Gamification and game-based learning*. Gamification and Game-Based Learning | Centre for Teaching Excellence | University of Waterloo

West, N., Christopher, N., Stratton, K., Görges, M., & Brown, Z. (2020). Reducing preoperative anxiety with child life preparation prior to intravenous induction of anesthesia: A randomized controlled trial. *Paediatric Anaesthesia*, *30*(2), 168–180. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_miscellaneous_2330331606

Appendix B: Literature Summary Tables

Literature Summary Table for Quantitative Studies

Legend: ASPAN=American Society of Peri-anesthesia Nurses; ENT= ears, nose, and throat; mYPAS = modified Yale Preoperative Anxiety Scale; OR = operating room; PACU=Post-Anesthesia Care Unit; PCBO = Pediatric competency-based orientation; PEARS: Pediatric Emergency Assessment, Recognition, and Stabilization

Study/Design	Methods	Key Results	Comments
Authors: Baroya et al. (2023) Design: Uncontrolled before and after Purpose: to evaluate the effectiveness of the ASPAN PCBO education on peri-anesthesia nursing knowledge, understanding, confidence, and ability to provide high quality pediatric care	N: 60 peri-anesthesia nurses working in preop and PACU, with five to >20 years of nursing experience Country/setting: United States **Intervention**: Independent learning • Learners provided with 18 chapters of reading on pediatric clinical information from the ASPAN PCBO • Readings divided into 3 sets, with sample topics of: • Set 1: growth and development, and assessment • Set 2: airway management and emergencies, and post-op care • Set 3: Pain management, general anesthesia, and discharge teaching Data collection before and after intervention: • ASPAN PCBO pre- and posttests for knowledge, and confidence and recognition of nursing expertise tools utilized in other studies Outcome 1: Nurse confidence and recognition of nursing expertise Outcome 2: Nurse Knowledge	Outcome 1: Nurse confidence and recognition of nursing expertise • Self-reported confidence increase seen in assessment, medications administration, self-management, and knowledge ($p<0.01$) • Total confidence increased by 12% (score of 85.9 pretest to 97.8 post-test; $p<0.001$) • Recognition of nursing expertise increased by 11% (score of 43.4 pretest and 48.6 posttest; $p<0.001$) Outcome 2: Nurse knowledge • improvements in knowledge seen across all chapter sets pertaining to care of pediatric patients • Only significant improvement in knowledge was for Set 2 knowledge • Pretest group score 62.2% • Posttest group score 81.5% • P=0.022	**Strength of Design:** Weak **Quality:** Medium Comments: • Convenience sampling • Used developed assessment tools, but did not describe or outline tools • Did not define outcome measures explicitly • Moderate statistical score

Study/Design	Methods	Key Results	Comments
Authors: Crowe et al. (2018) Study Design: Uncontrolled before and after Purpose: to assess nursing confidence, knowledge and patient outcomes on a medicine unit after education about deteriorating patients.	N: 161 post-license RN and LPN who worked on medical inpatient units (median years of experience as a nurse was 6 years). Country/setting: Canada **Intervention**: 40-minute-didactic lecture and 40-minute simulation on a deteriorating patient Data collection: 1. Paper based knowledge assessment, pre, immediately post- and three months post-intervention to assess nursing confidence to care for patients in acute deterioration, and knowledge about deteriorating patients. 2. Review of the critical care outreach team and code blue records three months pre- and three most post intervention to determine the medicine unit's call frequency, patient condition upon arrival, and reason for call. Outcome 1: Changes in knowledge Outcome 2: Code blue and critical care outreach	Outcome 1: Changes in knowledge • Testing score (mean score and standard deviation): • Pre-: M=12.67; SD=2.19 • Immediate post-: M=13.34; SD=2.06 • 3 months post-: M=13.98; SD=1.8 • Change from pre- to immediate post-test score: t=2.57; p<0.001 • Change from pre- to 3 months post-test score: t=4.48; p<0.001 Outcome 2: Code blue and critical care outreach • Increase in enhanced understanding and early recognition of deteriorating patients • 3 months prior to intervention 67% (n=232) of consults were related to a deteriorating patient. • 3 most post intervention 74% (n=276) of consults were related to a deteriorating patient. • Code blue data saw decrease in the overall number of code blue arrests (n=16 3 month prior, and n=14 3 months post) • 3 months post there was a decrease in pulseless cardiac arrest (59% decrease, p<0.05), and increase in pre-attests called (increase by 52%, p<0.05).	**Strength of Design:** Weak **Quality:** Medium Key items to note: • Did not use high level statistics (e.g., linear regressions) to determine associations. • Statistically significant results

Study/Design	Methods	Key Results	Comments
Authors: Fortier et al. (2010) Design: Uncontrolled before and after Purpose: to examine pediatric perioperative anxiety and identify risk factors for increased anxiety	N: 261 children aged two to twelve years old undergoing general anesthesia for outpatient tonsillectomy and adenoidectomy Country/setting: United States Data collection: • To measure pediatric perioperative anxiety • mYPAS • Measured the day of the procedure in pre-op area, at parental separation, entrance to the OR, and at mask induction • Visual analog scale (VSA) • Measured postoperatively in PACU • Numeric rating scale (NRS) • Measured after discharge by parents until day 14 post-operatively • To measure child behaviors and pain • Parent's postoperative pain measure • Measured after discharge by parents until day 14 post-operatively • Post-hospitalization behavioral questionnaire Outcome 1: Pediatric perioperative anxiety Outcome 2: Pediatric behaviors and pain	Outcome 1: Pediatric perioperative anxiety • Increased postoperatively ($F(1, 223) = 382.47$; $p<0.001$) • Anxiety increased at mask induction and immediately post-operatively ($F(1, 184) = 534.81$, $P < 0.00$), and 2 weeks post-operatively ($F(1, 188) = 183.54$, $P < 0.001$). Outcome 2: Pediatric behaviors and pain Perioperative anxiety was positively correlated with pain within the first 24 hours after surgery ($r=0.26$, $P=0.004$) and new onset negative behavioral change in the 2 weeks following surgery ($r = 0.25$, $P = 0.006$)	**Strength of Design:** Weak **Quality:** Medium Key items to note: • Used validated tools • Utilized ANOVA • Had significant results

Study/Design	Methods	Key Results	Comments
Authors: Frederick et al. (2020) Design: Cross-sectional study Purpose: to see the effectiveness an escape room would have on exam results for nurses taking an OR course	N: 22 registered nurses taking an AORN OR course to learn the essentials of OR nursing • Group 1: 18 learners • Group 2: 4 learners Country/setting: United States Data collection: • Tests scores on final exam • Group passing rate on first attempt at writing exam • No statistical analysis was done related to study limitations not disclosed Outcome 1: Test scores on final exam Outcome 2: Passing rate	Outcome 1: Test scores on final exam • Group 1: 79.7% • Group 2: 84% Outcome 2: Passing rate • Group 1: 44.4 • Group 2: 75%	**Strength of Design:** Weak **Quality:** Weak Key items to note: • No statistical analysis • Unequal group sizes • Included in literature review related to pertaining directly to the OR.

Study/Design	Methods	Key Results	Comments
Authors: Luehmann et al. (2019) Design: Non-randomized clinical trial Purpose: to study the effects of parental presence for induction has on pediatric anxiety	N: 1084 children (964 in the control group, and 120 in the study group) Country/setting: Beaumont Children's Hospital, Michigan, United States Intervention: Parental presence for induction Control: No parental presence for induction and give pharmaceuticals for anxiety Data collection: • Chart audits • Use of preoperative midazolam • Satisfaction survey • Not validated • 5-point Likert Scale • Given to caregivers of participants (e.g., parent, family, or other primary caregiver), and health care workers (e.g., nurses, physicians) in the OR Outcome 1: Midazolam use Outcome 2: Caregiver satisfaction Outcome 3: Healthcare worker satisfaction	Outcome 1: Midazolam use • 51% (392/964) of control group participants receive midazolam compared to 13% (16/118) of study participants ($p<0.001$) • After adjusting for demographic and surgical service the study group has a 71% decrease in odds of medication preoperative (aOR 0.29, CI 0.16 to 0.52; $p<0.0001$) Outcome 2: Caregiver satisfaction • Caregivers rated the benefit of the program a 5 (great benefit) on Likert Scale Outcome 3: Healthcare worker satisfaction • Physicians rated the benefit of the program to patients a 3-4 out of 5 on the Likert Scale • Nurses rated benefit of program a 5 out of 5 on Likert Scale	**Strength of Design:** Weak **Quality:** Medium Key items to note: • Convenience sampling by anesthesia the day of surgery • Control group much smaller than study group • Moderate statistical analysis • More females in the control group (32%) compared to study group (41%) ($p=0.04$). • 53% of study group participants had an ENT procedure, compared with 32% in control group ($p<0.001$)

Study/Design	Methods	Key Results	Comments
Authors: Ma et al. (2021) Design: Randomized Control Study Purpose: explore if game-based learning is more effective that scenario simulation to improve nursing student competency in disaster relief	N: 104 undergraduate nursing students (18-to-22 years old) (intervention group=51; control group 53) Country/setting: China Groups: Intervention: Game "Brave the Wind and Wave" • Played in 5 sessions, representing different part of the disaster relief • 6 groups of 8-10 students • Researchers could augment the contents and tasks for the students • Game elements included cooperation, competition, question/answer, and time pressure Control: Simulation group • 8-10 students in each group • Had 5 sections representing different parts of the disaster relief Data collection: pre- and post-intervention • The Questionnaire of Disaster Rescue Ability • Testing domains cognition, skill and affective response • 5-point Likert Scare Outcome 1: Total Competency level Outcome 2: Comparing Domains	Outcome 1: Competency level • The Questionnaire of Disaster Rescue Ability score increased in both groups • Intervention: pre: 3.38; post: 4.04 • Control: pre: 3.29; post: 3.77 • Average total score for intervention group higher than control (p=0.002) Outcome 2: Comparing Domains • Cognition • Intervention: 4.05 ± 0.56 • Control: 3.75 ± 0.48 • p=0.004 • Skill • Intervention: 3.88 ± 0.50 • Control: 3.62 ± 0.53 • p=0.008 • Affective response • Intervention: 4.25 ± 0.42 • Control: 4.02 ± 0.48 • p=0.010	**Strength of Design: S**trong **Quality:** Medium Comments: • Noted ethics approval • Participants were nursing students vs. practicing nurses, query generalizability • Could have used more sophisticated statistical analysis

Study/Design	Methods	Key Results	Comments
Authors: Mangold et al. (2018) Design: Cross-sectional study Purpose: to describe dominant patterns of learning for nursing	N: 1,399 nurses in tertiary and quaternary academic medical centers who worked on adult inpatient, ambulatory, procedural, or emergency units Country/setting: Southwestern United States Data collection: • Assessment tool: Index of Learning Styles • 44-item questionnaire with 4 subscales (active-reflective, visual-verbal, sequential-global and sensing-intuitive) • A higher score within in a subscale indicated a strong preference for this style of learning, and a low score (weak preference) indicates a balance between the learning styles in the subscale • Rankings: Strong-Moderate-Weak Outcome 1: Type of learning style	Outcome 1: Type of learning style Active-Reflective: • Balanced between these learning styles • 428 (30.68%) participants had a weak preference for active learning • 381 (27.31%) participants had a weak preference for reflective learning Sensing-Intuitive • Favor for sensing learning style • 443 (31.71%) participants had a strong preference for sensing • 30 (2.15%) participants had a strong preference for intuitive • 83.54% of participants choose sensing as their preferred style Visual-Verbal • Favor for visual learning style • 74.68% of participants choose visual as their preferred style Sequential-Global • Overall, well balanced between styles, with slight preference for sequential • 134 (9.63%) participants had a strong preference for sequential learning, and 20 (1.44%) had a strong preference for global learning • 461 (33.12%) participants had a weak preference for sequential learning, and 264 (18.97%) had a weak preference for global learning Outcome 2: demographic variables and learning styles	**Strength of Design:** Weak **Quality:** Strong Key items to note: • Tool chosen based on reliability, validity, and recent use with nurses in the literature • Participants were from different clinical areas • Large number of participants

Study/Design	Methods	Key Results	Comments
	Outcome 2: demographic variables and learning styles	• Nurses with <26 years of experience had stronger preference for verbal learning ($p<0.001$), whereas those with less experience favored visual learning ($p<0.001$) • Males have a 24% stronger preference for intuitive learning than females ($p<0.001$), and 17% stronger preference for visual learning ($p<0.001$) • No significant findings were noted between clinical areas	

Study/Design	Methods	Key Results	Comments
Authors: Mohammed et al. (2021) Design: Uncontrolled before and after Purpose: to assess competency level and skill performance of nurses after education on pediatric intestinal obstruction	N: 50 nurses and 50 pediatric patients (one day to two years old) on neonatal and pediatric surgical units at a Specialized Pediatric Hospital. Country/setting: Benha City, Egypt Intervention: received a multi-modal (e.g., modified lecture, simulation, handouts, and audio-visual) educational program on pediatric intestinal obstruction Data collection before and after intervention: • Nurse's Knowledge Assessment on illness • Completed by the nurse • Nurses given a percentage out of 100%, with 80-100% bring good knowledge • Nurses Competence Scale • Assessed by researchers • Assessed nurses' competency level with caring for children with intestinal obstruction • Overall ranking: poor, average, or good competence (score range from 0 to 3500) • Quality of nursing care • Assessed by researchers • Assessed the quality of the nurse's patient care • Overall ranking: low, moderate, or high quality (score range 0 to 72) Outcome 1: Nursing Knowledge Outcome 2: Nursing Competence Outcome 3: Quality of Nursing Care	Outcome 1: Nursing Knowledge • Pretest: 66% (33 of 50) of nurses scored poor for knowledge • Posttest: 96% (48 of 50) of nurses scored good for knowledge • Fisher exact test=65.37; *P*<0.000 Outcome 2: Nursing Competence • Total competency increased from a mean score of 1295 ± 157 to a mean score of 2850 ± 174 • *t*-test=47.13; *P*<0.000 Outcome 3: Quality of Nursing Care • Pretest 56% of nurses (28 of 50) provided low quality of care • Posttest 94% of nurses (47 of 50) provided high quality of care • Fisher exact test=64.96 • *P*<0.000 Linear Regression • Course attendance was a positive independent predictor of nurse's competency pre and post education (p=0.023 and p<0.000) Pearson Correlation Coefficient • Positive correlation between nurses' competence level and quality of care post education • R=0.929; p=<0.000 (2-tailed)	**Strength of Design:** Weak **Quality:** High Comments: • Developed tools were validated. • Tools were of favorable internal consistency and high reliability • Good statistical analysis (e.g., chi-square test, linear regression)

Study/Design	Methods	Key Results	Comments
Authors: Oliver (2017) Design: Uncontrolled before and after Purpose: To develop a clinical guide to increase perioperative outpatient nurses' knowledge on pediatric anxiety	N: 31 perioperative and intraoperative nurses who care for pediatric patients Country/setting: Nevada, United States Intervention: one-hour educational intervention and printable resource for each participating nurse, including a reference card • Learners had the option of self-learning or attending a voluntary instructed online education session Data collection: pre and post intervention • Knowledge attitude and confidence • Participant evaluation of the intervention (5-point Likert scale) Outcome 1: Knowledge of pediatric anxiety Outcome 2: Attitudes regarding one's own knowledge Outcome 3: Confidence in treating pediatric patients with anxiety Outcome 4: Participant evaluation of intervention	Outcome 1: Knowledge • statistically significant mean difference between pre-test and post-test knowledge score [t (29) = 6.6, $p<0.001$] Outcome 2: Attitude • statistically significant improvement in self-reported attitudes ($p<0.001$) was Outcome 3: Confidence • statistically significant improvement in confidence ($p<0.001$) was noted Outcome 4: participant evaluation • 30 of the 31 participants completed the survey with 90-93% of participants agreeing or strongly agreeing that the intervention was clear, well structured, aided in their learning, helped improve confidence with caring for pediatric anxiety, and that the intervention was well presented.	**Strength of Design:** Weak **Quality:** Medium Comments: • Convenience sampling • Ethical considerations discussed (e.g., ethics approval, informed consent, evaluation) • Validated tools • Assessment tool was short, and had only a few questions for each outcome • Did not specify amount of learners who attended the voluntary instructed session

Study/Design	Methods	Key Results	Comments
Authors: Razaghpoor et al., (2024) Design: Controlled before-after Purpose: compare effect of serious game and problem-based learning on nursing student knowledge and clinical decision making for transfusion medicine in pediatric nursing	N: 76 undergraduate nursing students Country/setting: Iran Groups: Intervention 1: Serious Game (quiz based) • Player takes role of staff nurse and answers multiple choice questions throughout scenario • Daily play for 2 weeks, and asked to read educational e-manual Intervention 2: problem-based learning • Two in person sessions (four hours total) • Educational content delivered through lecture, then small groups made and given scenario and problem-based intervention Control • Normal course based content Data collection: • Validated researcher made pre and post tool used to: • Collect demographic info • Assess knowledge • Higher score indicated better knowledge (score -100 to +100) • Clinical decision making • Higher score indicated better decision making (-33.33 to +100) Outcome 1: Knowledge growth Outcome 2: Clinical decision making	Outcome 1: Knowledge growth • Knowledge for both interventions increased compared to control group ($p<0.05$) • Serious game had a pre and post-test mean score difference of 15.1 (8.7, 21.5), with $t=4.91$, and $p<0.001$ • Problem based learning has a pre and post mean score difference of 6.6 (2.0, 11.0), t-2.97, and $p=0.006$ • Mean score difference between groups was significant ($p<0.001$) Outcome 2: Clinical decision making • Mean score difference between groups was significant ($p<0.001$) • Serious game had a pre and post-test mean score difference of 9.6 (2.2, 16.9, with $t=2.69$, and $p=0.013$ • Problem based learning has a pre and post mean score difference of 16.7 (8.1, 25.6), with $t=3.99$, and $p<0.001$	**Strength of Design:** Strong **Quality:** Medium Comments: • Convenience sampling • Noted ethics approval • ANOVA and Bonferroni tests used

Study/Design	Methods	Key Results	Comments
Authors: Tawfik et al., (2020) Design: Randomized Control Study Purpose: to evaluate the retention of knowledge between simulation and lecture-based learning in medical students	N: 72 third year medical students Country/setting: Saudi Arabia Groups: 60-minute sessions with same instructor and learning objectives Intervention: Simulation • Four different cases of bronchial asthma including intrinsic intermittent asthma, extrinsic mild asthma, extrinsic moderate asthma, and intrinsic severe asthma • Six students per group Control: Lecture • Power point presentation, with two multi-media videos Data collection: pre-, immediate post-intervention, and three months post intervention • Multiple choice knowledge assessment • Content clinical presentation, pathological changes, pathophysiology changes, etiology, etc. Outcome 1: Knowledge development Outcome 2: Feedback	Outcome 1: Knowledge • Pretest • No difference between groups (p=0.3) (Simulation: 41.2 ± 10.7%; Lecture: 38.9 ± 7.2%) • Immediate post-test • Improvement within groups (Simulation $p \leq 0.001$; lecture p=0.3), but simulation showed a greater improvement (not-significant, p=0.4) (Simulation: 50.6 ± 10.7%; Lecture: 45.3 ± 20%) • Three-month post-intervention • Scores higher than baseline, but no significant improvements (p=0.5) (Simulation: 48.9 ± 12.2%; Lecture: 46.5 ± 13.5%) Outcome 2: Feedback • General satisfaction scores higher in simulation (59.4% vs 23.3, p = 0.002) • Motivation for learning higher in simulation () • Feeling comfortable with the method higher in simulation (59.4% vs 13%, $p < 0.0001$) • Understanding of subject taught in a short time higher in simulation (59.4% vs 20%, p = 0.0007) • Better learning ability was higher in simulation (56.3% vs 13.3%, p = 0.001)	**Strength of Design:** Strong **Quality:** Medium Comments: • Noted ethics approval • Participants were medical students vs. practicing nurses, query generalizability • Standardized instructor for both groups

Study/Design	Methods	Key Results	Comments
Authors: West et al. (2020) Design: Randomized Control Study Purpose: To determine if preoperative Child Life Preparation reduced anxiety prior to intravenous anesthesia induction	N: 59, ages 3 to 10 years old, undergoing elective surgery Country/setting: Vancouver, Canada, British Columbia Children's Hospital Control Group: 31 children, standard practice **with no** Child Life Preparation program • Standard practice included topical anesthetic application (e.g., EMLA cream 5%), use of playroom preoperatively, parent accompaniment to the OR, and use of auditory and/or visual distraction techniques Intervention Group: 28 children, standard practice, and Child Life Preparation program • Adapted to the needs of the child and family • Included developmentally appropriate education (e.g., role play using dolls and medical equipment; coping and relaxation skills; and age-appropriate explanations about upcoming OR events) Data collection: Anxiety assessed at two time points using mYPAS-Short Form: 1) in the preoperative holding area 2) in the OR prior to IV cannulation • mYPAS-SF is rated out of 100, with 100 representing extremely high anxiety Outcome 1: Preoperative anxiety	Outcome 1: Preoperative anxiety Control Group: Baseline mYPAS= 29.2 [22.9-35.4] OR mYPAS= 35.4 [22.9-54.2] Intervention Group: Baseline mYPAS= 29.2 [22.0-43.8] OR mYPAS= 28.1 [22.9-35.9] • CLP significantly reduced OR mYPAS scores by an average of 13.8 (p=0.005) • In 6 to 10-year-old participants CLP significantly reduced OR anxiety (p=0.015) • In 3 to 5-year-old patients CLP did not significantly reduce OR anxiety (p=0.124)	**Strength of Design:** Strong **Quality:** Medium Key items to note: • Intervention group has more males than females with a ratio of 19:9 • Confounding factors identified and accounted for • Retention rate of 84% related to rescheduling of surgeries and change of anesthesia • Unsure if playroom used for control group was same playroom used for CLP (query if the control group received part of the intervention)

Literature Summary Table for Qualitative Studies

Legend: AORN: American Association of periOperative Registered Nurses; COREQ: Consolidated Criteria for Reporting Qualitative Research; PONT: Paediatric Perioperative Nursing Training; PNTP: Paediatric Nursing Training Program

Study/Design	Methods	Key Results	Comments
Authors: Abebe et al. (2018) Design: Qualitative Purpose: To assess how nurses who recently completed the SickKids-Ethiopia PONT applied their knowledge and skill to clinical practice	N: Nine BSc level perioperative nurses (four males and five females) who completed the PONT program, aged 27 to 53 years old. Country/setting: Ethiopia Data collection: • 25–37-minute semi-structured interviews using an interview guide by a hired interviewer • Interviews were transcribed and analyzed inductively using a systematic process of coding and theme development	Theme 1: using and sharing new knowledge, skills and confidence gained from the PONT • All participants reported the PONT helped with new knowledge and skill development, and refreshed what they already knew • Training motivated them to correct bad practices (e.g., not using count sheets, or completing the surgical safety checklist) • Participants were able to arrange education for current staff, and orientations and demonstrations for new hires Theme 2: availability of appropriate perioperative in-service training • Eight of the nine participants had never received any training prior to PONT; all training was from senior staff who had no formal training • Reported that training can motivate change, assist in improving patient well-being, and content is focused training can be easily retained Theme 3: sustainability of changes, both personal and programmatic • PONT improved confidence • Aided in the creation of change (e.g., instrument counting)	**Rating**: Medium credibility Comments: • No statement locating the researcher culturally or theoretically • Details of PONT content not discussed, mention that it aligns with the AORN program • No mention of type of patient participants cared for (e.g., adult or pediatrics) • Results can be transferable related to the educational nature • Authenticity is evident based on the descriptions and narrative presentation

Study/Design	Methods	Key Results	Comments
Authors: Solheim & Flo (2023) Design: Qualitative Purpose: to describe nurses' experiences of simulation-based learning	N: 21 medical nurses attended the focus groups who participated in the simulation (24-64 years old, and 2-25 years of nursing experience) Country/setting: Norway Intervention: two 10-to-15-minute emergency simulation scenarios (e.g., anaphylactic shock and hypoglycemia) with a computer-driven mannequin • Each simulation session had a theoretical lesson associated lead by the nursing manager • Each simulation was followed up a 25-to-30-minute debrief Data collection: • 12-18 months after training nurses were asked about their thoughts on the simulation training via focus groups • The focus groups comprised of the same nurses who were in the simulation groups • A thematic guide was used for the interviews that was developed by the researchers with specific questions pertaining to the simulation • The COREQ was followed	Theme 1: Simulation as rewarding learning method • Staff enthusiastic about the simulation • Thought it was exciting and a new way of thinking and learning for many • Positive and rewarding way to learn • Helped prepare them for the unexpected • Useful in practicing teamwork, and building trust Theme 2: Pedagogical factors that affected the simulation • Liked the small groups for simulation, simulation group was their peers, • Did not like that some had to observe, made those who did the simulation uncomfortable. However, some who observed saw benefit in watching others. • Some reported performance anxiety and feared being judged. Theme 3: Wanted to repeat simulation • All the participants expressed wanting more simulation training with difference scenarios • Some expressed wanting to repeat the study scenarios • The debrief was appreciated and helped learning	**Rating**: High credibility Comments: • Description of program included. • Results can be transferable related to the educational nature. • Authenticity is evident based on the descriptions and narrative presentation. • Had detailed description of analysis • Ethics approval • Trustworthiness established through establishing credibility, dependability and transferability

Literature Summary Table for Non-Research Literature

Legend: AORN: American Association of periOperative Registered Nurses; ASPAN=American Society of Peri-anesthesia Nurses

Study/Purpose	Appraisal Considerations	Content Relevance
Authors: Bräuer et al. (2024) Purpose: An overview of perioperative thermoregulation in children	Publication Date: 2024 Publication Source: Anasthesiologie und Intensivmedizin (article accessed in English) Work Cited: • Published Literature • Research literature • Non-research literature • Literature reviews Key Information: • Article highlights considerations for pediatric thermoregulation in the OR • Risk factors and causes of hypothermia • Preventative measures • Safety considerations for preventative measures	Content Relevance: High Content covered in article pertains to potential content of educational recourse.

Study/Purpose	Appraisal Considerations	Content Relevance
Authors: Dave (2019) Purpose: An overview of premedication and induction of anesthesia in pediatric patients	Publication Date: 2019 Publication Source: Indian Journal of Anesthesia Work Cited: • Published Literature • Research literature • Non-research literature • Literature reviews Key Information: • Article highlights key pediatric anesthesia consideration for induction • Premedication and route of administration • Non-pharmacological management of perioperative anxiety • Anesthesia induction • Pediatric anxiety	Content Relevance: Moderate Content covered in article pertains to potential content of educational recourse.

Study/Purpose	Appraisal Considerations	Content Relevance
Authors: Derig (2016) Purpose: To communicate an overview of perioperative care for pediatric patients	Publication Date: 2016 Publication Source: AORN Work Cited: • Government Agencies • Textbooks • ASPAN Competency Orientation for Registered Nurses • Published Literature • Case Studies • Recommendations and information articles Key Information: • Article highlights key pediatric knowledge perioperative nurses should know while caring for pediatric patients, including: • Development stages • Laryngospasms • Positioning • Thermoregulation • Airway differences • Fluid management	Content Relevance: High Content covered in article pertains directly to Literature Review objective.

Study/Purpose	Appraisal Considerations	Content Relevance
Authors: Mower (2015) Purpose: To communicate age-specific plans of care for the perioperative setting	Publication Date: 2015 Publication Source: AORN Work Cited: • Government agencies • Textbooks • Published Literature • Case studies • Non-research literature Key Information: • Age specific differences for perioperative care (i.e., neonate to adult) • Section on infants and children, and adolescents, covering topics such as: • Pain • Temperature regulation • Pulmonary function • Psychosocial	Content Relevance: High Content covered in article pertains directly to Literature Review objective.

Study/Purpose	Appraisal Considerations	Content Relevance
Authors: Nemeth et al. (2021) Purpose: To address anesthesia concerns related to pediatric hypothermia	Publication Date: 2021 Publication Source: International Journal of Environment Research and Public Health Work Cited: • Published Literature • Quality improvement projects • Case studies • Non-research literature Key Information: • Anesthesia concerns for the pediatric patient and perioperative hypothermia • Incidence • Development • Risk Factors • Adverse Events • Prevention	Content Relevance: Moderate Content covered in article pertains to potential content of educational recourse.

Study/Purpose	Appraisal Considerations	Content Relevance
Authors: Panella (2016) Purpose: Child Life perspective of preoperative care of the pediatric patient	Publication Date: 2016 Publication Source: AORN Work Cited: • Textbook • Published Literature • Quality improvement projects • Case studies • Non-research literature Key Information: • Developmental stages of pediatric patients and the unique preparation commonly required for surgical procedures	Content Relevance: Moderate Content covered in article pertains to potential content of educational recourse.

Appendix C: Consultations and Environmental Scan Report

London Health Sciences Centre (LHSC) Victoria Hospital in London, Ontario, serves as a trauma hospital for all ages in Southwestern Ontario. This facility's operating room (OR) completes elective and trauma procedures on pediatric (neonatal to adolescent) and adult patients. There is no dedicated or specialized nursing staff for either patient population. At this facility, I am the clinical educator responsible for ensuring that nursing staff are provided with education to provide safe and competent patient care. This includes orientating new nursing staff to the OR (e.g., new nursing graduates and experienced nurses) with or without prior OR experience. Additionally, many new nursing hires to the OR come with adult experience and minimal pediatric experience. Despite this identified lack of pediatric expertise, our current orientation does not include pediatric content, except for mentioning that they are a particular population with unique needs. Further, despite caring for pediatric patients for decades, there has never been a pediatric-focused education for new nursing hires in the OR at LHSC. This is a noteworthy oversight, and as the current clinical educator, I hope to change this with my Master of Nursing Science (MScN) practicum project. For this project, in partial fulfillment for my degree, I hope to develop a pediatric orientation resource for new nursing hires to the OR to provide them with the knowledge and skills to care for pediatric patients safely and competently.

Before starting the consultations and environmental scan, I completed a literature review exploring the development of educational resources for new nursing hires in the OR. In the literature review, I identified vital perioperative considerations for pediatric patients (e.g., thermoregulation, procedural differences for induction, and family-centered care) and potential delivery modalities of the resource (e.g., lecture, simulation, independent learning, and multi-modal). The literature review provided foundational knowledge that aided in the completion of

consultations with personnel from the LHSC OR and an environmental scan. I consulted with current OR nurses with varying OR experience levels, pediatric anesthesiologists and surgeons, OR managers, and the OR professional practice consultant. Through the consultations, I aimed to understand the current state of pediatric knowledge amongst nurses, which delivery modalities were preferred by nurses, and to determine any barriers or challenges new nurses to the OR experience when caring for pediatric patients noted by LHSC OR personnel. The environmental scan occurred simultaneously and involved consulting pediatric clinical educators (in units other than the OR) from LHSC and pediatric OR clinical educators nationwide. Through the environmental scan, I aimed to explore essential knowledge and skills for pediatric care and understand what other pediatric ORs are doing for their orientations. Additionally, I explored guidelines and resources from professional organizations, such as the American Association of periOperative Registered Nurses (AORN), Operating Room Nurses Association of Canada (ORNAC), Canadian Anesthesiologists' Society and American Society of Anesthesiologists, to gain insights into necessary content for the resource (e.g., thermoregulation, and anesthesia recommendations), and recommendations for education delivery for new nurses hired to the OR.

In the following paper, I will present my findings from the consultations and environmental scan. These conclusions will be used in creating an OR pediatric orientation resource for new nursing hires.

Methods

I completed consultations and an environmental scan to expand on the knowledge gained from the literature review. Specifically, I consulted with individuals affiliated with the LHSC OR and completed the environmental scan through communications with pediatric clinical educators at LHSC and pediatric OR clinical educators from across Canada. I also included a review of

resources from the AORN, ORNAC, Canadian Anesthesiologists' Society and American Society of Anesthesiologists in the environmental scan. Plans for both the consultations and environmental scan were developed with the assistance of my supervisor to determine the most effective collection methods (e.g., interview, survey, email) and to develop the data collection tools. In the next section, I will describe my methodology, objectives, and data analysis of the consultations and environmental scan findings.

Consultation Plan

I consulted with members and affiliates of the LHSC OR who could provide insights into essential content and delivery modalities of the pediatric orientation resource and assist with resource development. I sent surveys to current OR nursing staff with varying levels of OR experience (e.g., six months or less experience, 6 to 12 months of experience, 1 to 2 years of experience, and more than two years of experience in the OR) and pediatric anesthesiologists and surgeons. Additionally, I interviewed the current OR managers and the OR professional practice consult to determine current knowledge gaps influencing pediatric care, get their recommendations on resource development, and obtain their general feedback regarding a pediatric orientation for the OR. When conducting the consultations, there were three outlined objectives:

1. To determine what knowledge and skills novice nurses need to care for pediatric patients in the OR. This was completed through consulting OR nursing staff with different levels of experience (e.g., six months or less experience, 6 to 12 months of experience, 1 to 2 years of experience, and more than two years of experience in the OR), OR managers, and pediatric anesthesiologists and surgeons.

2. To determine the fundamental pediatric content to include in the pediatric orientation resource for new nursing hires to the OR through either surveys or interviews with current OR nursing staff with different levels of experience, OR managers, a professional practice consultant, and pediatric anesthesiologists and surgeons.
3. To determine the preferred delivery modality or combination of modalities for the pediatric orientation resource through either surveys or interviews with current OR nursing staff with different levels of experience, current OR managers, and a professional practice consultant.

Current OR Nursing Staff

Current OR nursing staff with varying levels of OR experience (e.g., six months or less experience, 6 to 12 months of experience, 1 to 2 years of experience, and more than two years of experience in the OR) were asked to complete a voluntary survey asking for their opinions and experiences working with pediatric patients and their views of how new staff care for pediatric patients. The survey was created on Microsoft Forms and included branching, Likert Scale, select all, and short text questions. I had planned to present the survey at one of the unit's weekly in-services, but due to time constraints, this was not possible. Instead, I emailed the nursing staff a short description of the survey and provided a link to the survey. I also included the survey description and link in our weekly newsletter and posted a QR code where? that took the staff member to the survey when scanned. The email and survey sent to current OR nurses are in Appendices A and B. Approximately 120 nurses (registered nurses and registered practical nurses) are in the OR and I received 22 responses.

Pediatric Anesthesiologists and Surgeons

Nursing, anesthesia, and surgery work closely in the OR to ensure patients are safely

cared for. Due to this and the expertise in pediatric care within the OR, pediatric anesthesiologists and surgeons have unique insights into what they consider fundamental skills and competencies for OR nurses who assist them in providing patient care. Through an email containing a description of the project, I sent a Microsoft Forms survey link to the pediatric anesthesiologists and surgeons at LHSC. The survey included branching, Likert Scale, select all, and short text questions. The email and survey sent to pediatric anesthesiologists and surgeons can be found in Appendices C and D. I emailed the survey to 25 pediatric anesthesiologists and surgeons and received seven responses.

I used a Microsoft Excel spreadsheet to organize and analyze data and content analysis methodologies by Elo & Kyngäs (2008) to analyze the data. I organized the data into categories and subcategories to better visualize and understand the data.

OR Managers

The OR managers are crucial for staff education as they are acutely aware of safety incidents and gaps in staff knowledge and skills through adverse event reports, word of mouth, and unit metrics. I met with the two OR managers in person for a 30-minute semi-structured interview to gain insights based on their experiences that will benefit the development of the pediatric orientation resource. The email and semi-structured interview questions can be found in Appendix E.

Professional Practice Consultant

At LHSC, all units have a professional practice consultant who ensures staff practice safely and competently and is available for any practice-related concerns and questions. I consulted the professional practice consultant for the OR for assistance with content, resource development, and organizational guidelines and recommendations for orientation development. I

met with them via Microsoft Teams for a 30-minute semi-structured interview. Appendix F includes a copy of the email and questions sent to the professional practice consultant.

Data Management and Analysis

I exported survey data into a Microsoft Excel spreadsheet for easy viewing and analysis, and I transcribed the notes from semi-structured interviews into a Microsoft Word document. I analyzed quantitative data from the surveys using descriptive statistics, whereas I analyzed qualitative data from the surveys and semi-structured interviews using methodologies laid out by Elo & Kyngäs (2008) for inductive content analysis. I created categories within the data which I further categorized to determine larger groups/categories/ideas/patterns to assist with understanding the information.

As mentioned, I concurrently completed an environmental scan. In the next sections, I will highlight its purpose, objectives, and methodologies.

Environmental Scan

The intent of the environmental scan was to gather information from individuals and written sources internal and external to my organization but outside of my direct unit (Charlton et al., 2021). I contacted pediatric clinical educators at LHSC and OR pediatric clinical educators from across Canada and sent pre-created questions regarding their new hire unit orientations, barriers and challenges noted in new hire orientations, and delivery of their orientations. The objectives of the environmental scan were:

1. To determine the fundamental pediatric content needed in the orientation resource through consulting pediatric clinical educators within LHSC and across Canada, as well as by accessing guidelines and resources published by the American Association of periOperative Registered Nurses (AORN), Operating Room Nurses Association of

Canada (ORNAC), Canadian Anesthesiologists' Society and American Society of Anesthesiologists.

2. To determine the most effective delivery modality or combination of modalities for the orientation resource based on recommendations from pediatric clinical educators within LHSC and across Canada and the guidelines and resources from AORN, ORNAC, Canadian Anesthesiologists' Society, and American Society of Anesthesiologists.
3. To identify developed guidelines and resources that can be used in creating the pediatric orientation resource through consultations with pediatric clinical educators at LHSC and across Canada.

In the following sections, I will discuss the different resources reviewed and the individuals I consulted to complete the environmental scan.

LHSC Pediatric Clinical Educators

LHSC has numerous pediatric clinical educators who work in neonatal, inpatient, outpatient, critical care, and perioperative care. These clinical educators are experts in their respective areas and have the knowledge and resources to assist in developing a pediatric orientation resource for new nurses to the OR. I emailed these clinical educators about the project and my questions about pediatric education within their areas. I gave the option of setting up a Microsoft Teams or in-person semi-structured interview or answering the questions via email. I received two responses, one from the neonatal intensive care unit (NICU) and one from perioperative care. I had a 60-minute semi-structured interview over Microsoft Teams with the clinical educators from NICU and a 60-minute in-person semi-structured interview with the pediatric educator from perioperative care. The email and questions I sent to the LHSC clinical educators can be found in Appendix G.

Canadian OR Pediatric Clinical Educators

I am part of a Canada-wide OR clinical educator group that includes adult and pediatric hospitals, with hospitals ranging from community hospitals to trauma hospitals. A central component of this group is asking practice, policy, and education-related questions to our peers**.** I emailed the group asking for assistance from those caring for pediatric patients regarding orientation education for new OR nursing hires. The email described the project, asked some questions about the content and delivery of their education, and asked what resources they used to help with development. Appendix H contains the email and semi-structured interview questions I sent these clinical educators. I received four responses to the email. Some responses were very detailed, whereas others were vague or only answered specific questions.

Practice Standards and Guidelines

The resources utilized for the environmental scan were:

- 2023 edition of the AORN Guidelines for Perioperative Practice
- 2023 ORNAC Standards, Guidelines, and Position Statements for Perioperative Registered Nurses
- 2022 American Society of Anesthesiologists practice guidelines for management of the difficult airway,
- Statement on American Society of Anesthesiologists physical status classification system
- Statement on practice recommendations for pediatric anesthesia from the American Society of Anesthesiologists
- 2023 American Society of Anesthesiologists practice guidelines for preoperative fasting
- Canadian Anesthesiologists' Society guidelines for? the practice of anesthesia

All resources from the American Society of Anesthesiologists and the Canadian

Anesthesiologists' Society were free to access online through the organizations' websites. The AORN guidelines and ORNAC standards are purchased resources that I accessed through permissions from LHSC OR management.

I initially thought these resources would be essential for developing the pediatric orientation resource due to their relevancy and impact on current policies and procedures within the OR. To complete the resource assessment, I read each guideline and standard and noted any content related to pediatric patient care in the OR. The AORN and American Society of Anesthesiologists guidelines provided a great basis for pediatric recommendations as this population were mentioned in the guidelines. The other resources and guidelines did not, or minimally mentioned pediatric patients, and were therefore not as impactful with the development of the pediatric orientation resource.

Data Management and Analysis

Information from email replies and the practice standards and guidelines were copied into a Microsoft Excel spreadsheet. I transcribed my notes from the semi-structured interviews in a Microsoft Word document and later copied it into a Microsoft Excel spreadsheet so all data would be together. I analyzed all interview data via inductive content analysis following the methodologies by Elo & Kyngäs (2008). To better understand the data, I categorized information into common categories (e.g., content, delivery) and subcategories based on the questions asked in the survey and the responses received.

Ethics

Ethics approval from MUN was not required as this project falls under number three of MUN's Health Research Ethics Authority (HREA) Screening Tool (Appendix A) as the project is for quality improvement with no research component. Due to being a quality improvement

project with no research component, no ethics approval was necessary from LHSC. My only requirement from LHSC was to obtain approval from the unit managers and director. I have received approval from these individuals, and they have no issues with the project being completed on the unit.

Consultations

All information gathered from the surveys and semi-structured interviews was given voluntarily, and consent was implied based on participation. All data obtained from the consultations was de-identified, and no personal information was asked of any participants (e.g., in the survey). Information from nursing and pediatric physicians will be presented in the following sections as group data (e.g., from current OR nursing staff). Information from OR managers and the professional practice consultant will be identified by role with no personal information.

Environmental Scan

All information gathered from the Clinical Educators was confidential and given voluntarily. Responding to my email implied consent to participate. The data collected is stored on my password-protected computer in a file dedicated to this project to prevent the accidental release of raw data. Information from the individuals will be presented in the next section as grouped data, i.e., “from OR Clinical Educators across Canada,” rather than presented individually.

Consultation Results

The consultations provided great insights into the perspectives of current OR nursing staff, pediatric anesthesiologists and surgeons, OR managers, and the professional practice consultant. The information from these consultations further supported the literature review

findings and provided additional items to consider. The survey response rates were low, with 22 of 140 current OR nurses (15%) and 7 of 20 (35%) pediatric anesthesiologists and surgeons completing the survey. These results are surprising as it was found in a meta-analysis that with the increase in popularity, intranet online surveys used in published research have an average response rate of 44.1% (Wu et al., 2022). Additionally, I thought the response rate would be higher as current OR nurses and physicians repeatedly report the need for more education for new OR nurses and are opinionated on how it should be developed. However, the surveys were distributed during July, corresponding with many summer vacations, which may account for a portion of those who did not respond. Despite this, I received enough responses with substantive data providing an appropriate foundation for the orientation resource.

Nursing Experience

Of the nurses who responded, four had less than two years of OR experience (two 6-months or less, one 6-to-12 months, and one 1-to-2 years of experience); the other nurses had greater than 2 years of OR experience with 36% (8 of 22) having 5-to-10 years of experience and 27.3% (6 of 22) having greater than 15. Prior pediatric experience was low, with only four nurses reporting prior pediatric experience (one with less than 2 years of OR experience and three with greater than 2 years of OR experience). Two of those with prior pediatric experience had 2-to-5 years of experience with pediatric patients, whereas the other two nurses had 6 months or less of pediatric experience.

Current Orientation and Readiness

LHSC's current OR Orientation combines in-class lectures and precepted shifts. If the new nursing hire does not have prior OR experience, they also enroll in an OR course that covers the basics of being an OR nurse. There is currently minimal content for pediatric patients, and

the primary way they receive pediatric knowledge and experience is through their precepted shifts.

Those with less than 2 years of OR experience reported mixed feelings about how the in-class OR orientation prepared them for pediatric patients. Of the four respondents, they each chose a different component of the Likert Scale when asked if the in-class orientation prepared them for practice with pediatric patients; one chose each of agree, neither agree nor disagree, disagree, and strongly disagree. This changed when asked how the precepted shifts prepared them for pediatric practice, with three respondents agreeing and one strongly disagreeing. The difference could be the surgical service new OR nurses are placed into for orientation. Not all surgical services have pediatric patients, and pediatric experience is not an intentional component of our current orientation.

The experienced nurses (those with over 2 years of OR experience) were asked if they felt new nursing hires to the OR were prepared well in orientation to care for pediatric patients. Of the 18 nurses, 12 disagreed with the statement, and one strongly disagreed; this amounts to 72.2% of the experienced nurses; two nurses agreed with the statement, and two neither agreed nor disagreed. Pediatric anesthesiologists and surgeons were asked a similar question: “I feel confident that VH-OR nurses have the competency to care for pediatric patients. Of the seven respondents, six agreed with this statement, and 1strongly agreed. The difference in opinions here may be related to how closely the nurses work together in the room, and that the experienced nurses are precepting new nursing hires regularly and are acutely aware of the knowledge gaps of new nursing hires.

Gaps in Knowledge and Skills

There were many identified knowledge gaps for new nursing hires to the OR. In the surveys, examples of crucial nursing knowledge regarding pediatric patients were provided based on findings from the literature review. The areas that were identified with the most extensive knowledge gaps were developmental stages and age-specific care (highlighted by all physicians, nursing (18 of 22), OR managers and professional practice consultant), procedural differences for inductions and anesthesia complications (highlighted by 6 of 7 physicians, 19 of 22 nurses, OR managers and professional practice consultant), and anatomical differences and vital signs (highlighted by 2 of 7 physicians, 17 or 22 nursing staff and the professional practice consultant). Some of those who participated in the surveys or interviews further elaborated on these topics. They stated that new nurses lack experience interacting with pediatric patients (e.g., how to talk to them and hold infants), gaining trust, and forming relationships with pediatric patients. They also lack basic assessment skills for pediatric patients. Due to this experience, it is thought that new nurses are unable to recognize when a patient is deteriorating and how to help. Those who participated also identified additional knowledge gaps, such as how to prepare the OR environment for pediatric patients (e.g., warming the room), specialized equipment for airways and vitals monitoring, pediatric surgical instrumentation (e.g., choosing instrumentation based on size of patient and special surgical equipment for pediatric patient), and the attention to detail to ensure we maintain skin integrity (e.g., choosing the proper surgical skin prep, use of surgical tape, and location of electrical surgical grounding pad).

Essential Resource Content

All consulted personnel were asked about essential content for the pediatric orientation resource. Utilizing content analysis methodologies laid out by Elo & Kyngäs (2008), I identified

categories and subcategories. These included growth and development (including developmental stages, age-specific care, and how to talk to pediatric patients), thermoregulation (including techniques to warm pediatric patients at different developmental stages, and risks and consequences of hypothermia), family-centered care (including parental presence for induction, incorporating Child Life Specialists in care or adapting their techniques to assist in reducing stress in patients and families, and how to speak to families and include them in the care of the pediatric patient), assisting anesthesia (including the difference in pediatric airways, inductions, emergency management, and equipment), and understanding of pediatric surgical equipment (including selecting the size of instrumentation based on the pediatric patient, and specialized surgical equipment).

Resource Delivery Modality

Only nurses were asked about preferred delivery modality due to the resource being developed for nurses. There was a resounding preference for multi-modal delivery (e.g., lecture paired with simulation), with 20 of 22 nurses indicating it as an effective way for them to learn. Simulation-based learning was also preferred by 13 of 22 nurses, suggesting that it was an effective learning modality. Two nurses also indicated that hands-on patient care experience, such as assigned precepted shifts with pediatric patients, would be beneficial.

Barriers and Challenges

Consulted individuals identified many barriers and challenges with OR nurses when caring for pediatric patients. The main barrier was a lack of knowledge or experience with pediatric care. Within this, subcategories were identified, such as lack of knowledge on interacting with pediatric patients, assisting anesthesia, providing family-centered care, and identifying and selecting pediatric equipment.

The most common barrier or challenge identified was a lack of knowledge about interacting with pediatric patients. It was noted that new nurses lack the personal experience and knowledge to develop therapeutic relationships with pediatric patients. They are unaware of how to speak to pediatric patients (specifically infants, toddlers, and preschool-aged children) when to include the pediatric patient in assessments, and unsure of how to carry or transport the patient to the OR (e.g., carry, toy car, walk, crib or stretcher). Further, it was stated that new nurses to the OR are unable to effectively manage and soothe pediatric patients who are experiencing preoperative anxiety. Related to this category was the identified lack of knowledge that new nurses to the OR (especially those without prior pediatric experience) have regarding the developmental stages of pediatric patients, and the necessary age-specific care requirements. Many new nurses to the OR are young adults with minimal personal experience with children. Further, it was mentioned by one individual that pediatric care was not a required component of their nursing education; I cannot verify what nursing program this individual attended, but this is noteworthy as the pediatric orientation resource may have to start with the basics of pediatric care (e.g., vital signs). As the resource is implemented and continually refined what is being taught in nursing schools may need to be considered to ensure that new nursing hires to the OR have a fundamental understanding of pediatric care and assessment.

Another prominent theme from the data was the knowledge and skill to assist anesthesia effectively. Some subcategories included a lack of knowledge to identify emergencies (e.g., laryngospasms), pediatric deterioration, and treating pediatric patients like adult patients (e.g., with equipment and their patient-nurse interactions).

The last two identified barriers and challenges were a lack of family-centered care and pediatric equipment knowledge. The difficulties identified with family-centered care were a lack

of awareness of parental presence for induction and the inability to incorporate or speak to families accompanying pediatric patients. Lack of knowledge of pediatric equipment was also identified, specifically when it came to specialized equipment (e.g., tape oximeter compared to clip oximeter or laparoscopic equipment) or awareness of the pediatric patient size (e.g., choosing the correct size of retractor or needle drivers).

The consultations have yielded valuable information that can be directly applied to the creation of the pediatric orientation resource for new nursing hires to the OR at LHSC. To supplement this information, I completed an environmental scan, and the results are presented in the next section.

Environmental Scan Results

The personnel consulted, and resources explored for the environmental scan provided significant information for developing the OR pediatric orientation resource. I had three LHSC pediatric clinical educators respond, two from NICU and one from perioperative care, and five pediatric OR clinical educators respond from across the country (Ontario, PEI, Manitoba, and British Columbia). Some of the resources reviewed did not provide a large variety of information or detailed information. The standards from ORNAC and the Canadian Anesthesiologists' Society provided vague recommendations, such as ensuring staff are adequately trained and having appropriately sized equipment for pediatric patients (Dobson et al., 2024; ORNAC, 2023). However, the guidelines from AORN had an immense amount of helpful and research-based recommendations, as well as the American Society of Anesthesiologists that had published guidelines on difficult airway management and fasting guidelines (Apfelbaum et al., 2022; AORN, 2023; Committee on Economics, 2020; Committee on Pediatric Anesthesia, 2021; Joshi et al., 2023).

Utilizing Elo and Kyngäs' (2008) content analysis methodology, I determined categories and subcategories within the environmental scan data. These categories were based on the questions asked during the semi-structured interviews and email and included essential knowledge, delivery modality, and barriers and challenges. A few subcategories were identified from the essential knowledge and skills category that will be discussed, including individualized patient care and anesthesia care for pediatric patients. I will present this information in the following section.

Essential Knowledge and Skill

All the guidelines and all but one personnel involved in the environmental scan (e.g., ORNAC, AORN, American Society of Anesthesiologists and the Canadian Anesthesiologists' Society) emphasized the need for proper pediatric education to ensure competency (Apfelbaum et al., 2022; AORN, 2023; Committee on Pediatric Anesthesia, 2021; Dobson et al., 2024; Joshi et al., 2023; ORNAC, 2023). Unfortunately, the guidelines did not specify what content was essential for pediatric education before independent practice in the OR, but they did provide practice recommendations that can be used to determine essential education. From the clinical educator groups, one OR pediatric clinical educator mentioned that they currently do not offer any formal orientation besides preceptor shifts. However, they noted that education is important to ensure safe patient care and that they would re-evaluate their orientation to determine if it was necessary. The remaining clinical educators (at LHSC and across Canada) all felt that proper education before precepted shifts was essential.

Recommended essential pediatric topics from the clinical educators were similar, including developmental stages and age-specific care, assessments (e.g., vital signs, pain, neuro), thermoregulation, physiological differences between pediatric and adult patients, skin integrity

(e.g., skin development, pressure injury prevention, and positioning), emergency management and assisting anesthesia. To build on the necessary content the NICU educators emphasized the importance of educating nurses about the difference between neonates and the rest of the children population. The main differences emphasized were the immature skin development and the negative impact improper skin prep selection and surgical dressing and tape can have, as well as changes and differences in vital sign values depending on the gestational age of the patient. These are important considerations when developing this resource that I would not have considered without their guidance. The guidelines emphasized assisting anesthesia, emergency airway management, individualized care, thermoregulation, surgical skin prep selection, pressure injury prevention, and fasting guidelines for pediatric patients.

Individualized Patient Care

Adapting nursing care to the patient can be incredibly impactful (AORN, 2023). AORN (2023) recommends individualizing patient care for pediatric patients to assist in reducing preoperative anxiety and creating therapeutic relationships. The pediatric clinical educators at LHSC and across Canada further emphasize this. The clinical educators all identified knowledge of the pediatric developmental stages and age-specific care as essential content for the orientation resource. With this knowledge, new OR nurses can improve their communication with the pediatric patient, tailor their assessments to the patient, and create a more holistic therapeutic relationship.

Anesthesia Care for Pediatric Patients

Assisting anesthesia during the perioperative period is essential for all OR nurses, regardless of patient age. However, there are many differences between adults and pediatric patients regarding anesthesia care, including induction procedures, emergencies, and airway

anatomy. As an OR nurse, it is essential that one is aware of the differences and understands how to assist anesthesia with routine care, difficult airways, and in emergency situations. All but one OR pediatric clinical educator indicated that knowledge of anesthesia care for pediatric patients was essential to the OR nurse's practice due to the process being different from adults. Further, ORNAC states that OR nurses need to be aware of the anesthesia plan of care to provide safe and competent patient care (ORNAC, 2023). This is partially done by having the foundational knowledge and skills to assist anesthesia.

To assist with providing new OR nursing staff with this knowledge, many clinical educators shared their current orientations with me, and there are resources online that can be accessed (some of which were included in the previously completed literature review), one of which is from the American Society of Anesthesiologists. The American Society of Anesthesiologists has a detailed guideline for anesthesiologists to manage difficult airways, including pediatric patients, which can be used as a reference for the pediatric orientation resource (Apfelbaum et al., 2022).

With essential knowledge and skills identified for the pediatric orientation resource, in the next section I will focus on delivery modalities of other pediatric orientations.

Resource Delivery Modality

There was no mention of recommended delivery modalities of orientations in the chosen guidelines; however, the clinical educators provided many insights into how they currently facilitate their orientations. The most common delivery modality was multi-modal, primarily lecture paired with simulation (e.g., in a simulation lab or hands-on experience with the equipment). In contrast, another clinical educator provided their staff with an independent learning booklet, lecture, and a shadow shift with a Child Life Specialist before the new staff

precepted shifts. Clinical educators emphasized providing multiple delivery methods to appeal to different learning styles and provide some hands-on experience with equipment and techniques prior to patient care.

Two clinical educators mentioned that they utilize a tiered orientation, which allows new hires to gain comfort in caring for less acute or adult patients before caring for more acute or pediatric patients. One clinical educator divides their orientation into two sessions, adult and pediatric, and has staff complete in-class orientation and precepted shifts with adult patients approximately 1 month before completing pediatric in-class orientation and precepted shifts. They have found this tiered orientation effective as it allows new staff to gain comfort with the unit and adult patients before caring for pediatric patients and the complexities and unpredictability that can come with this unique population.

Barrier and Challenges

The clinical educators provided many insights into the barriers and challenges experienced by new nursing hires when caring for pediatric patients. Some common barriers and challenges identified include lack of exposure to pediatric patients, fear, being uncomfortable with having someone always watching you provide care (e.g., parents or caregiver), knowledge gaps and minimal prior nursing experience, not following policy, adapting to different workflows with pediatric patients compared with adults, and not understanding family-centered care (e.g., including parents in child's care). These barriers can be challenging to overcome with little or no education on pediatric patients before providing care.

To support new nursing hires, the clinical educators provided comprehensive pediatric education/orientation, plenty of precepted shifts with pediatric patients, shadow shifts with Child Life Specialists, and ongoing support from the clinical educator, management, and charge nurses.

Additionally, continuing education and skill refreshers were found to help ensure staff maintain competency in pediatric care.

The main categories of essential knowledge and skills, delivery modality, and barriers and challenges were consistent in the environmental scan and consultations. In the following section, I will synthesize the consultations and environmental scan findings.

Synthesis of Findings

The information acquired from the environmental scan and the consultations provide a strong foundation for developing the pediatric orientation resource for new nursing hires to the OR.

Through the consultations, I identified that the current OR orientation lacks pediatric content, and experienced nurses are noticing the deficit in knowledge and skills amongst new hires. Although pediatric physicians do feel confident in the competency of the OR nurses to care for pediatric patients, they did note that there were challenges and gaps in new nurses' knowledge that may impact care.

Gaps in Knowledge and Skills and Essential Content

The consultations provided great insights into the knowledge and skills gaps of current OR nurses. These gaps included knowledge of pediatric developmental stages and age-specific care, physiological and anatomical differences between adult and pediatric patients (including vital signs), specialized pediatric anesthesia and surgical equipment, and anesthesia procedures for pediatric patients. This is reinforced in the findings from the environmental scan. Essential content for the pediatric orientation resource identified in the environmental scan includes knowledge of pediatric developmental stages and age-specific care (including individualized care), family-centered care, ability to assist anesthesia, skin integrity (e.g., surgical prep

selection, pressure injury prevention, and positioning), thermoregulation, emergency management, and understanding of surgical equipment.

The essential content emphasized in the consultations and environmental scan aligns with what was found in the literature review (Derig, 2016; Mower, 2015; Panella, 2016). This is partially because some of the survey and interview questions are based on the literature review findings. Still, some of the essential content suggested by individuals had no example prompts (e.g., in the environmental scan). This alignment of findings between the literature review, consultations, and environmental scan adds robustness to the foundation for the orientation resource.

Resource Delivery Modality

In both the consultations and environmental scan, the preferred delivery modality was multi-modal (e.g., lecture and simulation, independent learning paired with shadow shifts and lecture). This delivery modality was preferred as it presented similar information multiple times in different ways, appealed to various learning styles, and when combined with hands-on opportunities (e.g., simulation), it was beneficial in solidifying taught knowledge (Crowe et al., 2018; Mohammed et al., 2021). The literature reflects this preference not only from learner preference but also due to the increased knowledge gain, nursing competency, and quality of nursing care noted compared to other learning modalities (Crowe et al., 2018; Mohammed et al., 2021). Multi-modal delivery is also supported by Knowles' Adult Learning Theory in that adults learn best in a collaborative and respectful environment where they can put the teachings into practice (Collins, 2004; Teaching Excellence in Adult Learning [TEAL] Centre, 2011). Multi-modal resource delivery will allow this to occur using simulation and gamification, in addition to lectures or a self-directed learning package (Collins, 2004; TEAL Centre, 2011).

Two clinical educators utilized a tiered orientation, progressively building on knowledge and skills. Although I can see the benefit of this orientation style, I am unsure how to implement this in the LHSC OR. Many surgical services in the OR provide care for adult and pediatric patients, and the OR is currently structured in such a way that we do not have separate staff for either patient population. One way I may be able to incorporate this premise is through separate adult and pediatric orientation days, but still keeping the orientation days at the beginning of the nurse's orientation. Separating the content may assist the new hire in understanding that there are two separate patient populations with unique considerations.

Barriers and Challenges

Numerous identified barriers and challenges were rooted in a lack of knowledge, skill, and experience with pediatric patients. Many nurses who come to the OR do not have prior pediatric nursing experience and, without provided education, are not given the knowledge and skill to provide competent care for these patients. One of the most prominent identified challenges is that new pediatric nurses do not know how to talk to or interact with pediatric patients and, therefore, have difficulty completing assessments, making care decisions (e.g., how to transport the patient to the OR), and forming positive therapeutic relationships that could help ease preoperative anxiety. The main barrier with this is that new nursing hires do not understand the different developmental stages and age-specific care necessary for pediatric patients, which is evident in their interactions. Other identified barriers included a lack of assessment skills (e.g., vital signs, pain), understanding of pediatric emergencies, and family-centered care. Hopefully, by including these topics in the pediatric orientation resource, I can help new nurses hired to the OR overcome these barriers and challenges.

Conclusion

Using consultations and an environmental scan, I determined that there were identified knowledge and skill gaps in current OR nurses regarding pediatric patients in the OR. Thus, there is a need for a pediatric-specific OR orientation. During the consultations, I gained insights from key personnel regarding essential content to include in the pediatric orientation resource for new nurses hired to the OR, the best delivery modality, and barriers and challenges for nurses when working with pediatric patients. The environmental scan reinforced this information, where I consulted other pediatric clinical educators at LHSC and pediatric OR clinical educators from across the country. The environmental scan also gave me insights into what other units within LHSC and ORs across Canada are doing for their orientations; I can use this information and modify it to fit the needs of the LHSC OR. The one barrier to the consultations and environmental scan was the lack of responses to surveys and emails. Although the information gathered was noteworthy and helped tremendously in providing a foundation for developing the pediatric orientation resource, it is possible that more responses would have provided contrasting inputs or stronger arguments for content inclusion. Despite this, I was able to identify categories/themes within the data, such as knowledge gaps, essential pediatric knowledge, essential resource content, resource delivery modality and barriers and challenges. Within these categories, I identified subcategories such as individualized care and anesthesia care. The information gathered through the consultations and environmental scan, coupled with findings from the literature review, will provide foundational knowledge to develop an impactful pediatric orientation resource for new nursing hires to the LHSC OR that provides staff with the knowledge and skills necessary to provide safe and competent care to pediatric patients.

References

Apfelbaum, J. L., Hagberg, C. A., Connis, R. T., Abdelmalak, B. B., Agarkar, M., Dutton, R. P., Fiadjoe, J. E., Greif, R., Klock, P. A., Mercier, D., Myatra, S. N., O'Sullivan, E. P., Rosenblatt, W. H., Sorbello, M., & Tung, A. (2022). 2022 American Society of Anesthesiologists practice guidelines for management of the difficult airway. *Anesthesiology (Philadelphia), 136*(1), 31–81. https://doi.org/10.1097/aln.0000000000004002

Association of perioperative Registered Nurses. (2023). *Guidelines for perioperative practice*. 2023 Edition. AORN, Inc.

Charlton, P., Kean, T., Liu, R. H., Nagel, D. A., Azar, R., Doucet, S., Luke, A., Montelpare, W., Mears, K., & Boulos, L. (2021). Use of environmental scans in health services delivery research: a scoping review. *BMJ open*, *11*(11), e050284. https://doi.org/10.1136/bmjopen-2021-050284

Collins, J. (2004). Education techniques for lifelong learning: Principles of adult learning. *RadioGraphics*, *24* (4),1483–1489. Available at: https://doi.org/10.1148/rg.245045020

Committee on Economics. (2020). Statement on ASA physical status classification system. *American Society of Anesthesiologists.* https://www.asahq.org/standards-and-practice-parameters/statement-on-asa-physical-status-classification-system

Committee on Pediatric Anesthesia. (2021). Statement on practice recommendations for pediatric anesthesia. *American Society of Anesthesiologists'*. https://www.asahq.org/standards-and-practice-parameters/statement-on-practice-recommendations-for-pediatric-anesthesia

Crowe, S., Ewart, L., & Derman, S. (2018). The impact of simulation based education on nursing confidence, knowledge and patient outcomes on general medicine units. *Nurse Education in Practice*, *29*, 70–75. https://doi.org/10.1016/j.nepr.2017.11.017

Derieg, S. (2016). An overview of perioperative care for pediatric patients. *AORN Journal*, *104*(1), 4–10. https://doi.org/10.1016/j.aorn.2016.05.001

Dobson, G., Chau, A., Denomme, J., Frost, S., Fuda, G., Mc Donnell, C., Milkovich, R., Milne, A. D., Sparrow, K., Subramani, Y., & Young, C. (2024). Guidelines to the practice of anesthesia—Revised edition 2024. *Canadian Journal of Anesthesia*, *71*(1), 8–54. https://doi.org/10.1007/s12630-023-02675-0

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115. https://doi.org/10.1111/j.1365-2648.2007.04569.x

Joshi, G. P., Abdelmalak, B. B., Weigel, W. A., Harbell, M. W., Kuo, C. I., Soriano, S. G., Stricker, P. A., Tipton, T., Grant, M. D., Marbella, A. M., Agarkar, M., Blanck, J. F., & Domino, K. B. (2023). 2023 American Society of Anesthesiologists practice guidelines for preoperative fasting: Carbohydrate-containing clear liquids with or without protein, chewing Gum, and pediatric fasting duration-A modular update of the 2017 American Society of Anesthesiologists practice guidelines for preoperative fasting. *Anesthesiology (Philadelphia)*, *138*(2), 132–151. https://doi.org/10.1097/ALN.0000000000004381

Mohammed, F. I., Al Sharkawi, S. S., Sabaq, A. G., & Abd-Elaziz, S. M. (2021). Improve nurses' competency level regarding care of children undergoing intestinal obstruction surgery: An educational program. *International Journal of Novel Research in Healthcare and Nursing, 8*(1), 662-678. https://fnur.stafpu.bu.edu.eg/Pediatric%20Nursing/1845/publications/Amaal%20Gharieb%20%20Sabbaq_sixth.pdf

Mower, J. (2015). Incorporating age-specific plans of care to achieve optimal perioperative outcomes. *AORN Journal*, 102(4), 369–388. https://doi.org/10.1016/j.aorn.2015.07.014

Operating Room Nurses Association of Canada. (2023). *The ORNAC standards, guidelines, and position statements for perioperative registered nurses*. 16th edition. Canadian Standards Association.

Panella, J. J. (2016). Preoperative care of children: Strategies from a child life perspective. *AORN Journal, 104*(1), 11–22. https://doi.org/10.1016/j.aorn.2016.05.004

Teaching Excellence in Adult Learning Centre. (2011). Adult learning theories. *U.S. Department of Education*. Available at: https://lincs.ed.gov/sites/default/files/11_%20TEAL_Adult_Learning_Theory.pdf

Wu, M. Zhao, K., & Fils-Aime, F. (2022). Response rates of online surveys in published research: A meta-analysis. *Computers in Human Behavior Reports, 7*, 100206. https://doi.org/10.1016/j.chbr.2022.100206

Appendix A

Sample Email to Current OR Nursing Staff

To whom it may concern:

I am completing a practicum project as part of my Master of Science in Nursing (MScN) at Memorial University. For my project, I am developing a pediatric orientation resource for new OR nurses to assist with increasing the competency, skill, and patient care of our pediatric patients. To aid in creating this resource, I have completed a literature review and am in the process of completing consultations with key stakeholders and experts, along with an environmental scan to identify essential content to include, ideal delivery modality, and established resources.

If you have a moment, I was wondering if you would be willing to complete the linked survey below. All information provided will be de-identified in the final report for the project and will be used to assist in developing the pediatric orientation recourse for new nurses hired to the OR.

Linked Survey

Thank you for your time, and I look forward to your response.

Sincerely,
Rebecca Tompkins
MScN Student
Memorial University
rprtompkins@mun.ca

Appendix B

Survey Questions for Current OR Nursing Staff

The following questions will be in a Microsoft Form Survey and provided to current OR nursing staff. The survey will have a branching style question at the beginning to determine the individual's level of experience.

Branching question:

1. How much of OR nursing experience do you have?
    a. 6 months or less → if chosen will bring the individual to the novice nurse survey
    b. 6 to 12 months → if chosen will bring the individual to the novice nurse survey
    c. 1 to 2 years → if chosen will bring the individual to the novice nurse survey
    d. 2 to 5 years → if chosen will bring the individual to the experienced nurse survey
    e. 5 to 10 years → if chosen will bring the individual to the experienced nurse survey
    f. 10-15 years → if chosen will bring the individual to the experienced nurse survey
    g. Greater than 15 years → if chosen will bring the individual to the experienced nurse survey

For novice nurses (<2 years of experience)

1. How long have you been practicing as a nurse:
    a. 6 months or less
    b. 6 to 12 months
    c. 1 to 2 years
    d. 2 to 5 years
    e. 5 to 10 years
    f. 10-15 years
    g. Greater than 15 years

2. Before coming to the OR, did you have any pediatric nursing experience?
    a. Yes → Will proceed to question 3
    b. No → Will proceed to question 4

3. How long did you care with pediatric patients?
    a. 6 months or less
    b. 6 to 12 months
    c. 1 to 2 years
    d. 2 to 5 years
    e. 5 to 10 years
    f. 10-15 years
    g. Greater than 15 years

4. The knowledge provided during OR orientation was sufficient to prepare me to care for pediatric patients.
    a. Strongly Agree
    b. Agree
    c. Neither Agree or Disagree
    d. Disagree
    e. Strongly Disagree

2. I felt prepared to care for pediatric patients after my initial OR orientation.
    a. Strongly Agree
    b. Agree
    c. Neither Agree or Disagree
    d. Disagree
    e. Strongly Disagree

3. The following pediatric content would be beneficial for new nursing hires to the OR (select all that apply):
    a. Development stages and age-specific care
    b. Family-Centered Care
    c. Anatomical Differences and Vital Signs
    d. Procedural Differences for Induction and Complications
    e. Thermoregulation
    f. Other (Please specify)

4. The following are knowledge gaps for new staff when caring for pediatric patients (select all that apply):
    a. Development stages and age-specific care
    b. Family-centered Care
    c. Anatomical Differences and Vital Signs
    d. Procedural Differences for Induction and Complications
    e. Thermoregulation
    f. Other (Please specify)

5. The following delivery modalities would be beneficial in my learning of pediatric care for the OR:
    a. Lecture
    b. Independent Learning (e.g., self-directed, manual, online resource)
    c. Simulation
    d. Game-Based Learning
    e. Multi-modal (e.g., lecture combined with simulation)
    f. Other (Please specify)

6. What common barriers or challenges do you see with OR nurses when interacting and caring for pediatric patients? (short answer)

7. Please use the section below to communicate any other feedback or thoughts about pediatric education for new nursing hires to the OR. (short answer)

For experienced nurses (>2 years of experience)

1. How long have you been practicing as a nurse:
    a. 2 to 5 years
    b. 5 to 10 years
    c. 10-15 years
    d. Greater than 15 years

2. Before coming to the OR, did you have any pediatric nursing experience?
    a. Yes → Will proceed to question 3
    b. No → Will proceed to question 4

3. How long did you care with pediatric patients?
    a. 6 months or less
    b. 6 to 12 months
    c. 1 to 2 years
    d. 2 to 5 years
    e. 5 to 10 years
    f. 10-15 years
    g. Greater than 15 years

4. I feel that new nursing hires to the OR are prepared to care for pediatric patients after OR orientation.
    a. Strongly Agree
    b. Agree
    c. Neither Agree or Disagree
    d. Disagree
    e. Strongly Disagree

5. The following pediatric content would be beneficial for new nursing hires to the OR (select all that apply):
    a. Development stages and age-specific care
    b. family-centred Care
    c. Anatomical Differences and Vital Signs
    d. Procedural Differences for Induction and Anesthesia Complications
    e. Thermoregulation
    f. Other (Please specify)

6. The following are knowledge gaps for new staff when caring for pediatric patients (select all that apply):
    a. Development stages and age-specific care
    b. Family-Centred Care
    c. Anatomical Differences and Vital Signs
    d. Procedural Differences for Induction and Anesthesia Complications
    e. Thermoregulation
    f. Other (Please specify)

7. The following delivery modalities would have been beneficial in my learning of pediatric care for the OR:
    a. Lecture
    b. Independent Learning (e.g., self-directed, manual, online resource)
    c. Simulation
    d. Game-Based Learning
    e. Multi-modal (e.g., lecture combined with simulation)
    f. Other (Please specify)

8. What common barriers or challenges do you see with OR nurses when interacting and caring for pediatric patients? (short answer)

9. Please use the section below to communicate any other feedback or thoughts about pediatric education for new nursing hires to the OR. (short answer)

Appendix C

Sample Email to Pediatric Surgeons and Anesthesiologists

To whom it may concern:

My name is Rebecca Tompkins. I am the Clinical Educator at the Victoria Hospital OR and am currently completing a practicum project as part of my Master of Science in Nursing (MScN) at Memorial University. For my project, I am developing a pediatric orientation resource for new OR nurses to assist with increasing the competency, skill, and patient care of our pediatric patients. To aid in creating this resource, I have completed a literature review and am in the process of completing consultations with key stakeholders and experts, along with an environmental scan to identify essential content to include, ideal delivery modality, and established resources.

If you have a moment, would you be willing to complete the linked survey below? All information provided will be de-identified in the final report for the project and will be used to assist in developing the pediatric orientation recourse for new nursing hires to the OR.

Linked Survey

Thank you for your time, and I look forward to your response.

Sincerely,
Rebecca Tompkins
MScN Student
Memorial University
rprtompkins@mun.ca

Appendix D

Survey Questions for Pediatric Surgeons and Anesthesiologists

1. I feel confident that the VH-OR nurses are competent in caring for pediatric patients.
    a. Strongly Agree
    b. Agree
    c. Neither Agree nor Disagree
    d. Disagree
    e. Strongly Disagree

1. The following pediatric content would be beneficial for new nursing hires to the OR (select all that apply):
    a. Development stages and age-specific care
    b. Family Centered Care
    c. Anatomical Differences and Vital Signs
    d. Procedural Differences for Induction and Anesthesia Complications
    e. Thermoregulation
    f. Other (Please specify)

2. The following are potential knowledge gaps for new staff when caring for pediatric patients (select all that apply):
    a. Development stages and age-specific care
    b. Family-Centered Care
    c. Anatomical Differences and Vital Signs
    d. Procedural Differences for Induction and Anesthesia Complications
    e. Thermoregulation
    f. Other (Please specify)

3. What common barriers and challenges do you see with OR nurses when interacting and caring for pediatric patients? (short answer)

4. Please use the section below to communicate any other feedback or thoughts about pediatric education for new nursing hires to the OR. (short answer)

Appendix E

Email Template and Semi-Structured Interview Questions for OR Managers

To whom it may concern:

I am completing a practicum project as part of my Master of Science in Nursing (MScN) at Memorial University. For my project, I am developing a pediatric orientation resource for new OR nurses to assist with increasing the competency, skill, and patient care of our pediatric patients. To aid in creating this resource, I have completed a literature review and am in the process of completing consultations with key stakeholders and experts, along with an environmental scan to identify essential content to include, ideal delivery modality, and established resources.

At one of our upcoming managers-clinical educator meetings, I wondered if we could discuss my practicum projects and the questions outlined below. All information provided will be de-identified in the final report for the project and will be used to assist in developing the pediatric educational recourse for new nursing hires to the OR.

Questions of interest:

1. What pediatric knowledge and skills are essential for:
    a. New OR nurses with minimal pediatric experience?
    b. New OR nurses with previous pediatric experience?
2. What are some common adverse events you see from staff when it comes to caring for pediatric patients?
3. What common barriers or challenges do you see with OR nurses when interacting and caring for pediatric patients?
4. Is there any other feedback or comments you have that will assist in developing this pediatric orientation resource for new nursing hires to the OR?

Thank you for your time.

Sincerely,
Rebecca Tompkins
MScN Student
Memorial University
rprtompkins@mun.ca

Appendix F

Email Template and Semi-Structured Interview Questions for the Professional Practice Consultant

To whom it may concern:

I am completing my practicum project as part of my Master of Science in Nursing (MScN) at Memorial University. For my project, I am developing a pediatric orientation resource for new OR nurses to assist with increasing the competency, skill, and patient care of our pediatric patients. To aid in creating this resource, I have completed a literature review and am in the process of completing consultations with key stakeholders and experts and an environmental scan to identify essential content to include, ideal delivery modality, and established resources.

If you have a moment, would you be willing to complete the linked survey below, or alternatively, can I arrange a Microsoft Teams meeting to discuss the content further with you? All information provided will be de-identified in the final report for the project and will be used to assist in developing the pediatric education recourse for new nursing hires to the OR.

Questions of interest:

1. Is there an organizational process for changing unit orientations or new hire education?
2. Do you have any recommendations for creating new educational content for nurses?
3. What pediatric knowledge and skills do you deem essential for new nursing hires to the OR with minimal pediatric experience?
4. Is there any other feedback or comments you have that will assist in developing this pediatric orientation resource for new nursing hires to the OR?

Thank you for your time.

Sincerely,
Rebecca Tompkins
MScN Student
Memorial University
rprtompkins@mun.ca

Appendix G

Sample Email to Internal Individuals

To whom it may concern:

My name is Rebecca Tompkins. I am the Clinical Educator at the Victoria Hospital OR. I am currently completing a practicum project as part of my Master of Science in Nursing (MScN) at Memorial University. For my project, I am developing a pediatric orientation resource for new OR nurses to assist with increasing the competency, skill, and patient care of our pediatric patients. To aid in creating this resource, I have completed a literature review and am in the process of completing consultations with key stakeholders and experts, along with an environmental scan to identify essential content to include, ideal delivery modality, and established resources. If you have a moment, would you be willing to answer the following questions by responding to this email? Alternatively, I can arrange a Microsoft Teams meeting or telephone call to discuss the content further with you. All information provided will be de-identified in the final report for the project and will be used to assist in developing the pediatric orientation resource for new nursing hires to the OR.

Questions of interest:

5. What knowledge and skills do you deem essential for new nursing hires who come to the OR with minimal pediatric experience?
6. When is this essential content given to new nursing hires (i.e., at what point in their orientation or hiring process)?
7. What resources did you base this educational content on (e.g., guidelines, procedures, literature)?
8. What are the common barriers or challenges for new nursing hires when interacting and caring for pediatric patients? How do you assist nurses in overcoming these barriers or challenges?
9. How is your content delivered in your orientation/education? Which method(s) are best received by new nursing staff?
10. Do you have any established resources for your content that you are willing to share?

Thank you for your time, and I look forward to your response.

Sincerely,
Rebecca Tompkins
MScN Student
Memorial University of Newfoundland
rprtompkins@mun.ca

Appendix H

Sample Email to External Individuals

To whom it may concern:

My name is Rebecca Tompkins. I am the Clinical Educator at the London Health Science Centre - Victoria Hospital OR in London, Ontario. I am currently completing a practicum project as part of my Master of Science in Nursing (MScN) at Memorial University of Newfoundland. For my project, I am developing a pediatric orientation resource for new OR nurses to assist with increasing the competency, skill, and patient care of our pediatric patients. To aid in creating this resource, I have completed a literature review and am in the process of completing consultations with key stakeholders and experts, along with an environmental scan to identify essential content to include, ideal delivery modality, and established resources. If you have a moment, would you be willing to answer the following questions by responding to this email, or alternatively, can I arrange a Microsoft Teams meeting or phone call to discuss the content further with you? All information provided will be de-identified in the final report for the project and will be used to assist in developing the pediatric orientation resource for new nursing hires to the OR.

Questions of interest:

1. What knowledge and skills do you deem essential for new nursing hires who come with minimal pediatric experience?
2. When is this essential content given to new nursing hires (i.e., at what point in their orientation or hiring process)?
3. What resources did you base this educational content on (e.g., guidelines, procedures, literature)?
4. What are the common barriers or challenges for new nursing hires when interacting and caring for pediatric patients? How do you assist nurses in overcoming these barriers?
5. How is your content delivered in your orientation/education? Which method(s) are best received by new nursing staff?
6. Do you have any established resources for your content that you are willing to share?

Thank you for your time, and I look forward to your response.

Sincerely,
Rebecca Tompkins
MScN Student
Memorial University of Newfoundland
rprtompkins@mun.ca

Appendix I

Health Research Ethics Authority (HREA) Screening Tool

Student Name: Rebecca Tompkins

Title of Practicum Project: Development of a pediatric operating room (OR) orientation resource for new nursing hires (RN and RPN/LPN) to the OR.

Date Checklist Completed: June 15, 2024

This project is exempt from Health Research Ethics Board approval because it matches item number **____3____** from the list below.

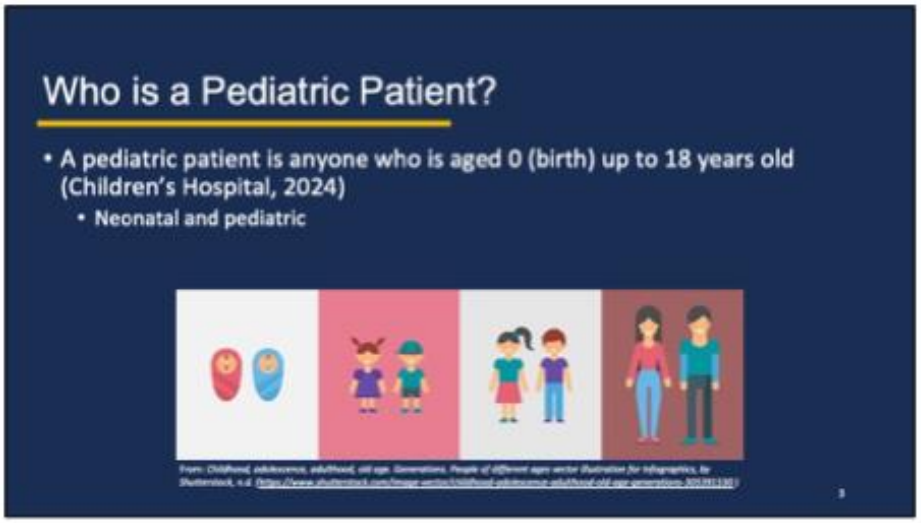
1. Research that relies exclusively on publicly available information when the information is legally accessible to the public and appropriately protected by law; or the information is publicly accessible and there is no reasonable expectation of privacy.
2. Research involving naturalistic observation in public places (where it does not involve any intervention staged by the researcher, or direct interaction with the individual or groups; individuals or groups targeted for observation have no reasonable expectation of privacy; and any dissemination of research results does not allow identification of specific individuals).
3. Quality assurance and quality improvement studies, program evaluation activities, performance reviews, and testing within normal educational requirements if there is no research question involved (used exclusively for assessment, management or improvement purposes).
4. Research based on review of published/publicly reported literature.
5. Research exclusively involving secondary use of anonymous information or anonymous human biological materials, so long as the process of data linkage or recording or dissemination of results does not generate identifiable information.
6. Research based solely on the researcher's personal reflections and self-observation (e.g., auto-ethnography).
7. Case reports.
8. Creative practice activities (where an artist makes or interprets a work or works of art).

For more information please visit the Health Research Ethics Authority (HREA) at https://rpresources.mun.ca/triage/is-your-project-exempt-from-review/

Appendix D: Pediatric Orientation

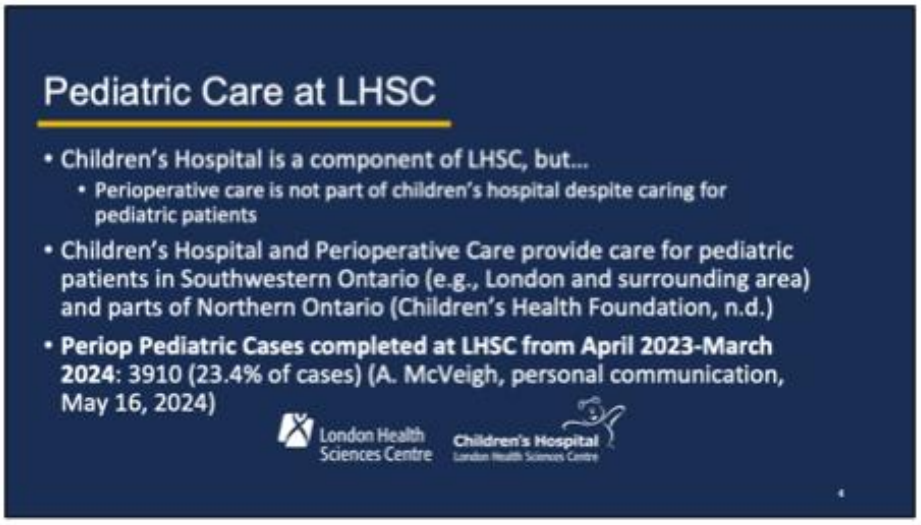

Pediatric OR Orientation
Rebecca Tompkins
Memorial University
N6661
Renee Crossman
Fall 2024
London Health Sciences Centre
Children's Hospital
London Health Sciences Centre
Great people. Great care.
1

- Who are pediatric patients?
- Anatomical Differences between adults and pediatric patients
  - Will discuss
    - thermoregulation and ways to maintain normothermia
    - Skin anatomy
    - Pulmonary anatomy and function
    - Perioperative anxiety this will lead us into a discussion on….
- Family Centered Care
  - Parental presence for induction
- Developmental appropriately care
- Pediatric surgical differences
- Anesthesia considerations



Pediatric can be divided into Neonatal (e.g., NICU) and pediatric

- This is related to the increased care requirements and unique health concerns of neonatal patients


Pediatric Care at LHSC
• Children's Hospital is a component of LHSC, but...
• Perioperative care is not part of children's hospital despite caring for pediatric patients
• Children's Hospital and Perioperative Care provide care for pediatric patients in Southwestern Ontario (e.g., London and surrounding area) and parts of Northern Ontario (Children's Health Foundation, n.d.)
• Periop Pediatric Cases completed at LHSC from April 2023-March 2024: 3910 (23.4% of cases) (A. McVeigh, personal communication, May 16, 2024)
London Health Sciences Centre
Children's Hospital
London Health Sciences Centre
4

4

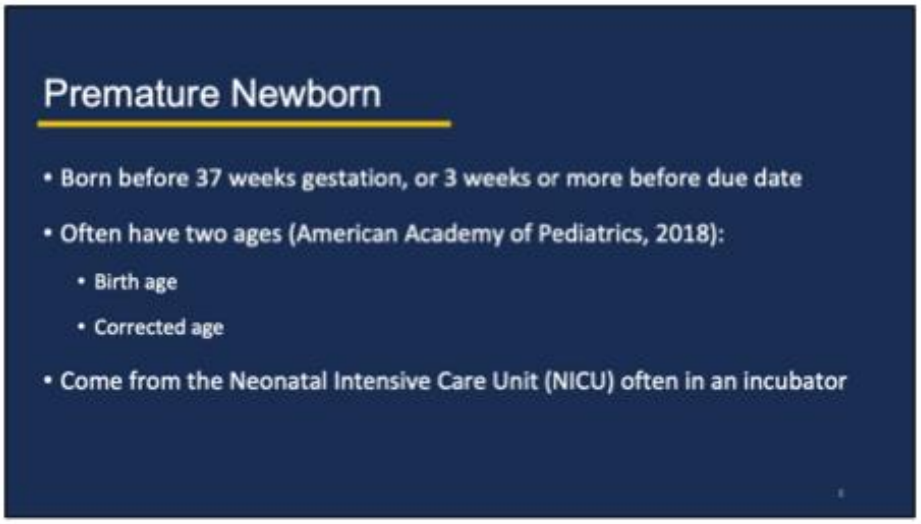
Pediatric Surgical Services at LHSC

- General
- Urology
- Orthopedic
- Spine
- Plastics
- Neuro
- Ophthalmology
- Dental
- Transplant (kidney)

5

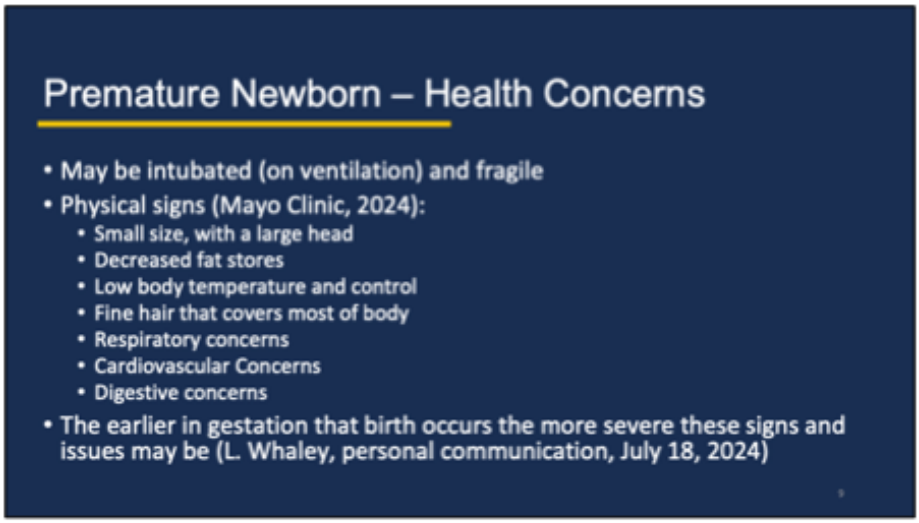
- Premature=pre-term="premie"
- Before we move forward, I would like to highlight premature newborns, as there are some specific considerations to note.


Premature Newborns
7



- Birth Age – Normal Date of Birth
- Corrected Age – Actual age in weeks minus weeks preterm
- For the first 2 years , the corrected age will give a better understanding of developmental goals

8



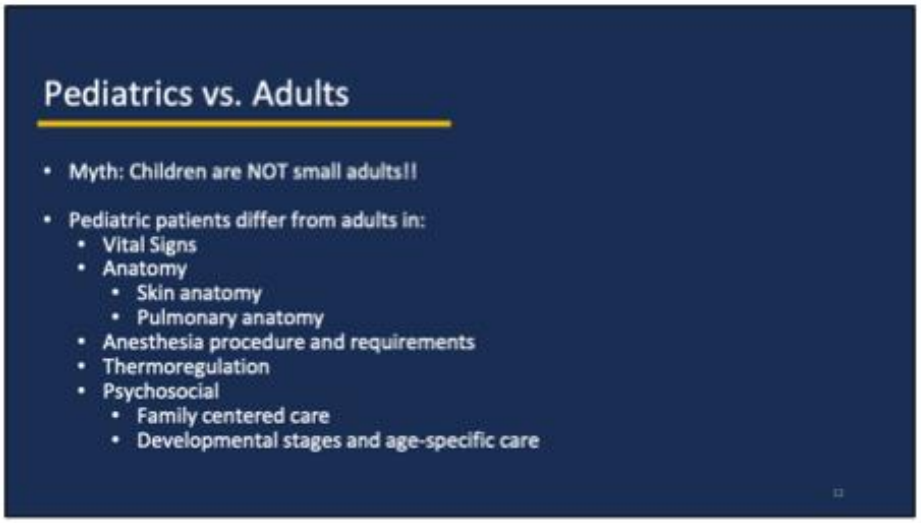
- May be intubated (on ventilation) and fragile
- Physical signs (Mayo Clinic, 2024):
    - Small size, with a large head
    - Decreased fat stores
    - Low body temperature and control
        - Temperature Control Concerns
        - Lose body heat quickly related to decreased fat stores and are unable to make enough heat to replace what is lost (Mayo Clinic, 2024)
        - Premature newborns are often warmed by external sources (Mayo Clinic, 2024)
    - Fine hair that covers most of body
    - Respiratory concerns
        - Respiratory concerns related to underdeveloped respiratory systems, and lack of surfactant (Mayo Clinic, 2024)
        - Common to have periods of apnea, and irregular rhythm (L. Whaley, personal communication, July 18, 2024; Mayo Clinic, 2024)
    - Cardiovascular Concerns
        - Patent ductus arteriosus (PDA) – opening between the aorta and pulmonary artery (Mayo Clinic, 2024)
        - Low blood pressure (Mayo Clinic, 2024)
            - Blood pressure measurements/ranges vary depending on the corrected age of the child (L. Whaley, personal communication, July 18, 2024)
    - Digestive concerns
        - Underdeveloped GI tract (Mayo Clinic, 2024)

- The earlier in gestation that birth occurs the more severe these signs and issues may be (L. Whaley, personal communication, July 18, 2024)

- Potential to have a lot of issues related to underdevelopment, gastrointestinal tract is commonly affected.
- Common Surgeries (L. Whaley, personal communication, July 18, 2024):
  - Congenital Diaphragmatic Hernia
    - Intestines are herniated into lung cavity
  - Esophageal Atresia/Tracheoesophageal fistula
  - Bowel resection for necrotizing enterocolitis
  - Bowel perforation
  - Bowel obstruction (e.g., ileostomy, atresia)
  - Inguinal hernia
  - Gastroschisis/omphalocele
    - Intestine are outside of abdomen
    - Gastroschisis – not contained in a sac
    - Omphalocele – contained in a sac of connective tissue

10

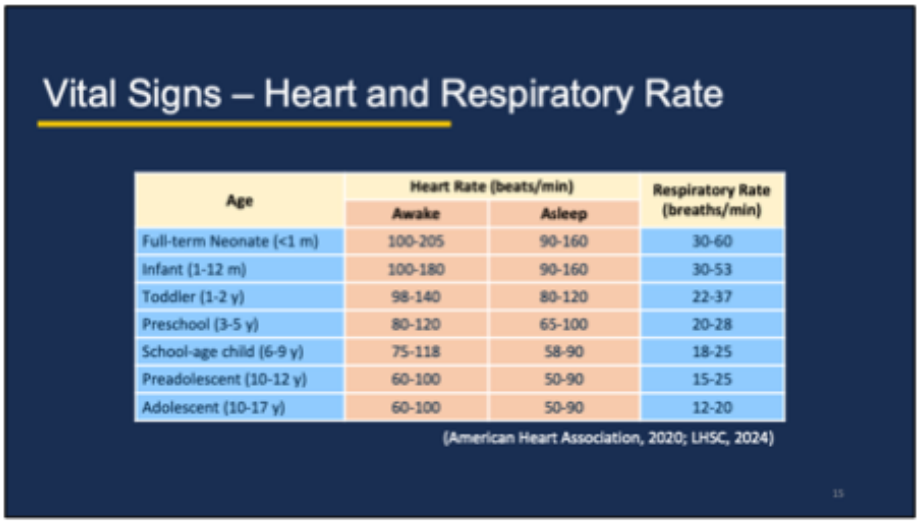

Pediatric Differences
11


Pediatrics vs. Adults
• Myth: Children are NOT small adults!!
• Pediatric patients differ from adults in:
• Vital Signs
• Anatomy
• Skin anatomy
• Pulmonary anatomy
• Anesthesia procedure and requirements
• Thermoregulation
• Psychosocial
• Family centered care
• Developmental stages and age-specific care

12


Pediatric Differences
Vital Signs
13

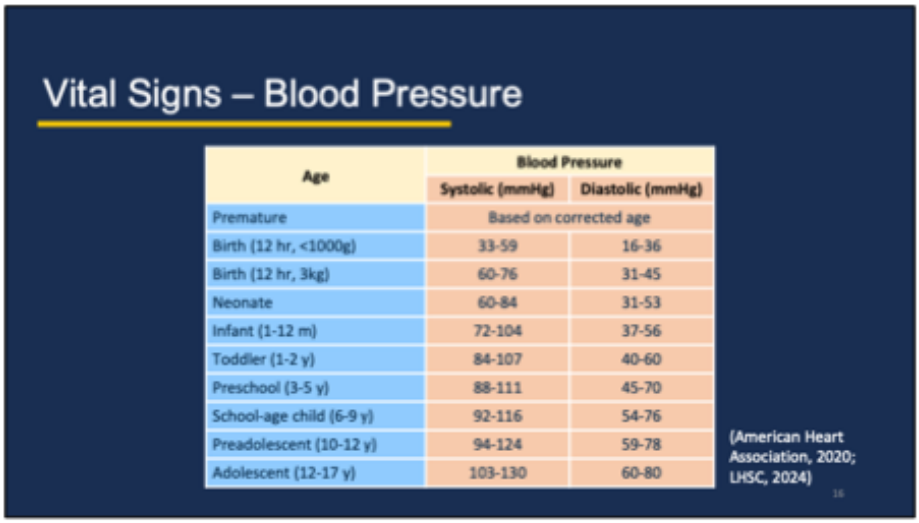
Adult and pediatric vital signs are not the same!



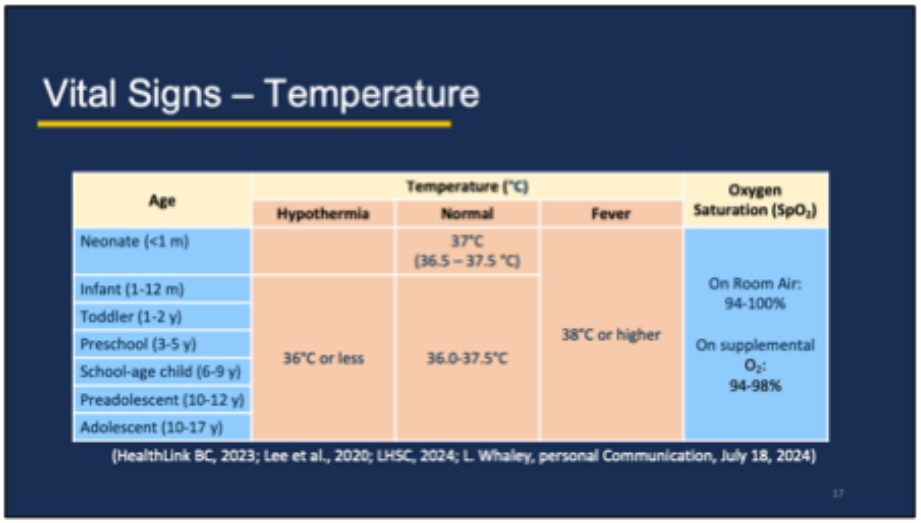
- Heart Rate:
  - Small fluctuations in heart rate is normal (American Heart Association, 2016).
    - Often linked with respiration rate (e.g., increasing with inspiration, and decreasing with expiration)
  - May note bradycardia in athletic children (American Heart Association, 2016).
  - Bradycardia is a common symptom of hypoxia (American Heart Association, 2016).
  - Tachycardia is common in children who are anxious, crying, febrile or seriously ill or injured (American Heart Association, 2016).
    - In infants and toddlers – heart rate greater than 180/min requires investigation (American Heart Association, 2016)
    - In children older than 2 years old a heart rate greater than 160/min requires investigation (American Heart Association, 2016)

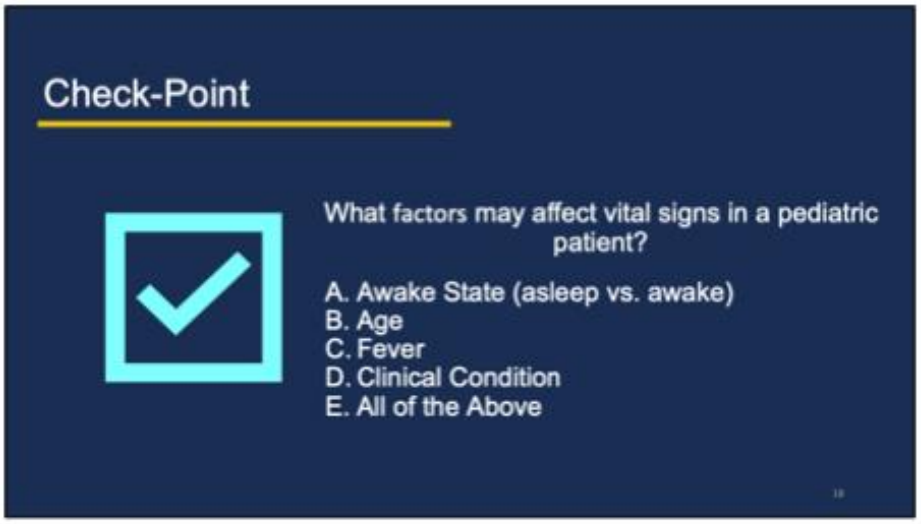
Respiration:

- In neonates, respiratory rate is often irregular (this is normal) (L. Whaley, personal communication, July 18, 2024)



- Require an appropriately sized blood pressure cuff (American Heart Association, 2016).
  - Demo: different sizes of pediatric blood pressure cuffs
  - Cuff should cover 40% of mid-upper arm circumference.
- Children who are injured or experiencing stress may have elevated blood pressure (American Heart Association, 2016).
- Premature children
  - Their BP is dependent on their corrected age
  - The table is extensive, and available online


Vital Signs – Temperature
Age
Temperature (°C)
Hypothermia
Normal
Fever
Oxygen Saturation (SpO_2)
Neonate (<1 m)
37°C (36.5 – 37.5 °C)
Infant (1-12 m)
Toddler (1-2 y)
Preschool (3-5 y)
School-age child (6-9 y)
Preadolescent (10-12 y)
Adolescent (10-17 y)
36°C or less
36.0-37.5°C
38°C or higher
On Room Air: 94-100%
On supplemental O_2: 94-98%
(HealthLink BC, 2023; Lee et al., 2020; LHSC, 2024; L. Whaley, personal Communication, July 18, 2024)
17



- What is a Check-Point?
  - It is an opportunity to test your knowledge on content you have learned thus far
  - There will be prizes for getting them correct

Q: What factors may affect vital signs in a pediatric patient?
A: All of the above

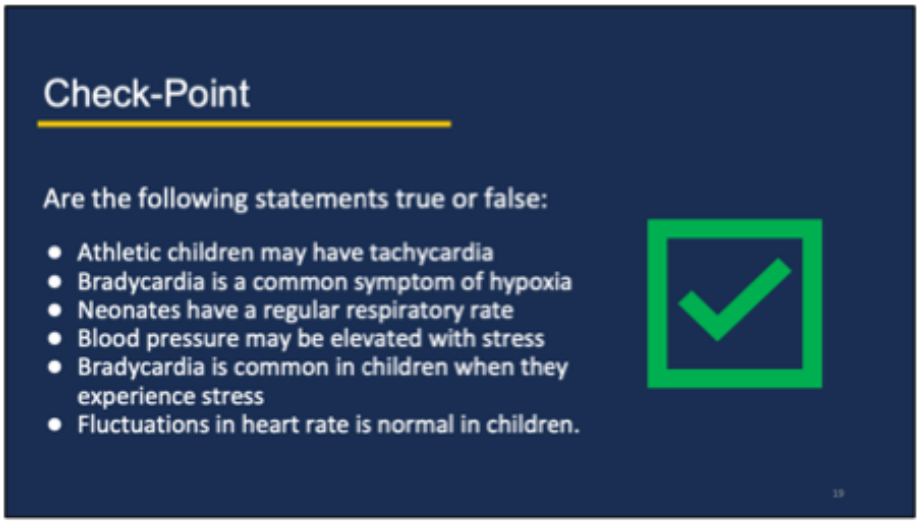
Other answers include:

Activity state (e.g., active children)

Medical state

Fever

Stress



Athlet children may have tachycardia
FALSE: May note bradycardia in athletic children (American Heart Association, 2016).

Brady rdia is a common symptom of hypoxia
TRUE: Bradycardia is a common symptom of hypoxia (American Heart Association, 2016).

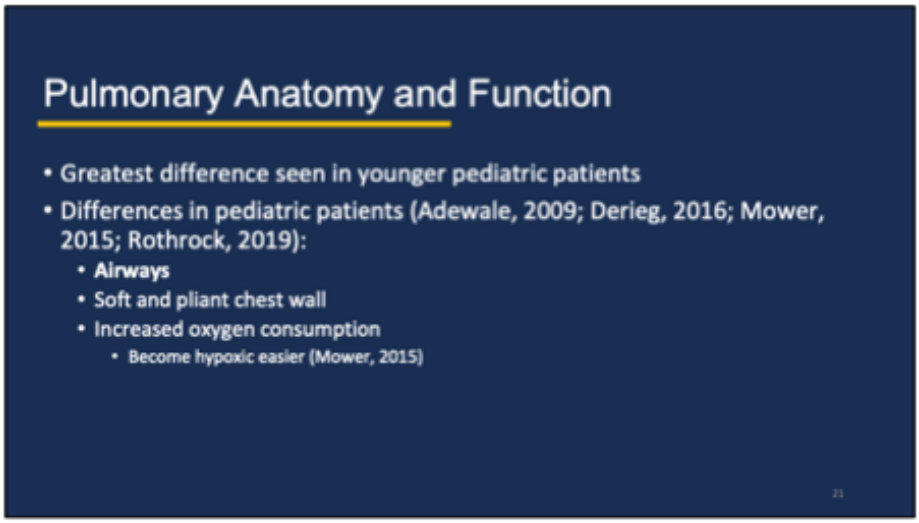
Neona s have a regular respiratory rate
FALSE: In neonates, respiratory rate is often irregular (this is normal) (L. Whaley, personal communication, July 18, 2024)

Blood essure may be elevated with injury
TRUE: Children who are injured or experiencing stress may have elevated blood pressure (American Heart Association, 2016).

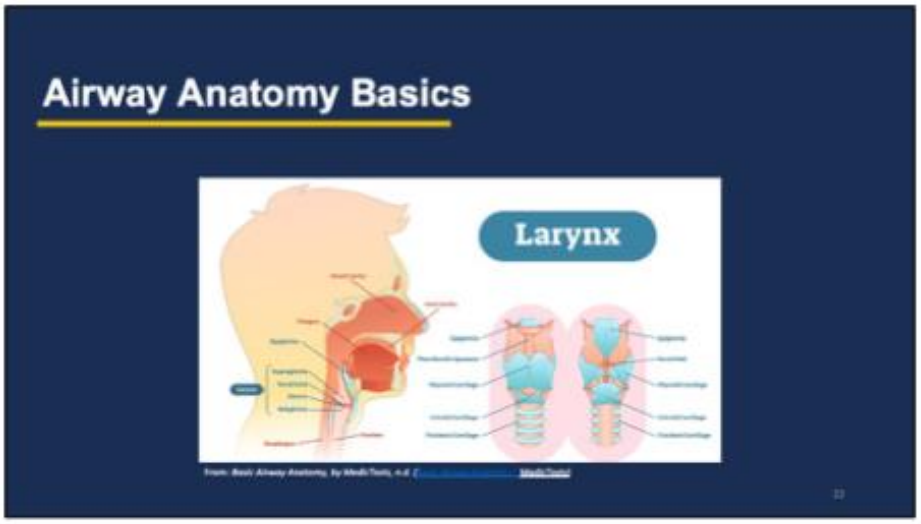
Brady rdia is common in children when they experience stress
FASLE: Tachycardia is common in children who are anxious, crying, febrile or seriously ill or injured (American Heart Association, 2016).
In infants and toddlers – heart rate greater than 180/min requires investigation (American Heart Association, 2016)
In children older than 2 years old a heart rate greater than 160/min requires investigation (American Heart Association, 2016)

Fluctu ions in heart rate is normal in children.
TRUE: Small fluctuations in heart rate is normal (American Heart Association, 2016).

20



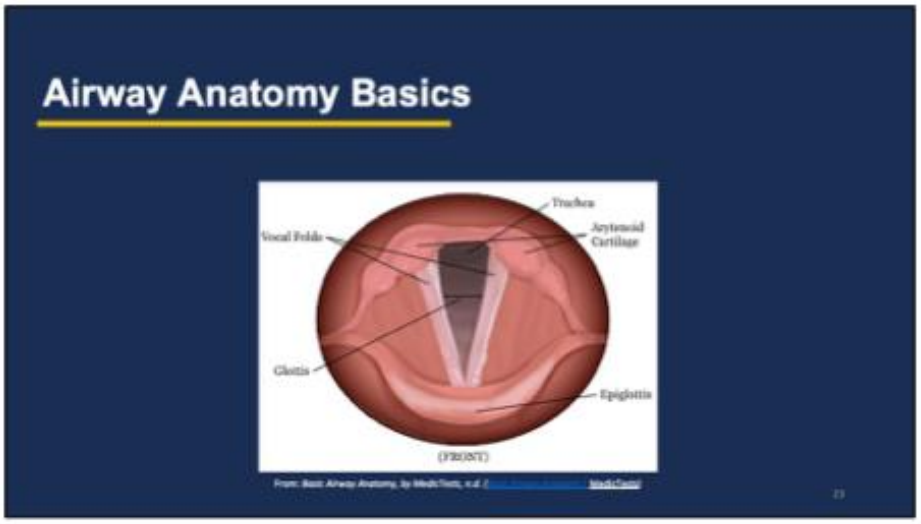
- Differences include:
  - Airways
  - Soft and pliable chest wall
  - Increased oxygen consumption
    - Become hypoxic easier (Mower, 2015)
      - **Therefore, need to present with anesthesia when intubating and extubating pediatric patients**
  - **We are going to focus on the airway related to the amount of differences in pediatrics when compared to adults**



Key things to point out:

- Size of tongue
- Location of larynx in relation to esophagus
  - Larynx is anterior to the esophagus
- Epiglottis
  - Normally will act as a gate to prevent food from traveling into the airway
  - For the anesthesiologist it gets in the way from viewing the vocal cord
    - they will use the laryngoscope to hold the epiglottis back to better their view
- Vocal cords
- Thyroid cartilage ("Adam's apple")
- Carotid cartilage
  - Need to know for a rapid sequence induction (prevents aspiration)

22

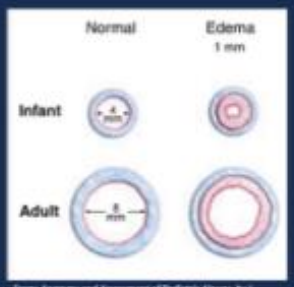


- Orientation of this image:
  - This is a superior view of the vocal cords and glottis
    - A similar view that the anesthesiologist will have when intubating the patient
  - The bottom of the image is anterior as evidenced by the epiglottis
- Key Points:
  - Vocal cords
    - Bilateral
    - Open and close (move medially towards one another) to produce sounds (i.e., one's voice)
  - Glottis
    - the opening between the vocal
    - This is where the endocranial tube passes through
- If we rotate the image…*hit the next key*…this is the exact view that the anesthesiologist sees when intubating the patient

23

Airway Differences

- Smaller in diameter (Adewale, 2009; Derieg, 2016; Rothrock, 2019)
  - Risk if airway becomes swollen/edema
  - Increase in resistance when intubating (approx. 15 times greater than in adults)
  - Smaller endotracheal tube will be used
    - Cuffed
    - Uncuffed



From: Anatomy and Assessment of Pediatric Airway, by I. Adewale, 2009.

24

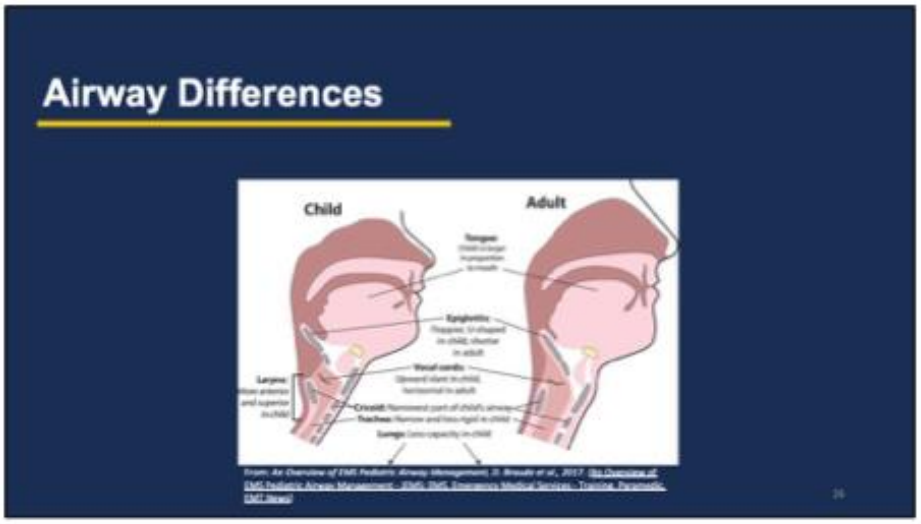
Airway Differences

- In infants, the larynx is narrowest below the glottis (at level of cricoid cartilage) (Adewale, 2009; Rothrock, 2019).
  - If this site is compromised (e.g., edema) risk of occlusion
  - Prolonged or repeated tracheal intubation can cause stenosis
  - This area is the narrowest until around 8 years old

From: Anatomy and Assessment of Pediatric Airway, by L. Adewale, 2009.

25

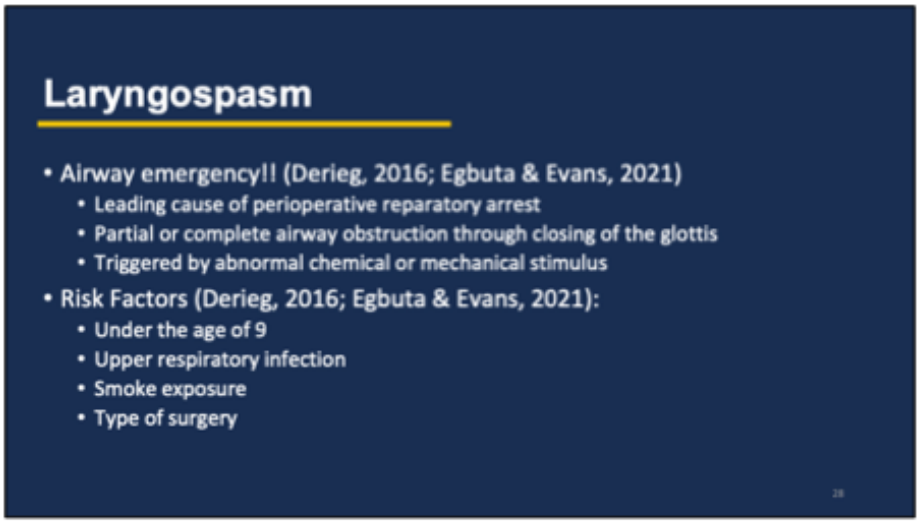
The larynx in both adult and pediatric patients is cone shaped (widest at the top, and narrow at the bottom), but the pediatric airway is more funneled (Adewale, 2009).



- Orientation to figure: This is a comparison of a pediatric airway to that of an adult. The image on the left is the airway of a child, and on the right of an adult.
- Other Airway differences (Adewale, 2009; Derieg, 2016; Rothrock, 2019)
  - In young children the tongue is large relative to the oropharynx
  - Larynx is infants and young children is more anterior
  - Vocal cords and glottis is slanted more anterior
  - Epiglottis is long, floppy and narrow
- Now how does this change the anesthesiologists view....

- Orientation to figure:
  - These images are the view that anesthesiologist have
  - This is a comparison of the larynx between an infant, a toddler and an adult.
  - The top of each image is anterior, with the epiglottis
  - Just below the epiglottis are the vocal cords.
    - It is harder to see them in the infant and easier in the adult.
  - I hope this image portrays the importance of securing an airway in pediatric patients.
    - The airways are small, and hard to visualize so we want to make sure that once we have placed the endotracheal tube it stays.

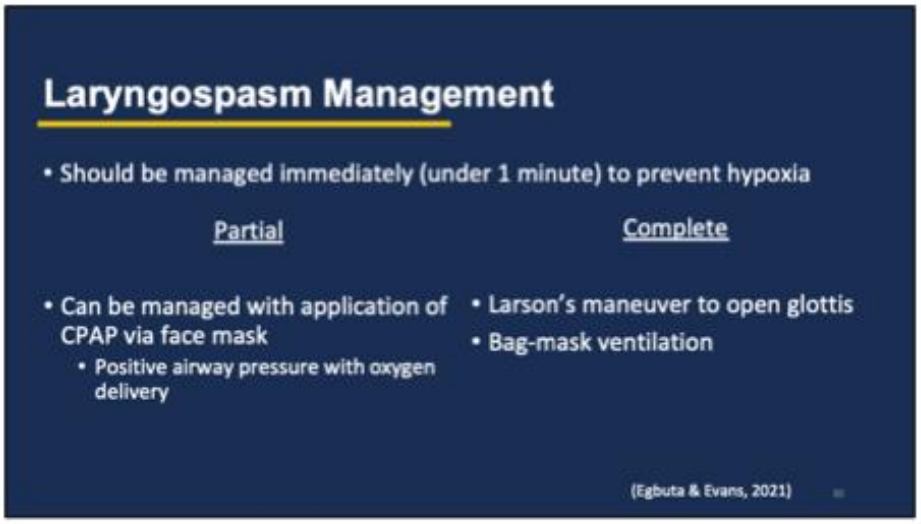
27



- Airway emergency!! (Derieg, 2016)
  - Leading cause of perioperative reparatory arrest
  - Partial or complete airway obstruction through closing of the glottis
  - Triggered by abnormal chemical or mechanical stimulus
- Risk Factors (Derieg, 2016; Egbuta & Evans, 2021):
  - Older children (3 months to 9 years) have twice the incidence as adults
  - Children 0-3 months have three time the incidence as adults
  - Upper respiratory infection (**recent or current**)
    - Within the last 6 weeks
  - Smoke exposure (**e.g., in home or teenage smoker**)
    - Increases risk 10-fold (Egbuta & Evans, 2021)
  - Type of surgery (**e.g., increased risk for mouth, nose or throat surgery**)

Video: https://www.youtube.com/watch?v=gmNwpJf1zUQ

Note: Show the beginning of the video so that learners know how normal vocal cords function, at 0:45 move to 0:58 for content on laryngospasm



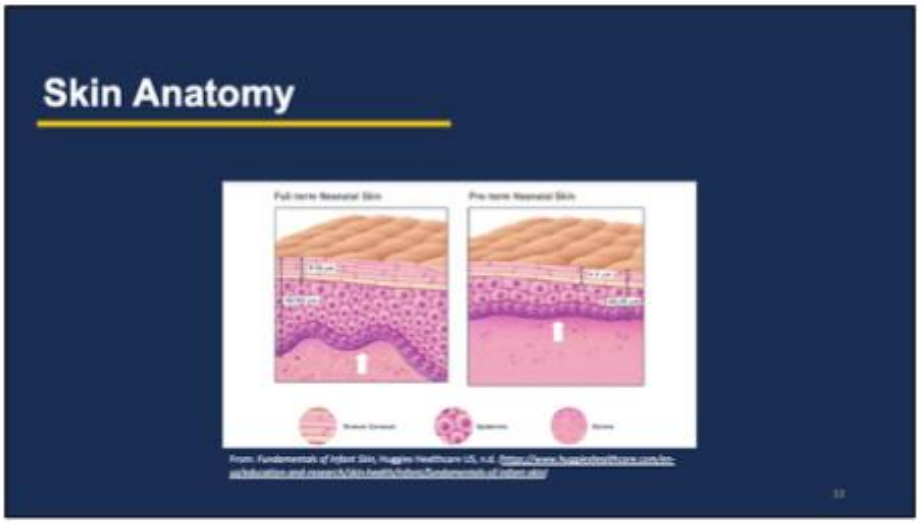
Larson's maneuver – bilateral pressure on styloid process behind mandible pulling mandible forward (Egbuta & Evans, 2021)

- The anesthesiologist will do this

30


Pediatric Differences
Skin
31

- In fetal development the skin is not fully maturated until 34 weeks gestation (Oranges et al., 2015).
- Full term newborn skin is well developed and functional at birth (Visscher et al., 2015).
  - Thick epidermis and well-formed stratum corneum layers.
  - Although, it may still be less developed when compared to the skin of an adult (Oranges et al., 2015).
- However, in premature newborns this is not the case….The conversation about skin development will focus on premature newborns



- This figure compared the skin of a full-term neonate, to that of a preterm neonate. In the figure you can see that the pre-term neonatal skin has less layers and depth to the stratum corneum and epidermis. This is related to lack of maturation, with the greatest difference seen in those born <28 weeks (Visscher et al., 2015)
- Note the skin layers and depths:
    - Epidermis (Yousef et al., 2024)
        - Roles:
            - Acts of a barrier from the external environment
            - Thermoregulation
            - Fluid hemostasis (e.g., water evaporation and absorption)
            - Immune defense
            - Sensory
    - Stratum Corneum (Murphrey et al., 2022; Yousef et al., 2024)
        - Outer layer of the epidermis, and therefore first layer of defense from the surrounding environment
        - Contains the mature skin cells that shed off
        - Aides in hydration and water retention, UV protection, and protects against infection and toxins (first line of immune defense).
    - Dermis (Cleveland Clinic, 2022)
        - Second layer of skin
        - Contains:
            - Connective tissue
            - Blood vessels
            - Nerve endings
            - Sweat glands
            - Oil glands
            - Fair follicles
        - Function:
            - Supports epidermis (i.e., strength and flexibility, and blood vessels)
            - Helps keep skin hydrated through sebaceous glands
- Not seen in the figure is the vernix. The Vernix is a biofilm (contains proteins, lipids and water) formed during the third trimester and assists with (Bamalan et al., 2023; Oranges et al., 2015):
    - Skin formation and maturation
    - Thermoregulation
        - May prevent water evaporation from the skin
    - Antimicrobial defenses
    - Hydration
    - Skin pH
    - Helps protect the skin from pathogens
    - Wound healing

Skin Anatomy – Premature Newborn

- All skin layers are underdeveloped in preterm newborns (Oranges et al., 2015; Visscher et al., 2015)
- **Epidermal** layer (Visscher et al., 2015):
  - Underdeveloped **stratum corneum**
  - Prone to skin damage
  - Delayed barrier maturation
  - Prone to Infection
- **Dermis** lacks structural proteins making the skin easily torn (Visscher et al., 2015).
- Those born before the third trimester lack a **vernix** layer at birth (Oranges et al., 2015).
- Can take 2-3 weeks after birth to be comparable to full-term newborn skin (Oranges et al., 2015)

All skin layers are underdeveloped in preterm newborns (Oranges et al., 2015; Visscher et al., 2015)

Poor epidermal layer (Visscher et al., 2015):

- Underdeveloped stratum corneum
  - is related to gestational age at birth with those born <28 weeks being at highest risk for underdevelopment or nearly absent , and those 34 to 35 weeks gestation being well-formed (Visscher et al., 2015)
  - Poor SC integrity increases risk of water loss, thermal instability, and increased irritant and infection exposure (Visscher et al., 2015)
- Prone to skin damage
- Delayed barrier maturation
- Prone to Infection
- Poor thermoregulation
- This can also be seen in full-term neonates born with low birth weights

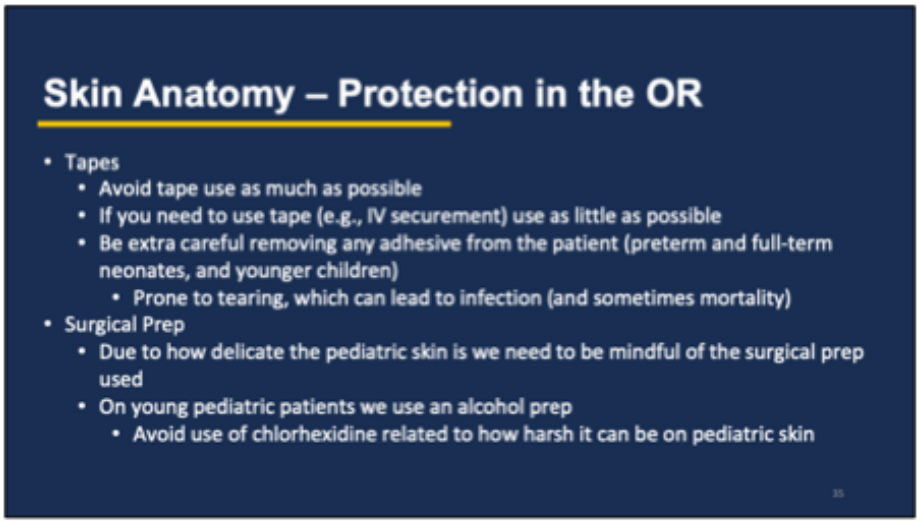
Dermis lacks structural proteins making the skin is easily torn (Visscher et al., 2015).

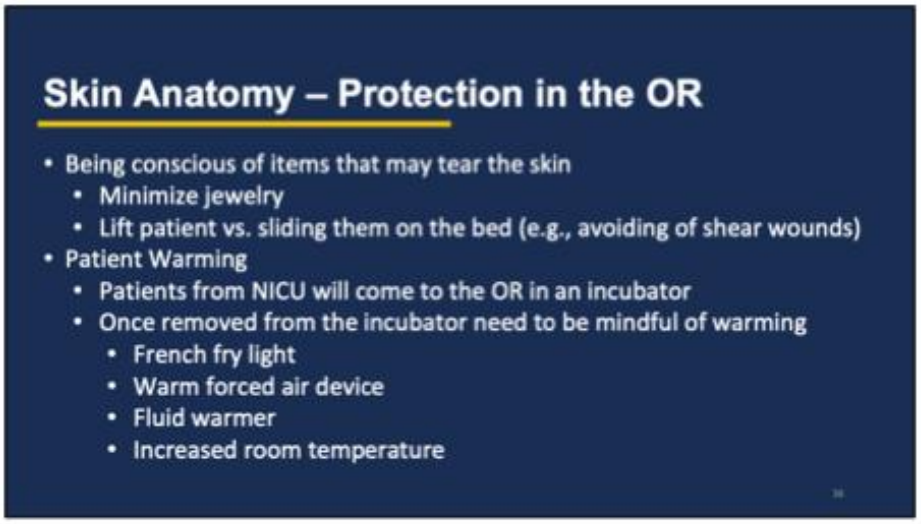
Those born before the third trimester lack a vernix layer at birth (Oranges et al., 2015).

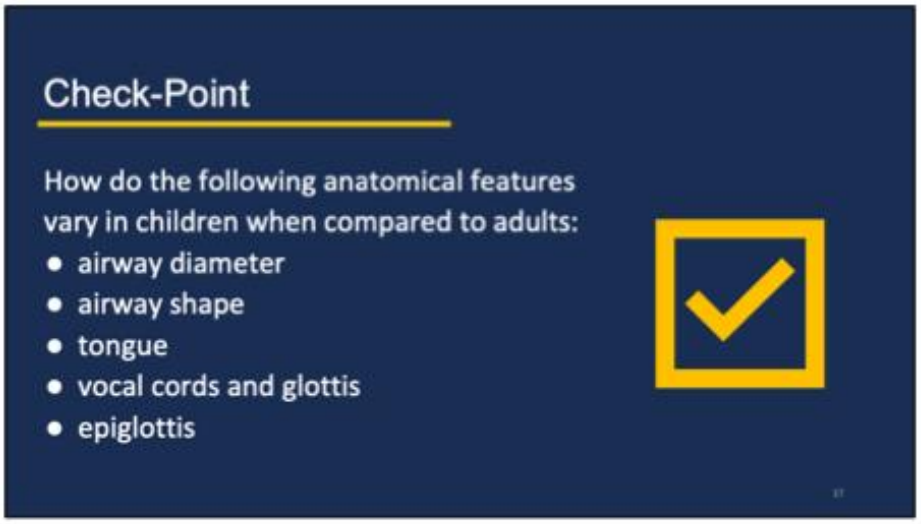
- Vernix contributed to high amounts of skin hydration, lower skin pH, and reduced heat loss after birth

Can take 2-3 weeks after birth to be comparable to full-term newborn skin (Oranges et al., 2015)Can take 2-3 weeks after birth to be comparable to full-term newborn skin (Oranges et al., 2015)

34


Skin Anatomy – Protection in the OR
• Tapes
• Avoid tape use as much as possible
• If you need to use tape (e.g., IV securement) use as little as possible
• Be extra careful removing any adhesive from the patient (preterm and full-term neonates, and younger children)
• Prone to tearing, which can lead to infection (and sometimes mortality)
• Surgical Prep
• Due to how delicate the pediatric skin is we need to be mindful of the surgical prep used
• On young pediatric patients we use an alcohol prep
• Avoid use of chlorhexidine related to how harsh it can be on pediatric skin
35


Skin Anatomy – Protection in the OR
• Being conscious of items that may tear the skin
• Minimize jewelry
• Lift patient vs. sliding them on the bed (e.g., avoiding of shear wounds)
• Patient Warming
• Patients from NICU will come to the OR in an incubator
• Once removed from the incubator need to be mindful of warming
• French fry light
• Warm forced air device
• Fluid warmer
• Increased room temperature
36



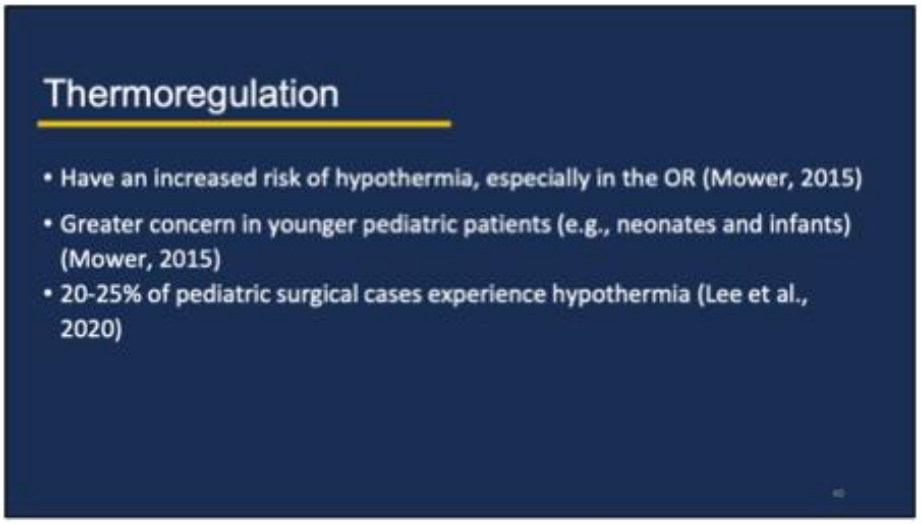
How do the following anatomical features vary in children when compared to adults:

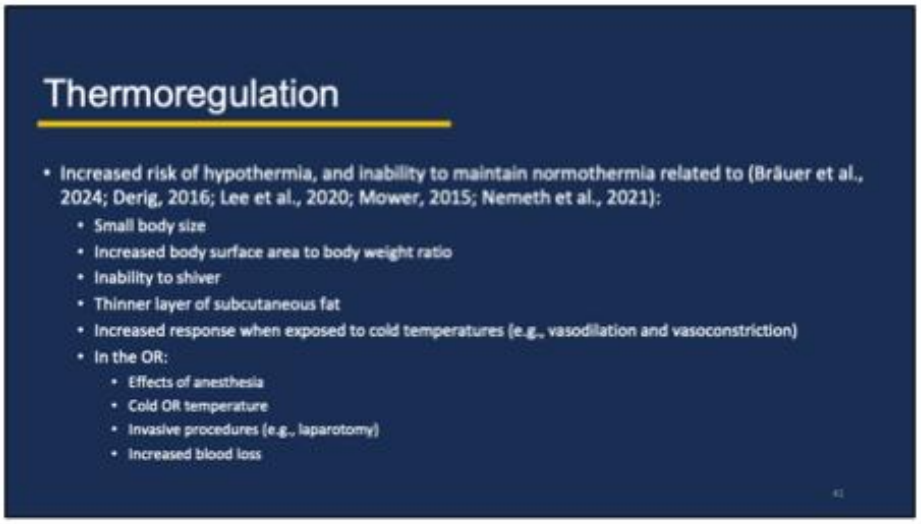
- airway diameter
  - Smaller diameter
    - Increased risk for obstruction related to edema
- airway shape
  - Cone shaped
    - Narrowest below glottis
- tongue
  - In young children the tongue is large relative to the oropharynx
- vocal cords and glottis
  - Vocal cords and glottis is slanted more anterior
- epiglottis
  - Epiglottis is long, floppy and narrow

37

- Minimize use of tape
- Careful removal of tape
- Surgical prep choices
  - Minimize use of chlorhexidine
- Minimize personal jewelry
- Avoid sliding the patient to move them. Rather lift the patient.


Pediatric Differences
Thermoregulation
39


Thermoregulation
• Have an increased risk of hypothermia, especially in the OR (Mower, 2015)
• Greater concern in younger pediatric patients (e.g., neonates and infants) (Mower, 2015)
• 20-25% of pediatric surgical cases experience hypothermia (Lee et al., 2020)



Small body size

Increased body surface **area** to body weight ratio

Inability to shiver

Thinner layer of subcutaneous fat

Increased response when exposed to cold temperatures (e.g., vasodilation and vasoconstriction)

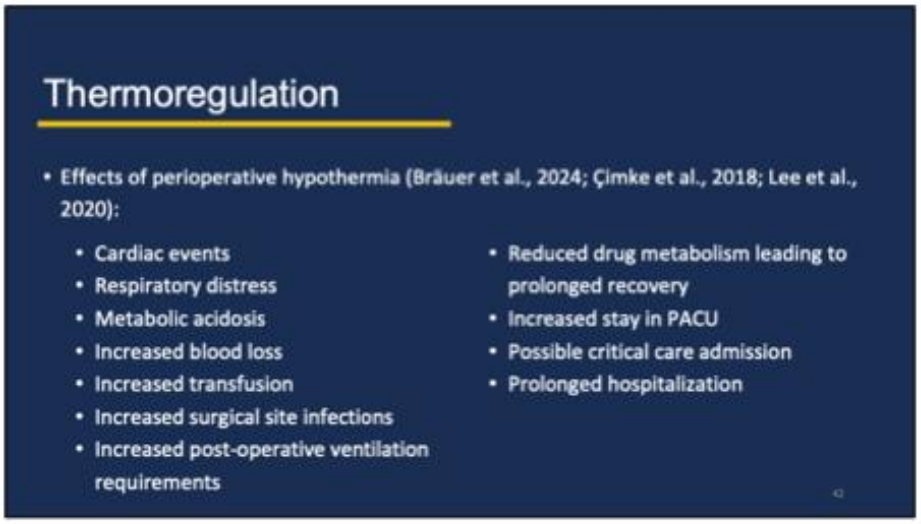
In the OR:

Effects of anesthesia

Anesthesia impairs thermoregulation control causing core heat redistribution and heat loss into the environment (Lee et al., 2020)

Cold OR temperature

41



- Effects in pediatric patients is poorly researched (Bräuer et al., 2024)...
- Cold stress leading to increased oxygen consumption. Resulting in hypoxia, respiratory depression, acidosis, hypoglycemia, and pulmonary vasoconstriction (Rothrock, 2019).
- Hypothermia can alter drug metabolism, such as prolonging the the action of neuromuscular blocker, and delays anesthesia emergence (Rothrock, 2019).

42

Thermoregulation in the OR

1. Increase the room temperature prior to patient arrival (Mower, 2013)
2. Warm cotton (e.g., flannel) blanket (Çimke et al., 2018)
3. Incubator/radiant heat (Çimke et al., 2018)
   - Used for neonates and newborns

From: Infant Warmer Olympic Warm-Lamps, HealthManagement, n.d., https://healthmanagement.org/products/view/infant-warmer-olympic-warm-lamps-natus-medical-incorporated

- Thermoregulation in the OR is multifactorial (i.e., no one device is used in isolation).
- Increase the room temperature prior to patient arrival (Mower, 2013)
  - Helps reduce the drop in core temperature
  - For neonates, the recommended room temperature is 32°C (Bräuer et al., 2024)
  - For infants and older, the recommended room temperature is 24°C (Bräuer et al., 2024)
- Warm cotton (e.g., flannel) blanket (Çimke et al., 2018)
  - At LHSC, the OR Aides will get a warm blanket for the patient prior to the patient entering the OR
- Incubator/radiant heat (Çimke et al., 2018)
  - Used for neonates and newborns
  - "French Fry Lamp"

43

Thermoregulation in the OR

4. Fluid warmer ("hotline") (Çimke et al., 2018; Mower, 2013)
   - Used to warm IV fluids that are being administered
5. Temperature monitoring (Çimke et al., 2018; Mower, 2013; Rothrock, 2019)
   - Often monitor core temperature through a probe that is placed alongside the endotracheal tube
   - For shorter cases may use an axillary probe

From: *Hotline Blood and Fluid Warmer*, ICU Medical, n.d., https://www.icumed.com/products/temperature-management/blood-and-fluid-warming-systems/hotline-blood-and-fluid-warmer/

- Fluid warmer ("hotline") (Çimke et al., 2018; Mower, 2013)
  - Used to warm IV fluids that are being administered
  - Has a special tubing that connects the IV primary and extension lines to the fluid warmer.
- Temperature monitoring (Çimke et al., 2018; Mower, 2013)
  - Often monitor core temperature through a probe that is placed along side the endotracheal tube

Thermoregulation in the OR

6. Forced air device ("Bair Hugger") (3M, 2024)
   - Underbody warming blanket
     - Small
     - Large
   - Over body warming blanket
     - Upper body
     - Lower body
   - Can increase core temperature by 0.75°C/h (Çimke et al., 2018)

From: 3M Bair Hugger, 3M, n.d-a., (https://www.3m.com/3M/en_US/p/d/v000252984/)

45

- The Bair Hugger blows warm are into a specially designed, single use blanket that is placed on top or under the patient.
- The blankets come in limited sizes and are not customizable.
- Always ask anesthesia what type of Bair hugger blanket they would like for the case.
- Which warming blanket chosen depends on:
  - Patient size
  - Surgical site
  - Anesthesia preference
    - Ability to visualize and access the patient (e.g., IV site)
- In the next few slides, we will review the common blankets used.

Thermoregulation – Small Underbody Bair Hugger

From: 3M Bair Hugger Pediatric Underbody Blanket, Model 55302 by 3M, n.d.-b. (https://www.3m.com/3M/en_US/p/d/b00002302/)

- Small Underbody Bair hugger (3M, n.d.-a)
  - Placed on the OR bed prior to patient's arrival
  - The Bair Hugger machine is turned on before the patient is placed on the bed, and often even before the patient enters the room
  - Used for small pediatric patients (e.g., neonates, newborns, etc.)
    - This is due to younger children having limited surface area, and it is easier to visualize and access them when the warmer in under them.
  - Note the plastic sheets on the patient, these are used as they can also keep heat in the patient (Rothrock, 2019).
    - We also have clear surgical drapes to allow visualization of the child during surgery.
  - Note: there have been instances where patients have experienced chemical burns on their buttocks related to pooling fluids between the patient and the Bair Hugger Blanket. Please ensure that all pooling prep is cleaned up before draping. During the case, surgery should be mindful of pooling fluid, and should be draping in a manner to reduce pooling fluids under the patient.

Thermoregulation – Large Underbody Bair Hugger

- Large Underbody Bair hugger (3M, n.d.-b)
  - Placed on the OR bed prior to patient's arrival
  - The Bair Hugger machine is turned on before the patient is placed on the bed, and often before the patient enters the OR.
  - Used for large/older pediatric patients
    - Concerned with visualization and access to the patient
- Note: there have been instances where patients have experienced chemical burns on their buttocks related to pooling fluids between the patient and the Bair Hugger Blanket. Please ensure that all pooling prep is cleaned up before draping. During the case, surgery should be mindful of pooling fluid, and should be draping in a manner to reduce pooling fluids under the patient.

47

Thermoregulation – Upper Body Bair Hugger

- Upper body Bair hugger (3M, n.d.-c)
  - Covers the patient's arms
  - Can be bilateral, or one sided
  - Used on large/older pediatric patients (also used in adults)
  - Used for abdominal, and lower body surgical procedures
  - Applied to the patient after induction, and the Bair Hugger machine is turned on after the surgical drapes are applied

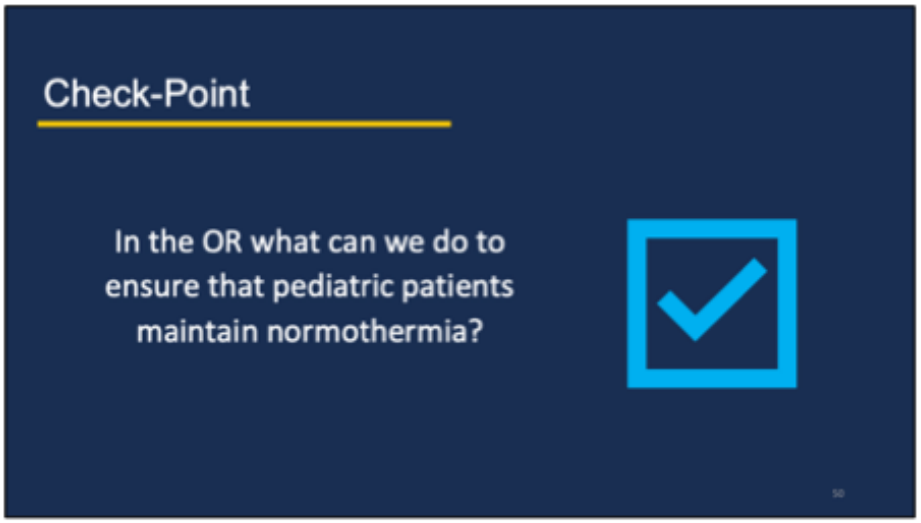
48

Thermoregulation – Lower Body Bair Hugger

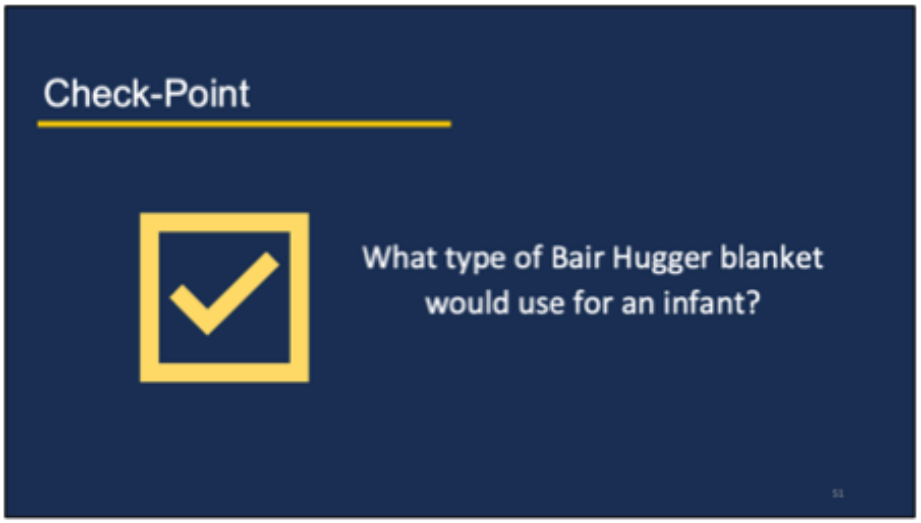
From 3M Bair Hugger Lower Body Blanket, Model 42308 by 3M, n.d.-a. (https://www.3m.com/3M/en_US/p/d/b00042295/)

- Lower body Bair hugger (3M, n.d.-d)
  - Covers the patient's lower body (waist down)
  - Used on large/older pediatric patients (and adults)
  - Used for upper body, thoracic, head and neck procedures
  - Applied to the patient after induction, and the Bair Hugger machine is turned on after the surgical drapes are applied

49

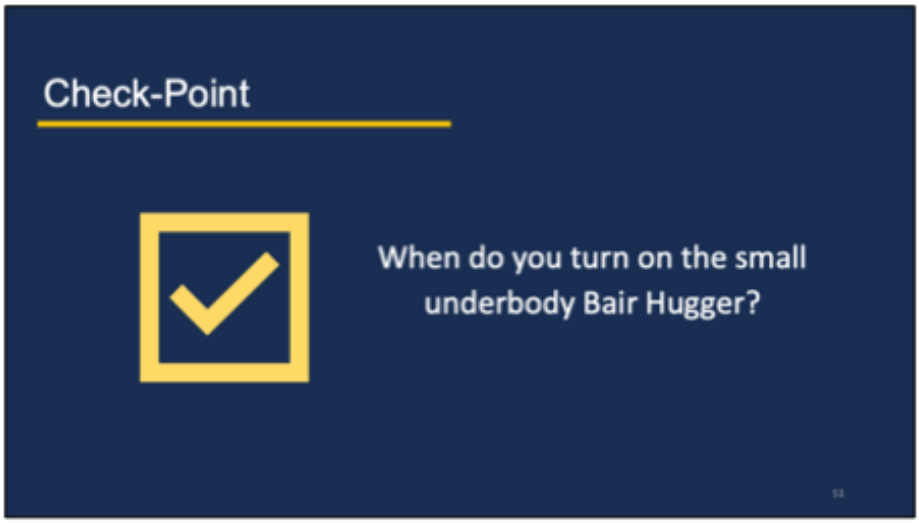


- Increase room temperature prior to patient arrival
- Warm cotton blanket preoperatively
- Incubator or radiant heat light
- Fluid warmer
- Temperature monitoring
- Bair Hugger with appropriate blanket



Small Underbody

On the bed, before the patient enters the room.



Before the patient enters the room

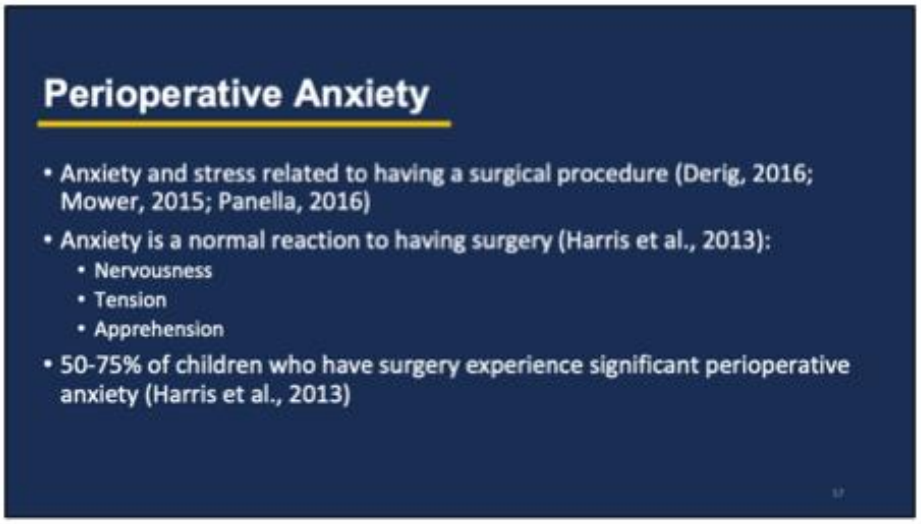
- Recommended to turn Bair hugger on approx. 5 minutes before the patient enters the room to ensure it is emitting warm air.


Psychological Development
54

- Surgery is a stressful and anxiety inducing experience (Mower, 2015).
- How a child responds and understands the new environment is depended on their developmental age (Rothrock, 2019).
    - One's developmental age may not match one's chronological age.
    - Developmental age is their progression in physical and mental development
- There are numerous developmental stages from newborn to adolescent.
    - We will discuss these stages in a few minutes, but first let's discuss perioperative anxiety!
- Clear communication is necessary to assist in reducing stress (Mower, 2015)
- Perioperative nurse acts as an advocate for both the patient and parent (Mower, 2015)

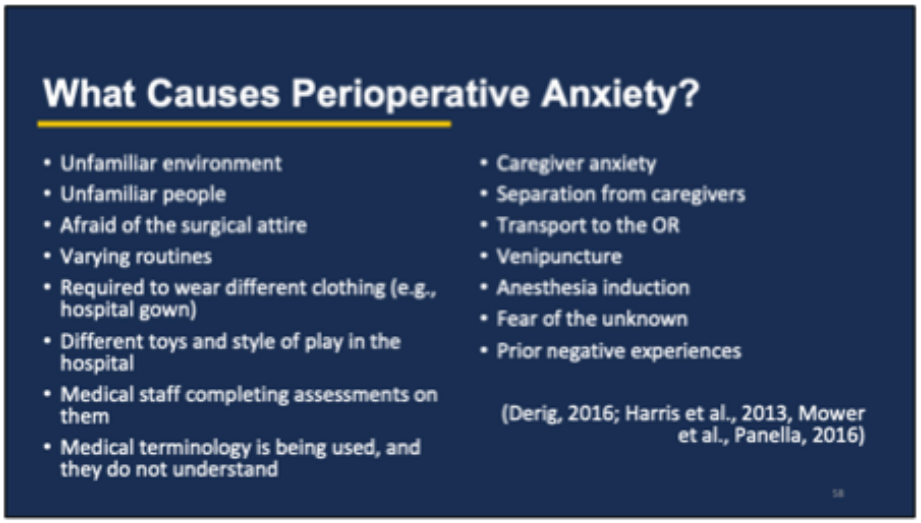
55


Psychological Development
Perioperative Anxiety
56

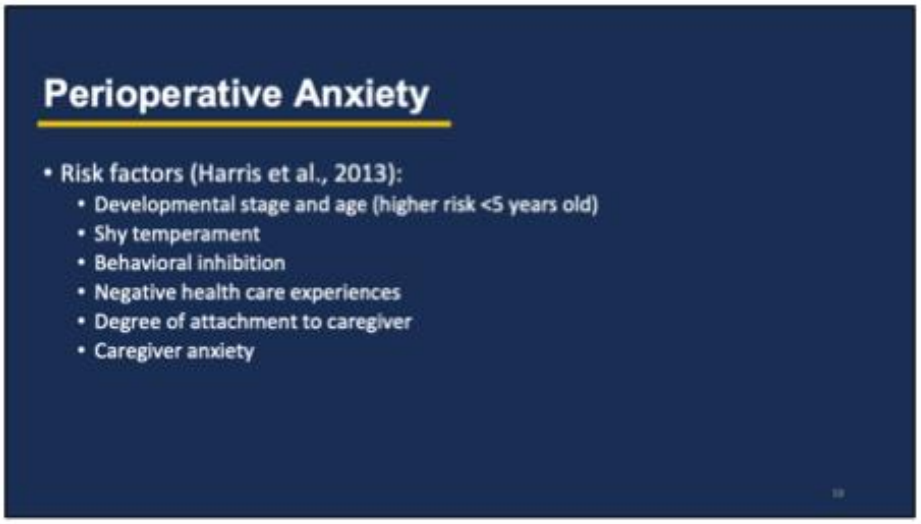


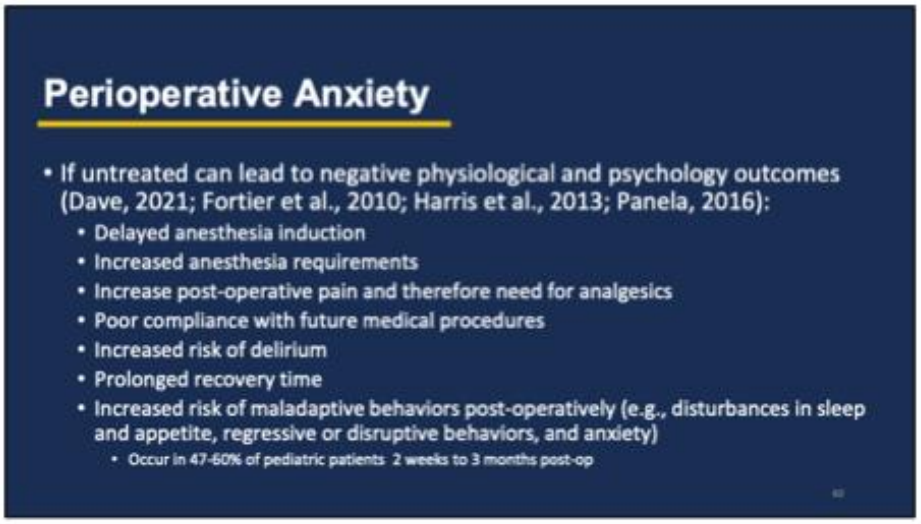
- Preoperative anxiety is the anxiety and stress that one experiences in relation to having a surgical procedure (Derig, 2016; Mower, 2015; Panella, 2016).
- Some level of anxiety is normal (Harris et al., 2013). With many presenting with nervousness, tension, or apprehension (Harris et al., 2013).
- When patients' have significant perioperative anxiety, it can lead to intraoperative and postoperative complications (Derig, 2016; Harris et al., 2013; Mower, 2015; Panella, 2016).
  It has been found that 50-75% of pediatric patients who undergo surgery experience significant perioperative anxiety (Harris et al., 2013)

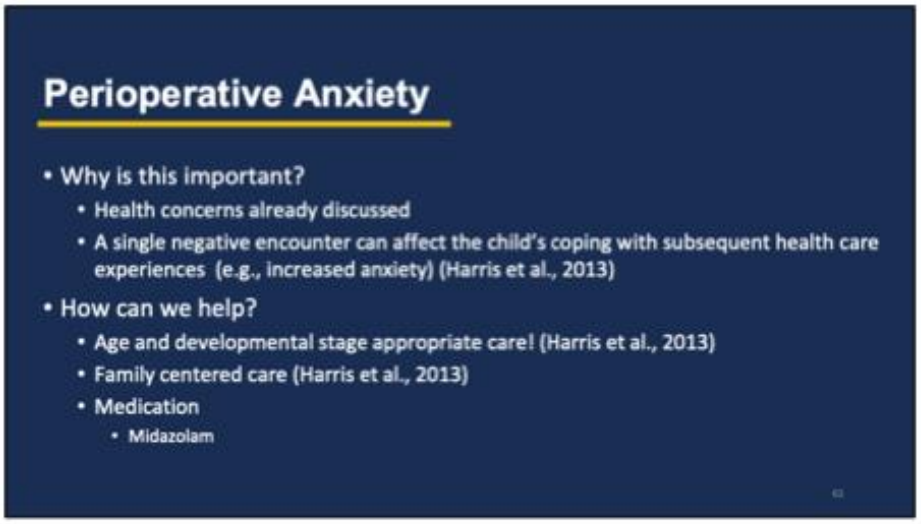
57



- There are many factors at play that work together to cause perioperative anxiety in pediatric patients.
- Ask new staff what they think some causes may be. Once there are a few answers show some common causes.
- They are: ***Read Slide***


Perioperative Anxiety
• Risk factors (Harris et al., 2013):
• Developmental stage and age (higher risk <5 years old)
• Shy temperament
• Behavioral inhibition
• Negative health care experiences
• Degree of attachment to caregiver
• Caregiver anxiety
59


Perioperative Anxiety
• If untreated can lead to negative physiological and psychology outcomes (Dave, 2021; Fortier et al., 2010; Harris et al., 2013; Panela, 2016):
• Delayed anesthesia induction
• Increased anesthesia requirements
• Increase post-operative pain and therefore need for analgesics
• Poor compliance with future medical procedures
• Increased risk of delirium
• Prolonged recovery time
• Increased risk of maladaptive behaviors post-operatively (e.g., disturbances in sleep and appetite, regressive or disruptive behaviors, and anxiety)
• Occur in 47-60% of pediatric patients 2 weeks to 3 months post-op
60



If the child has received midazolam preoperative, please do not let them walk to the OR.

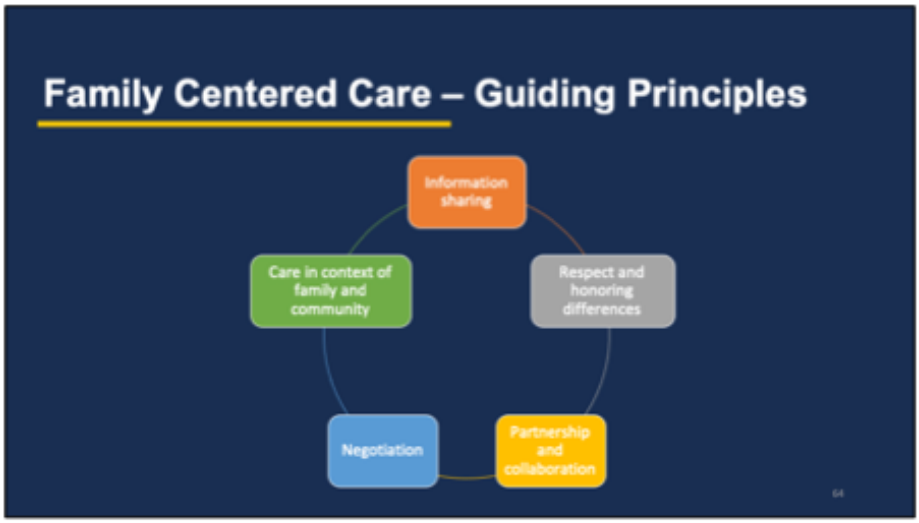

Psychological Development
Family Centered Care
62

Family Centered Care

- What is it?
  - It is an approach to health that is rooted in the partnership between the patient, their family and the healthcare providers (Kuo et al., 2012)
  - Considered a standard of pediatric healthcare (Kuo et al., 2012)

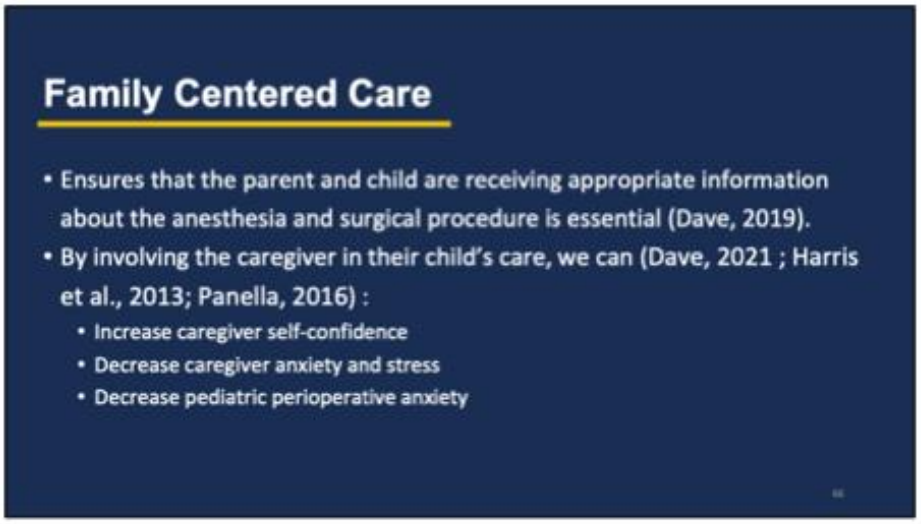
From: *Patient and Family Centered Care*, by North Shore Health Network, n.d. (https://www.nshn.care/patient-family-centered-care)

63



- Guiding principles (Kuo et al., 2012):
  - Information sharing
    - Information exchange that is open, unbiased and objective
  - Respect and honoring differences
    - Respect for diversity, cultural and linguistic traditions
    - Care preferences (e.g., blood refusal)
  - Partnership and collaboration
    - Care decisions are made together by all involved
  - Negotiation
    - Desired medical outcomes are flexible and never absolute (i.e., patients and families can change their mind)
  - Care in context of family and community
    - Medical care and decisions reflect the child with the context of their home, school, daily activities, and quality of life within their community
- How does this look in the OR?


Family Centered Care
• Pediatric surgery is a stressor on the patient and their immediate family (Harris et al., 2013)
• Caregivers experience anxiety regarding (Harris et al., 2013):
• Recovery
• Poor outcomes
• Lack of information (explain care to the parents so they can better assist and care for their child)
• Disruption of parental role (make them feel involved in the care)
• Concerns regarding pain
65



- Family Centered Care has become more popular for pediatric patients due to:
  - The impact a caregiver can have as a source of strength and support for the child
  - The positive impact on expectation management, satisfaction, and compliance (Leuhmann et al., 2019)
- To help facilitate family centered care LHSC has incorporated Child Life Specialists into the circle of care for pediatric patients.

Family Centered Care – Child Life Specialist (CLS)

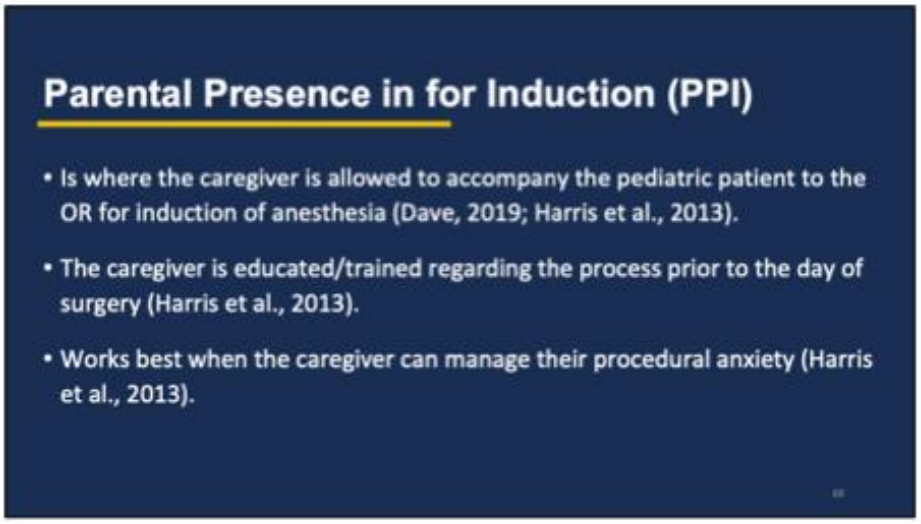
- CLS partners with children and families to help with the social and emotional impact hospitalization and illness can have (LHSC, n.d.-a); SickKids, n.d.).
- Use developmentally appropriate techniques (i.e., play) to educate and familiarize children with their current or upcoming medical care (Dave, 2021; LHSC, n.d.-a); SickKids, n.d.; West et al., 2020).

From *Child Life Development*, BC Children's Hospital, n.d. (http://www.bcchildrens.ca/our-services/support-services/child-life)

67

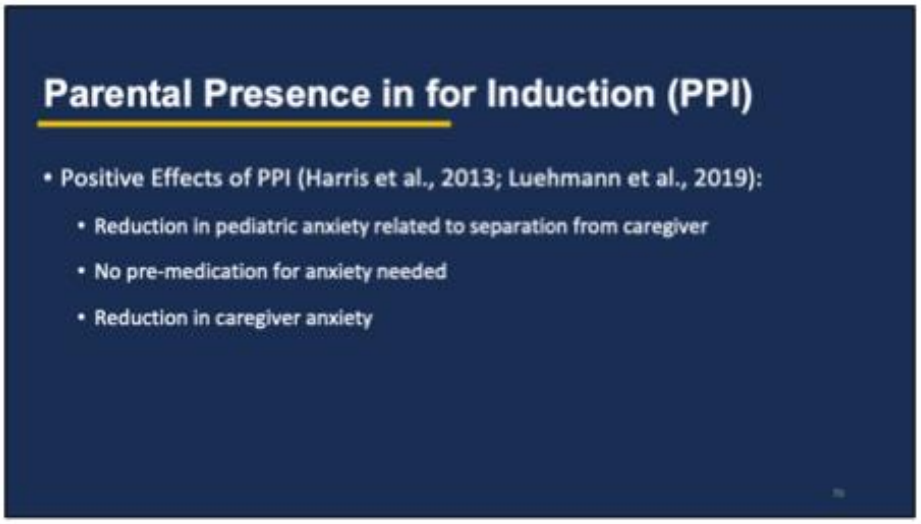
- CLSs partner with children and families to help with coping for medical procedures and care (**e.g., IV insertion and surgery**) (LHSC, n.d.; SickKids, n.d.).
- Use developmentally appropriate techniques (**e.g., play therapy, and distraction**), to educate and familiarize children with their current or upcoming medical care (Dave, 2021; LHSC, n.d.; SickKids, n.d.; West et al., 2020).

- Video: https://www.youtube.com/watch?v=eCn2mNs9x-o&t=9s
- Description: This video was made by LHSC in 2019, and explains the surgical preparation required for pediatric patients.
- Note: Fast forward video to 4:10 for portion on CLS, stop video at 6:17

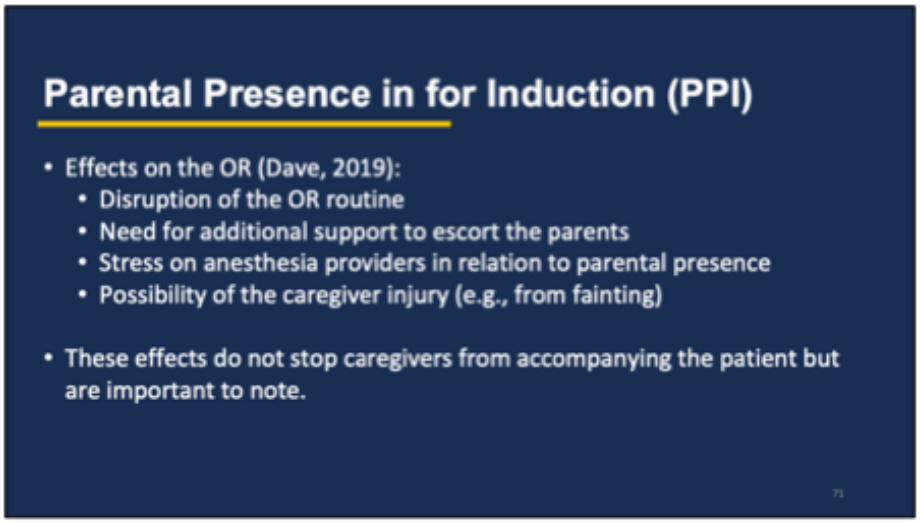


- Parent = caregiver = familiar adult
- Is where the parent is allowed to accompany the pediatric patient to the OR for induction of anesthesia (Dave, 2019; Harris et al., 2013).
- It was introduced as a technique to decrease anxiety and increase cooperation in the pediatric patient, in hopes of decreasing pre-medication with anti-anxiety medication and their potential side effects (Dave, 2019).
- To prepare, the caregiver is educated/trained regarding the process of PPI prior to the day of surgery (Harris et al., 2013).
- Often works best when the caregiver can manage their procedural anxiety, so that it does not increase the anxiety of the child (Harris et al., 2013).
- At LHSC not all pediatric parents have a PPI, it needs to be pre-planned (e.g., to ensure education to the parents), agreed upon by the anesthesiologist, and a Child-Life Specialist must be working to accompany the parent (i.e., Monday to Friday during working hours).
    - At LHSC, PPI is only offered to those who are 12 months to 8 years old (LHSC, n.d.-b)
        - Unsure of reasoning for limiting PPI ages, ? Resources ? Personnel availability
- When the caregiver comes to the OR they must be in OR appropriate attire (e.g., abiding by the OR's Surgical Attire Policy).
- Caregivers are in the OR for the mask-induction of the child, and then accompanied out by the CLS once the child is asleep.

69



- Effects of PPI (Harris et al., 2013; Luehmann et al., 2019):
  - Reduction in pediatric anxiety related to separation from caregiver
    - In a study it was found that 93.2% of caregivers reported a reduction in their child's anxiety due to the PPI program
  - No premedication needed
  - Reduction in caregiver anatomy
    - In a study it was found that 87.1% of caregivers reported a reduction in their anxiety due to the PPI program
- Despite these findings, the effects of PPI are mixed in the literature with some showing a benefit to the child and parent, but others show no benefit (Dave, 2019).



- However, these positive effects come with some increased demands and potential disruptions to the OR.
- Effects on the OR (Dave, 2019):
  - Disruption of the OR routine.
    - The OR is a well-oiled machine, and we need to be mindful of time allotments for procedures. For example, if a case takes longer to complete than anticipated, it could mean that the surgeries following may be canceled as there is no staff to complete them.
  - Need for additional support to escort the parents.
    - This is the CLS. Someone needs to be accountable for the parent.
  - Stress on anesthesia providers in relation to parental presence.
    - Having someone watching during this stressful time can make the anesthesiologist uncomfortable.
  - Possibility of the caregiver injury (e.g., from fainting).
    - Injury is always a risk. For example, if a caregiver is pregnant, they are not allowed to participate in a PPI due to the possibility of something occurring. (I have no more information…this is a historic thing, but with no know reasoning right now).
- These effects do not stop caregivers from accompanying the patient but are important to note.

Parental Presence for Induction (PPI)

From: *Parental Presence in the Operating Room*, by Wakefield Health & Hospitals, 2019. https://www.youtube.com/watch?v=cuMhZirnxvo

72

- Source link: https://www.youtube.com/watch?v=cuMhZirnxvo
- The video is an education for caregivers participating in PPI.
- LHSC's process for PPI is very similar to that described above!
- Point out that our practice compared to the video:
    - Parents wear a "warm up jacket" (a long sleeved, knee length jacket made of the same material as hospital scrubs) and a hair covered (e.g., scrub cap).

- Risk factors (Harris et al., 2013):
  - Developmental stage and age (higher risk <5 years old)
  - Shy temperament
  - Behavioral inhibition
  - Negative health care experiences
  - Degree of attachment to caregiver
  - Caregiver anxiety

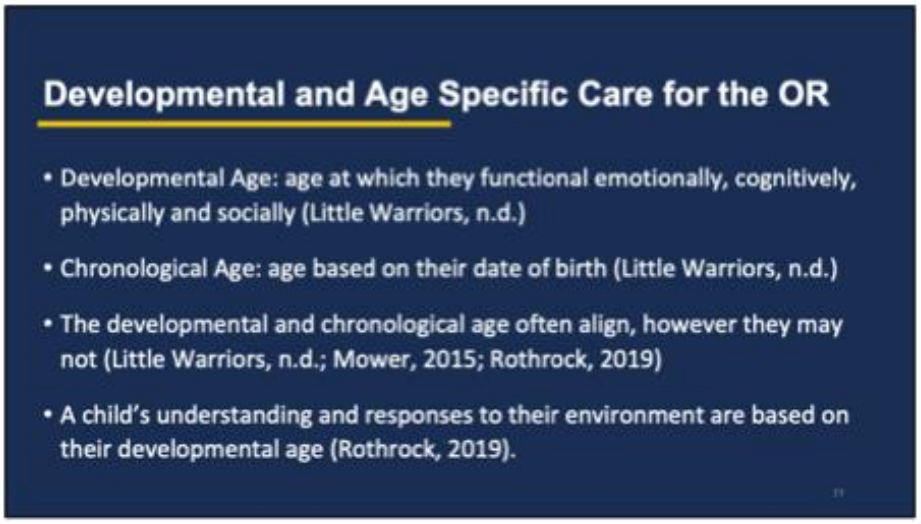
It is an approach to health that is rooted in the partnership between the patient, their family and the healthcare providers (Kuo et al., 2012)

- Guiding principles (Kuo et al., 2012):
  - Information sharing
    - Information exchange that is open, unbiased and objective
  - Respect and honoring differences
    - Respect for diversity, cultural and linguistic traditions
    - Care preferences (e.g., blood refusal)
  - Partnership and collaboration
    - Care decisions are made together by all involved
  - Negotiation
    - Desired medical outcomes are flexible and never absolute (i.e., patients and families can change their mind)
  - Care in context of family and community
    - Medical care and decisions reflect the child with the context of their home, school, daily activities, and quality of life within their community


Psychological Development
Developmental and Age
Specific Care
75

- Care of the pediatric patient is not a one-size fits all.
- Need to considers the patient's age, and developmental stage (Mower, 2015; Rothrock, 2019).
  - These often align, but depending on patient situation (e.g., premature) they may not.
- By understanding developmental stages nursing can utilize critical thinking to identify needs of the patient, determine desirable outcomes, and create an individualized plan of care to ensure safe, efficient, and effective care (Mower, 2015).
  - For example, the fears a child may have in relation to having surgery can vary based on the child's level of psychological development (Rothrock, 2019). If nurses understand the common nursing interventions for the developmental stages they can provide better and safer care.

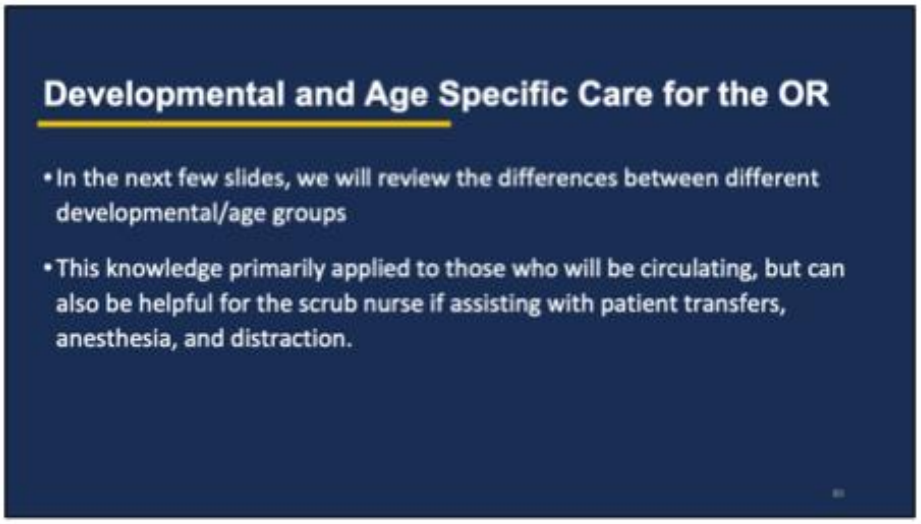
76

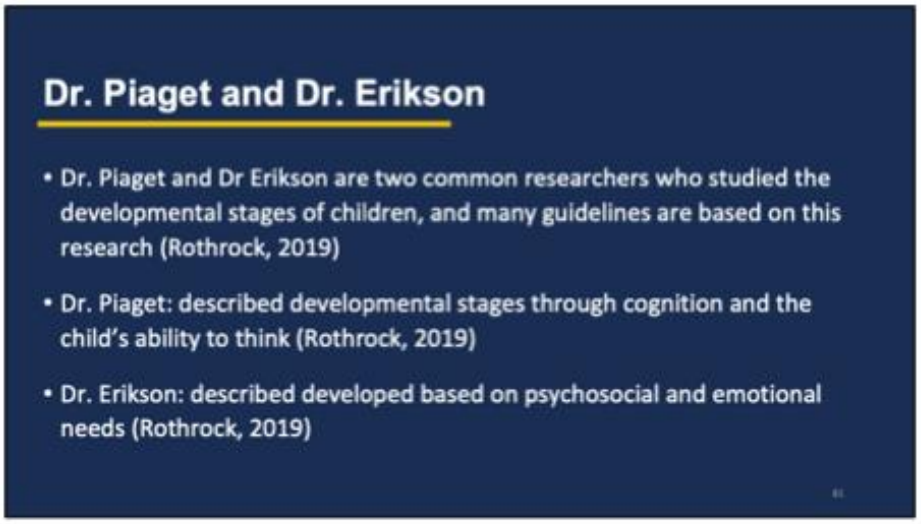

Developmental and Age Specific Care for the OR
• Developmental Age: age at which they functional emotionally, cognitively, physically and socially (Little Warriors, n.d.)
• Chronological Age: age based on their date of birth (Little Warriors, n.d.)
• The developmental and chronological age often align, however they may not (Little Warriors, n.d.; Mower, 2015; Rothrock, 2019)
• A child's understanding and responses to their environment are based on their developmental age (Rothrock, 2019).
77

- Patents at these different stages have different care and developmental needs. Nurses need to be aware of these (Mower, 2015).
- We will not go through the different developmental stages, and talk about common concerns for children, and nursing interventions.

78


Developmental and Age Specific Care for the OR
• Developmental age and chronological age may not align due to (Little Warriors, n.d.; Mower, 2015; Rothrock, 2019):
• Patient's health(e.g., developmental differences; premature)
• Their environment (especially home) (e.g., stress, negative or lack of interactions),
• Events (e.g., trauma)
• These events interrupt psychological stages of development, and can cause a regression in the patient's developmental age (Little Warriors, n.d.; Mower, 2015; Rothrock, 2019)
79


Developmental and Age Specific Care for the OR
• In the next few slides, we will review the differences between different developmental/age groups
• This knowledge primarily applied to those who will be circulating, but can also be helpful for the scrub nurse if assisting with patient transfers, anesthesia, and distraction.
80


Dr. Piaget and Dr. Erikson
• Dr. Piaget and Dr Erikson are two common researchers who studied the developmental stages of children, and many guidelines are based on this research (Rothrock, 2019)
• Dr. Piaget: described developmental stages through cognition and the child's ability to think (Rothrock, 2019)
• Dr. Erikson: described developed based on psychosocial and emotional needs (Rothrock, 2019)

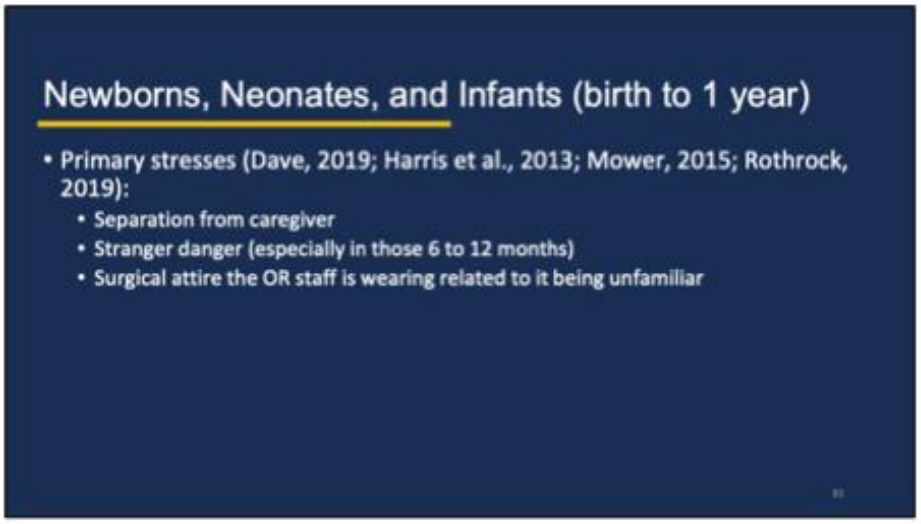
Premature Newborns

- May be intubated, or have other tubes and wires coming from them depending on condition
- Benefit from (Mower, 2016):
  - Close contact with others (e.g., parents, nurses)
  - Eye protection from bright lights
  - Quiet environments

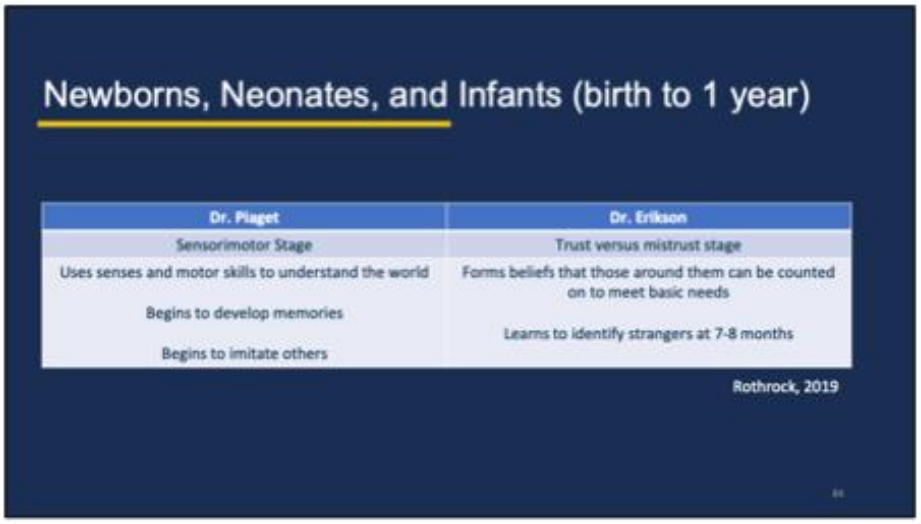
From: Premature Newborn, M.S. Williamson, n.d.

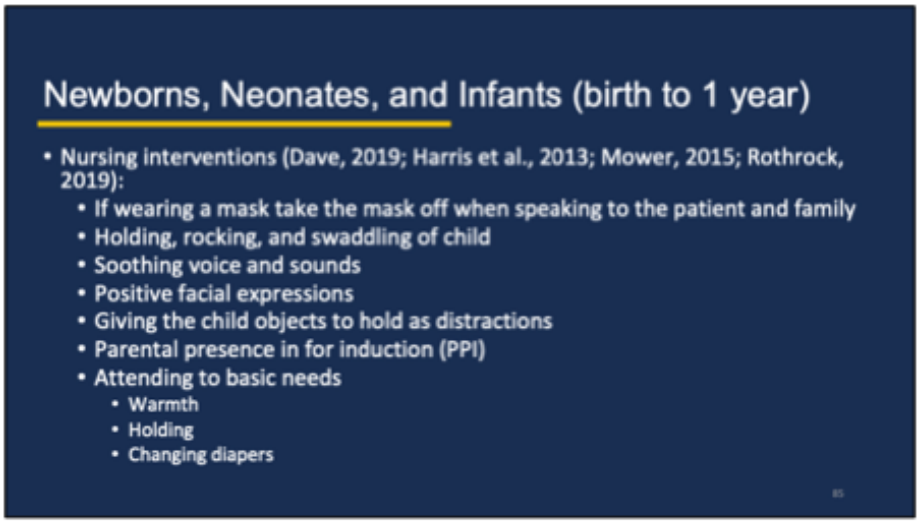
- If the premature newborn is intubated, please be mindful of moving the patient without assistance from anesthesia. Obtaining an airway in these patients is very difficult.
- Developmentally appropriate care can be a challenge.
- Will come to the OR with a parent, NICU nurse, and RT. Patient will be in an incubator.

82



- Primary fear in separation from their caregiver (Dave, 2019; Mower, 2015; Rothrock, 2019)
  - May experience stranger anxiety, especially those 6 to 12 months old.
- The nurse becomes the surrogate parent while in the OR (Mower, 2015)


Newborns, Neonates, and Infants (birth to 1 year)
Dr. Piaget
Dr. Erikson
Sensorimotor Stage
Trust versus mistrust stage
Uses senses and motor skills to understand the world
Begins to develop memories
Begins to imitate others
Forms beliefs that those around them can be counted on to meet basic needs
Learns to identify strangers at 7-8 months
Rothrock, 2019
84



- Interventions (Dave, 2019; Harris et al., 2013; Mower, 2015; Rothrock, 2019)
  - If wearing a mask take the mask off when speaking to the patient and family
  - Holding, rocking, and swaddling of child
    - Nurses will commonly carry the child down to the OR
      - If you do this, ensure that you ask the OR Aide to go pick up their bed from Day Surgery.
    - Children <9 months are usually willing to accept parental surrogates (Dave, 2019).
  - Soothing voice
  - Positive facial expressions
  - Giving the child objects to hold as distractions
    - Can bring in a personal item (e.g., toy)
  - PPI
    - We want to keep caregiver and child together as long as possible
  - Attending to basic needs
    - Warmth
    - Holding
    - Changing diapers

Toddlers (1 to3 years)

- Primary Stressors (Dave, 2019; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
  - Stranger anxiety
  - May see surgery as a punishment
  - Separation anxiety
  - Surgical attire the OR staff is wearing related to it being unfamiliar

From: What Age is a Toddler?, Tangerine Reve, n.d. https://tangerinereve.com/tr/blogs/knowledge-base/what-age-is-a-toddler

86


Toddlers (1 to3 years)
Dr. Piaget
Preoperational Stage
Starts to recognize symbols
Likes creative play (pretend play)
Egocentric
Dr. Erikson
Autonomy versus shame and doubt
Has developed free will
Increased control over their own bodies
Can feel regret, sorrow and recognize inappropriate behaviors
Rothrock, 2019
87

- Nursing interventions Dave, 2019; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
  - If wearing a mask take the mask off when speaking to the patient and family
    - Get down to the child's eye level can also be helpful
  - Include them in care
    - e.g., asking their name, or simple choices
  - Find comfort in familiar items, *transitional object* (e.g., teddy bear)
    - Can take these items to the OR – ensure it is present when extubating to provide comfort in unfamiliar environment
    - Often, we dress them up in OR attire
  - Sing songs
    - Some anthologist will sing the patients to sleep
  - PPI
    - Want to keep caregiver and child together as long as possible
  - Younger toddlers:
    - Enjoy interactive play (begins around 12 months) (e.g., peak a boo)
  - Older toddlers (>18 months)
    - Individual autonomy emerges
    - Pretend play
  - Play is a great distraction!

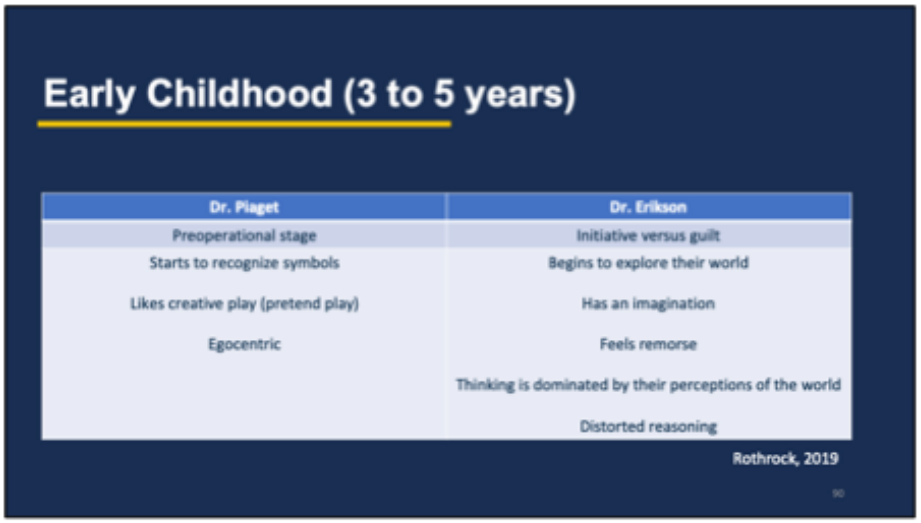
Early Childhood (3 to 5 years)

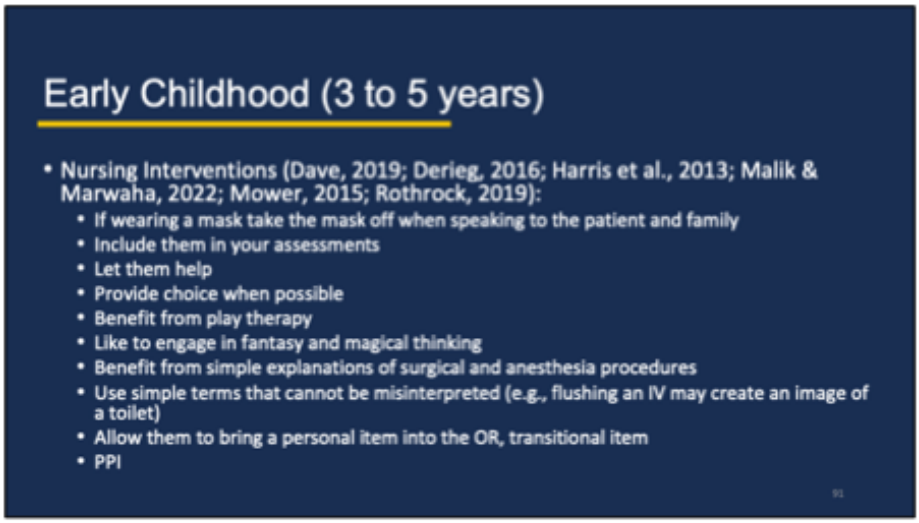
- Primary Stressors (Dave, 2019; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
  - Stranger anxiety
  - May see surgery as a punishment
  - Separation anxiety
  - Surgical attire the OR staff is wearing related to it being unfamiliar
  - Body mutilation (e.g., genitalia for males)
  - Fear of having done something wrong

From: Early Childhood, Canadian Business College, n.d.

- This group is starting to seek independence.
- Primary Stressors (Dave, 2019; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
  - Stranger anxiety
  - May see surgery as a punishment
  - Separation anxiety
  - Surgical attire the OR staff is wearing related to it being unfamiliar
  - Body mutilation (e.g., genitalia for males)
  - Feel surgery is related to something they did wrong

89


Early Childhood (3 to 5 years)
Dr. Piaget
Preoperational stage
Starts to recognize symbols
Likes creative play (pretend play)
Egocentric
Dr. Erikson
Initiative versus guilt
Begins to explore their world
Has an imagination
Feels remorse
Thinking is dominated by their perceptions of the world
Distorted reasoning
Rothrock, 2019



- Nursing Interventions (Dave, 2019; Derieg, 2016; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
    - Include them in your assessment
        - They are starting to seek independence
        - Can ask name, birth date, and sometimes what is going to happen
    - Provide choice when possible
    - Benefit from play therapy
    - Like to engage in fantasy and magical thinking
        - Tell stories during induction
    - Benefit from simple explanations of surgical and anesthesia procedures that cannot be misunderstood
        - Have them play with the items (e.g., mask or pulse oximeter) if necessary to provide some comfort and security
        - We simplify the content due to this developmental stage often associating problems with something unrelated (e.g., I am sick because the sky is blue, or I am sick because I stepped on a crack, or I am sick because I hit my sister)
            - Related to pre-operational thinking
            - Any misconceptions should be addressed prior to surgery
    - Use simple terms that cannot be misinterpreted (e.g., flushing an IV may create an imagine of a toilet)
        - E.g., heart, ears, and belly
        - Children this age have distorted thinking and want to ensure they are understanding correctly
    - Anxiety
        - May see surgery as a punishment, or related to something
        - Fear of mutilation
    - Allow them to bring a personal item into the OR
        - e.g., the transitional item such as teddy bear, or stuffed animal
    - PPI

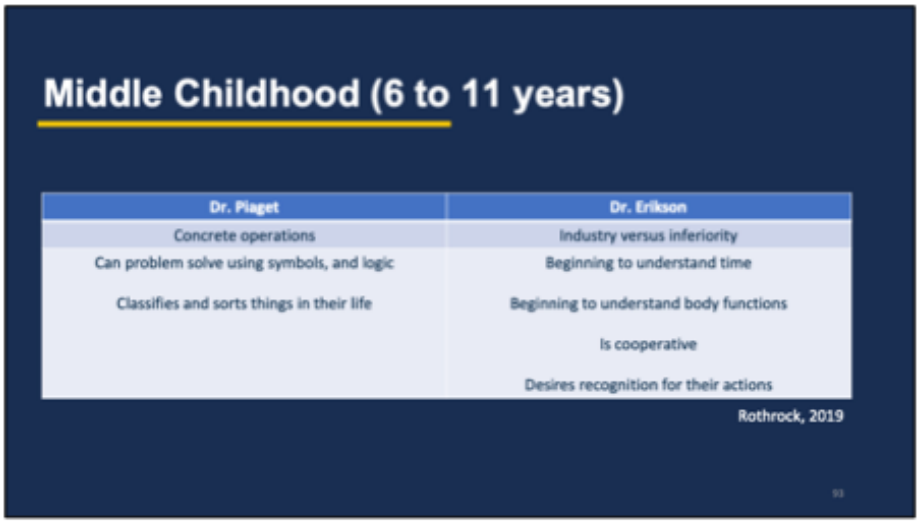
Middle Childhood (6 to 11 years)

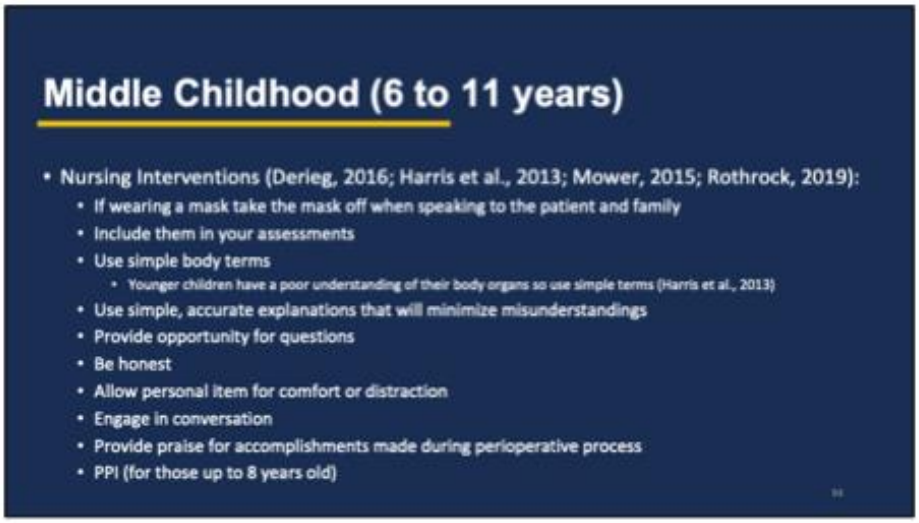
- Primary Stressors (Derieg, 2016; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
  - View surgery as a punishment or a consequence
  - Fear of pain
  - Fear of mutilation
  - Fear of the unknown
  - Fear of failure or inadequate performance
  - Separation anxiety

From: Middle Childhood, Kamryn Russel Child Therapist, n.d.

- Children this age are concrete thinkers (Mower, 2015)
  - For example, may view the wording "going to sleep" with the death of an animal
- They strive for approval
- Have the ability to rehearse problem-focused coping strategies
- Primary Stressors (Derieg, 2016; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
  - View surgery as a punishment or consequence
    - For example, from inhaling or ingesting something, or from touching something
  - Fear of pain
  - Fear of mutilation
  - Fear of the unknown
  - Fear of failure or inadequate performance
  - Separation anxiety
    - As child ages this decreases

92


Middle Childhood (6 to 11 years)
Dr. Piaget
Concrete operations
Can problem solve using symbols, and logic
Classifies and sorts things in their life
Dr. Erikson
Industry versus inferiority
Beginning to understand time
Beginning to understand body functions
Is cooperative
Desires recognition for their actions
Rothrock, 2019
93



- Nursing Interventions (Derieg, 2016; Harris et al., 2013; Mower, 2015; Rothrock, 2019):
  - If wearing a mask take the mask off when speaking to the patient and family
  - Include them in your assessments
    - Allows them to maintain a level of control
    - E.g., ask them their name, birth date, what procedure there are having, jewelry
  - Use simple body terms
    - Younger children have a poor understanding of their body organs so use simple terms (Harris et al., 2013)
  - Use simple, accurate explanations that will minimize misunderstandings
  - Provide opportunity for questions
    - We want to address any misconceptions before surgery
  - Be honest
  - Allow personal item for comfort or distraction
    - If item can be dressed in a mask and surgical cap do so!
  - Engage in conversation
  - Provide praise for accomplishments made during perioperative process
    - E.g., for being cooperative, or speaking up about their needs

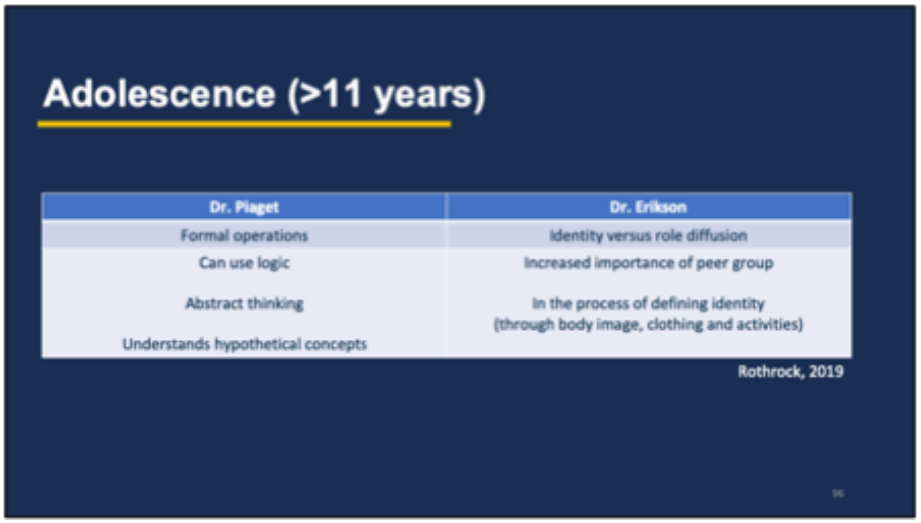
Adolescence (>11 years)

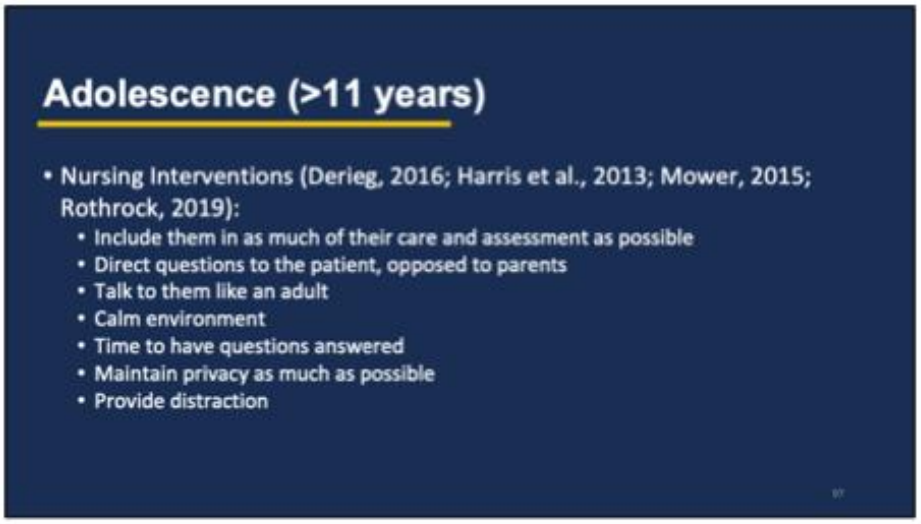
- Primary Stressors (Derieg, 2016; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
  - Loss of control
  - Fear of pain
  - Loss of contact with friends during surgery and recovery
  - Loss of privacy
  - Cosmetic implications of surgery
  - Fear of the unknown
- May demonstrate a fight or flight response to stressors (Mower, 2015).

From, Teenagers, Chip Somodevilla, n.d.

95

- These children often resemble adults, but are not (Mower, 2015)!
- They have a desire for autonomy (Mower, 2015).
- Have a greater understanding of how the body functions, and illness, and therefore can understand causation for disease (Harris et al., 2013).
- Primary Stressors (Derieg, 2016; Harris et al., 2013; Malik & Marwaha, 2022; Mower, 2015; Rothrock, 2019):
  - Loss of control
  - Fear of pain
  - Loss of contact with friends during surgery and recovery
    - Peer group is of great importance
    - We do not take personal phones into the OR
  - Loss of privacy
  - Cosmetic implications of surgery
    - E.g., appearance of scars
  - Fear of the unknown
- May demonstrate a fight or flight response to stressors (Mower, 2015).


Adolescence (>11 years)
Dr. Piaget
Formal operations
Can use logic
Abstract thinking
Understands hypothetical concepts
Dr. Erikson
Identity versus role diffusion
Increased importance of peer group
In the process of defining identity
(through body image, clothing and activities)
Rothrock, 2019



- Nursing Interventions (Derieg, 2016; Harris et al., 2013; Mower, 2015; Rothrock, 2019):
  - Include them in as much of their care and assessment as possible
  - Direct questions to the patient, opposed to parents
  - Calm environment
  - Time to have questions answered
    - Can have greater discussion and explanation
  - Maintain privacy as much as possible
    - Covering them up as much as possible
  - Provide distraction
    - Asking them questions, talking about interests
    - May identify other effective coping strategies (e.g., listening to music)

97

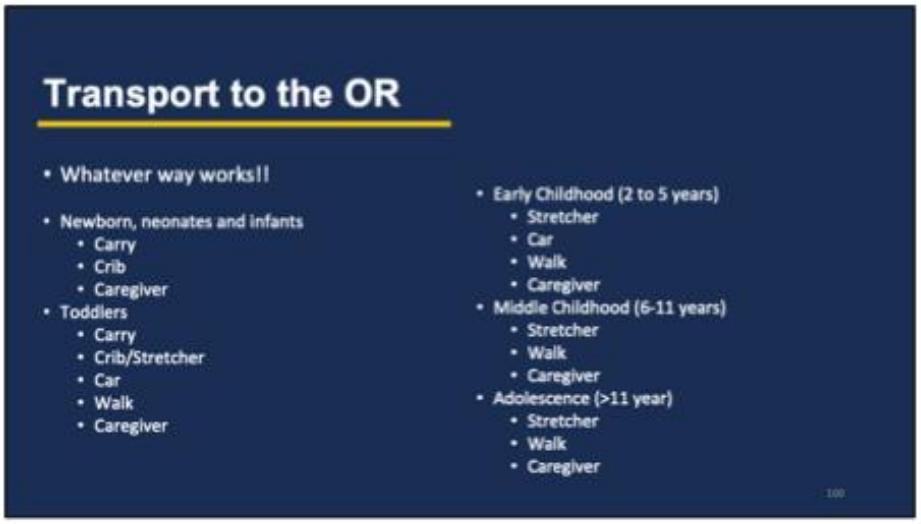

Developmentally Different Children
• Children who are developmentally different may need to treated younger than their chronological age (Nair, 2021)
• Autism
• Cerebral palsy
• Metabolic disorders
98

Transport to the OR

- Whatever way works!!
- Newborn, neonates and infants
  - Carry
  - Crib
  - Caregiver
- Toddlers
  - Carry
  - Crib/Stretcher
  - Car
  - Walk
  - Caregiver

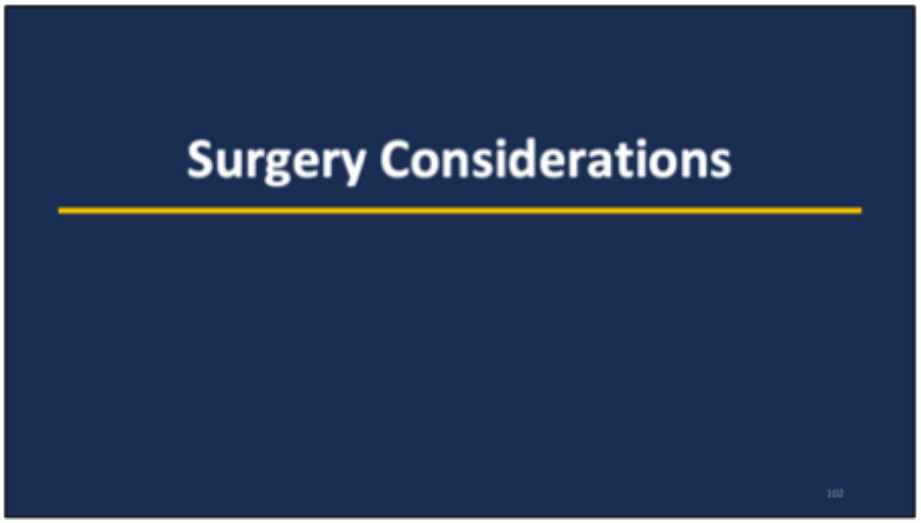
From: Whisper Ride Cruiser, Step 2, n.d.

- Newborn, neonates and infants
  - Carry by nurse
  - Crib
  - Caregiver assistance (e.g., carry)
- Toddlers
  - Carry by nurse
  - Crib/Stretcher
    - If on stretcher they may enjoy pushing the automatic door buttons
  - Car (Step 2 push car, as in picture)
  - Walk
    - Can only walk if no anti-anxiety medication were given
    - At your discretion, as this may take a while
  - Caregiver

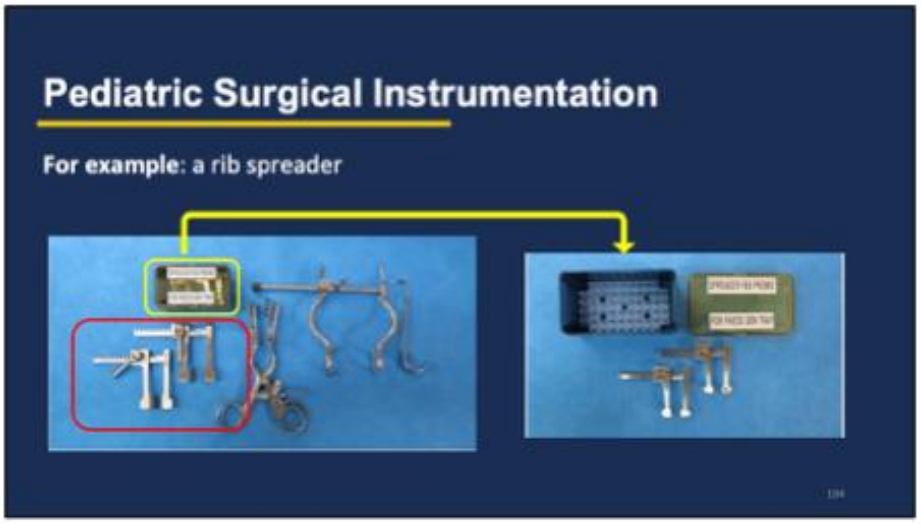


- Early Childhood (2 to 5 years)
  - Stretcher
    - If on stretcher they may enjoy pushing the automatic door buttons
  - Car (Step 2 push car, as in picture)
  - Walk
    - Can only walk if no anti-anxiety medication were given
    - At your discretion, as this may take a while
  - Caregiver
- Middle Childhood (6-11 years)
  - Stretcher
    - If on stretcher they may enjoy pushing the automatic door buttons
  - Walk
    - Can only walk if no anti-anxiety medication were given
    - At your discretion, as this may take a whil3
  - Caregiver
- Adolescence (>11 year)
  - Stretcher
    - If on stretcher they may enjoy pushing the automatic door buttons
  - Walk
    - Can only walk if no anti-anxiety medication were given
    - At your discretion, as this may take a while
  - Caregiver (if 12 and under)

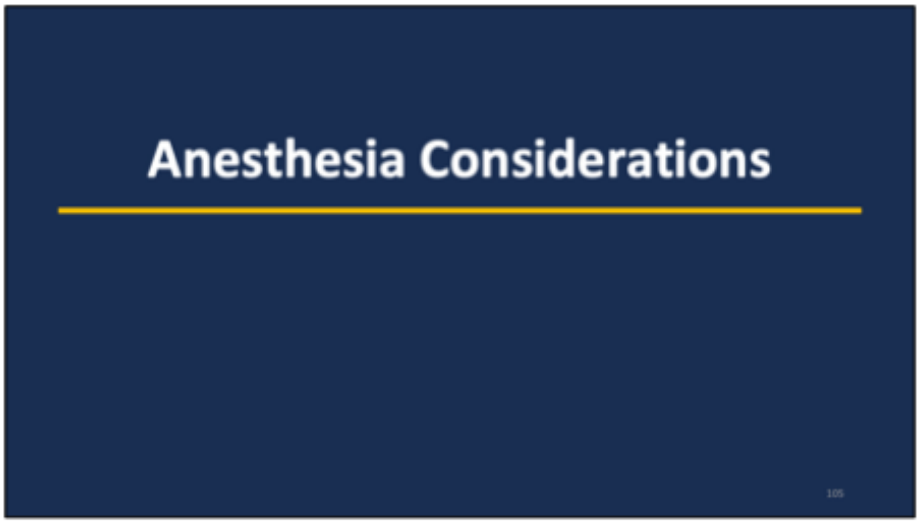
False! Always include as much as possible within the child's abilities.

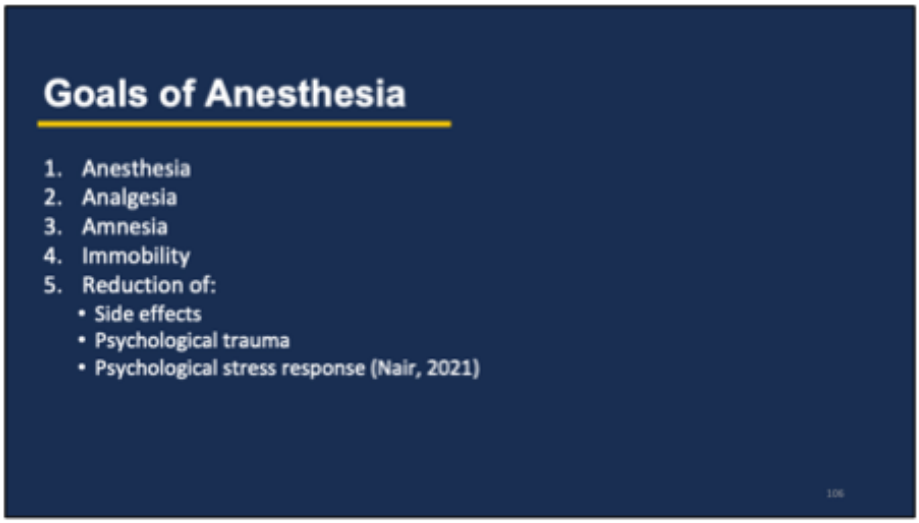

Surgery Considerations
102

- Instruments used in pediatric surgery are usually (Rothrock, 2019):
  - Smaller
  - Shorter
  - More delicate
  - Have less of a curvature (e.g., with hemostats)
- There is a range of pediatric instrumentation to accommodate the varying sizes of pediatric patients (e.g., premature newborns to adolescence) (Rothrock, 2019).
  - E.g., those less than 1 kg to those 100 kg or more
  - If the child (e.g., teenager) is similar in size to an adult can use adult instruments
  - This is the main factor when choosing instrument!!
- Fewer instruments are commonly used (Rothrock, 2019).
  - This is related to smaller incision sites and less depth

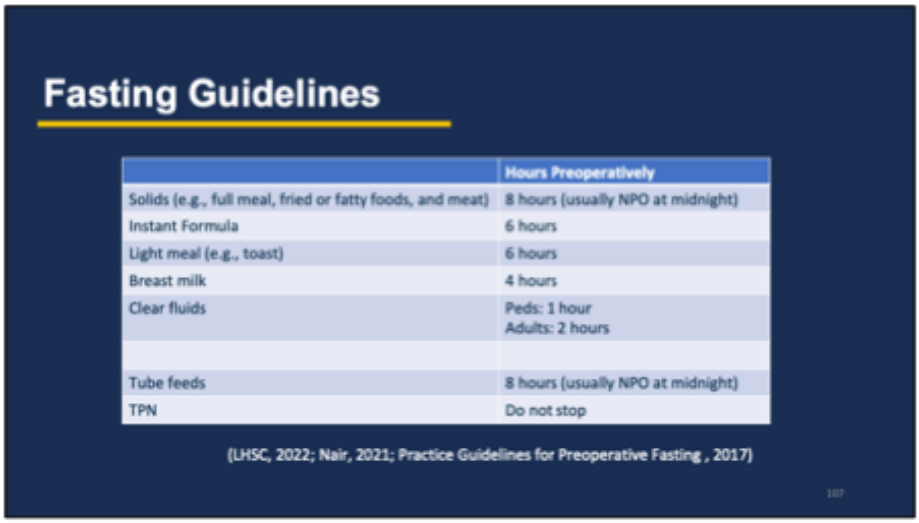


- The image on the left is example of retractors that can be used on pediatric patients. Outlined in red are pediatric rib spreaders.
- Outlined in yellow is a rib spreader for premature newborns, or smaller children
- As a trauma hospital we need to have instruments that accommodate all patient sizes from premature newborns to adults.


Anesthesia Considerations
105



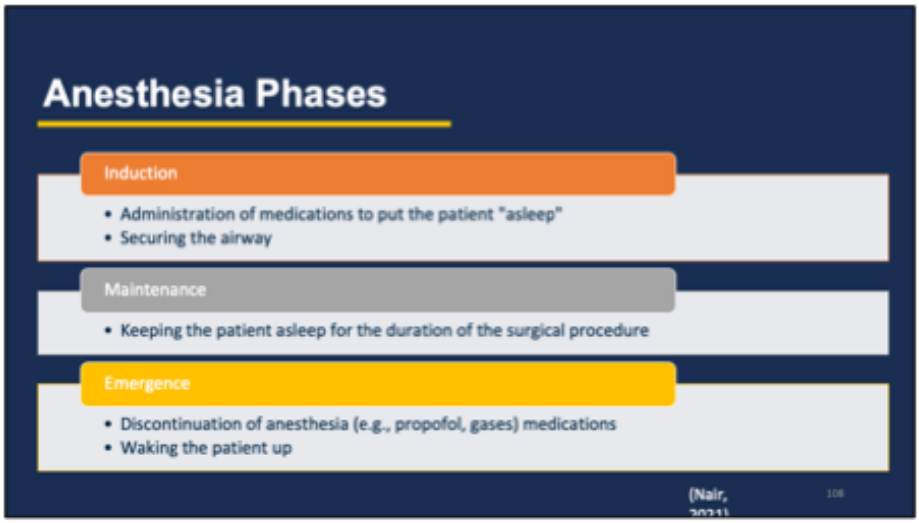
1. Anesthesia
    - Lack of sensation
2. Analgesia
    - Lack of pain
3. Amnesia
    - Lack of awareness
4. Immobility
5. Reduction of:
    - Side effects
    - Psychological trauma
    - Psychological stress response



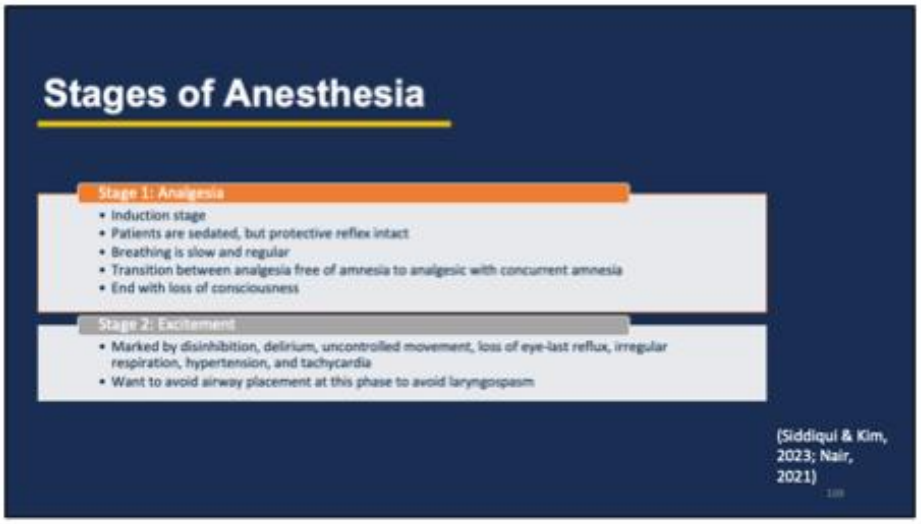
Fasting guidelines are for elective cases.
For trauma case, will utilize a rapid sequence induction if patient needs surgery, and unable to meet these guidelines.
Clear Fluids are fluids one can see through (LHSC, 2022):

- Water
- Fruit juice (e.g., apple juice)
- Ready diluted drinks
- Non-fizzy sports drinks
- Non-thickened fluids
- Non-carbonated drinks

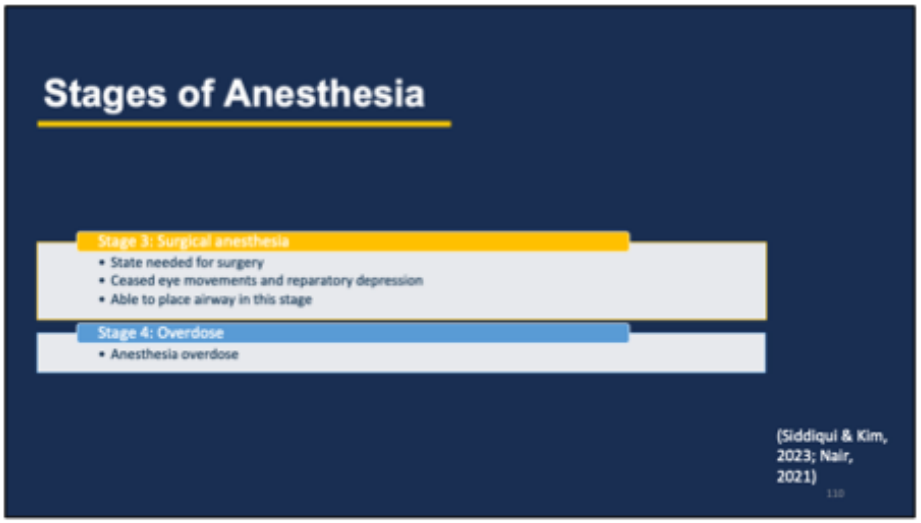
The maximum about of fluid appropriate for the child's weight will be documented on PowerChart (LHSC, 2022). As an OR nurse you are not required to confirm this, as the Day Surgery nurse and Inpatient nurse should be aware.
During the preoperative assessment the OR nurse needs to confirm NPO status. They will ask about last intake of fluid and food.



- Nursing primarily assists during induction and emergence.
- It is expected the nursing will be present and focused on anesthesia and the patient during these time. The exception to this is when a respiratory therapist is present.



- This is important to know, so the the OR nurse knows what to expect during induction.



- This is important to know, so the the OR nurse knows what to expect during induction.

- A nurse or respiratory therapist should always be by the patient's side assisting anesthesia for induction
- Laryngospasm
- Failed ventilation
    - Unable to oxygenate the patient
- Failed intubation
    - With pediatric airways this is a possibility
- Vomiting or aspiration
    - Strict NPO guidelines with elective cases
    - Rapid sequence induction with or without cricoid pressure
        - Related to position of cricoid cartilage (i.e., more cephalad) (Dave, 2019)
- Failed IV

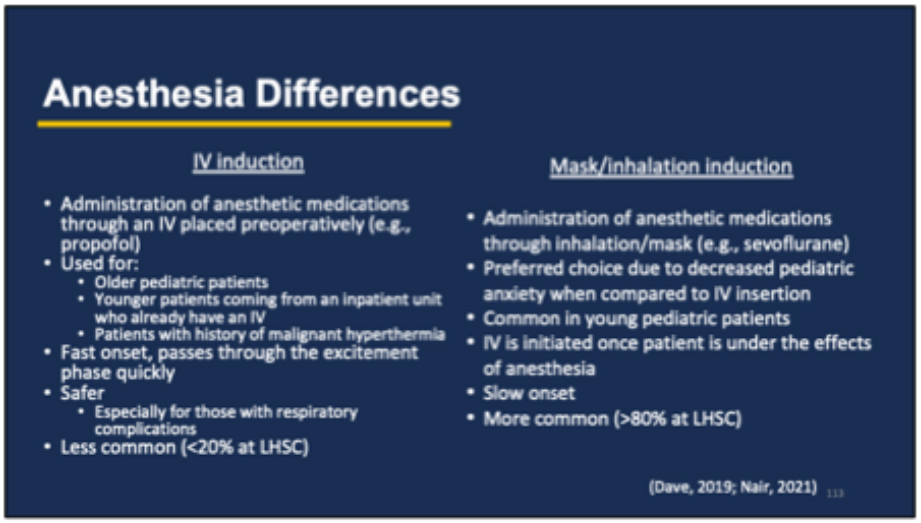
Anesthesia Induction

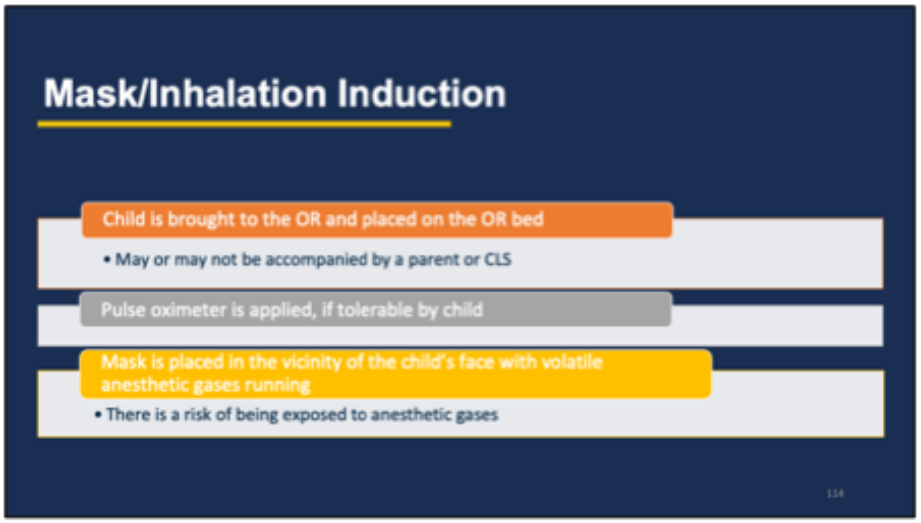
- Mask/Inhalation vs. IV induction
  - Administration of anesthetic medication to put a patient "to sleep" and prepare for intubation
- Anesthesia induction may be the most stressful experience of the entire perioperative period (Dave, 2019).
  - Can cause:
    - Emergency delirium
    - Increased analgesic requirement
    - Post-operative maladaptive behaviors
  - Try to make this as atraumatic as possible

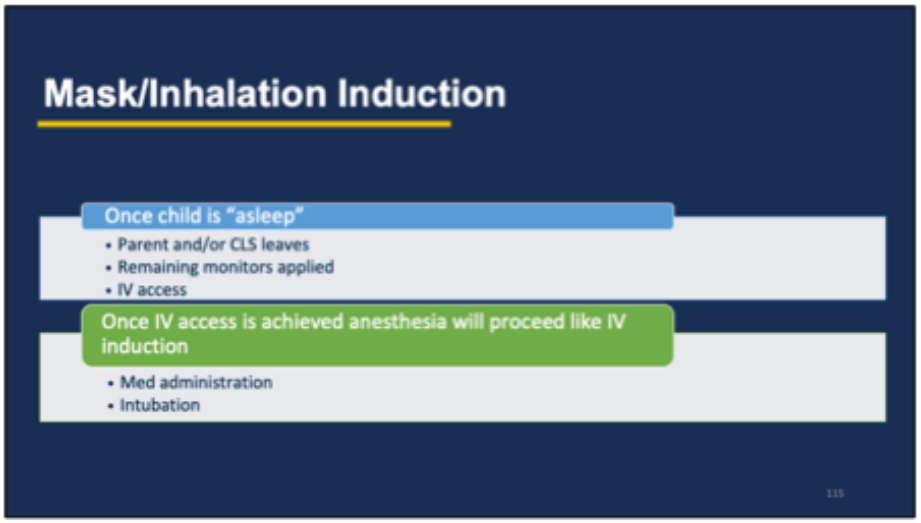
From: Ideal Induction with Distraction, Basics of Pediatric Anesthesia, n.d. (https://basicsofpediatricanesthesia.com/section-iii-anesthetic-management/preanesthetic-preparation-of-the-%E2%80%9Cpediatric-patient%E2%80%9D/ideal-induction/)

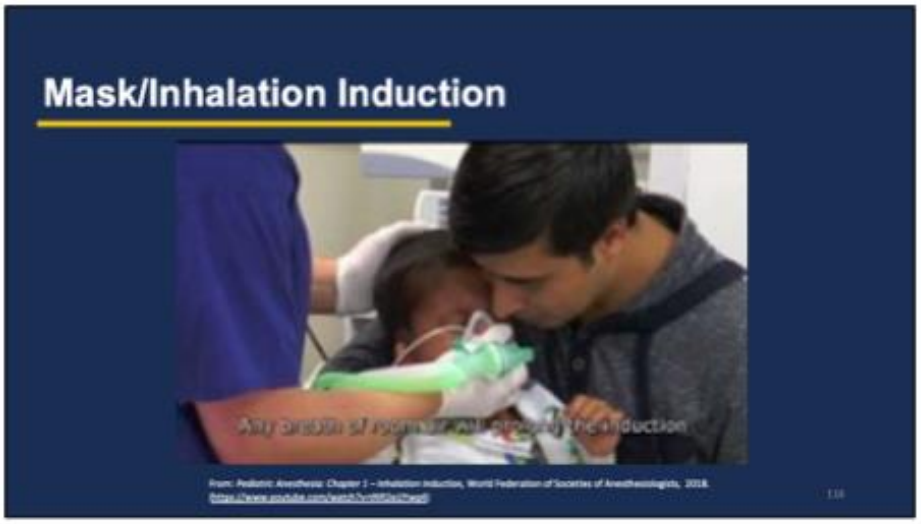
112

- Mask/Inhalation vs. IV induction
  - Administration of anesthetic medication to put a patient "to sleep" and prepare for intubation
- Anesthesia induction may be the post stressful experience of the entire perioperative period (Dave, 2019).
  - Can cause:
    - Emergency delirium
    - Increased analgesic requirement
    - Post-operative maladaptive behaviors
      - sleep disturbances
      - Separation anxiety
      - Eating issues
      - New-onset enuresis
      - Aggression
  - Try to make this as atraumatic as possible
    - There may be scenarios where you have to hold a patient down, please avoid this, and try to explain to the patient what you are doing. Alternatively, do it in a manner that is not traumatic (e.g., holding their hands).

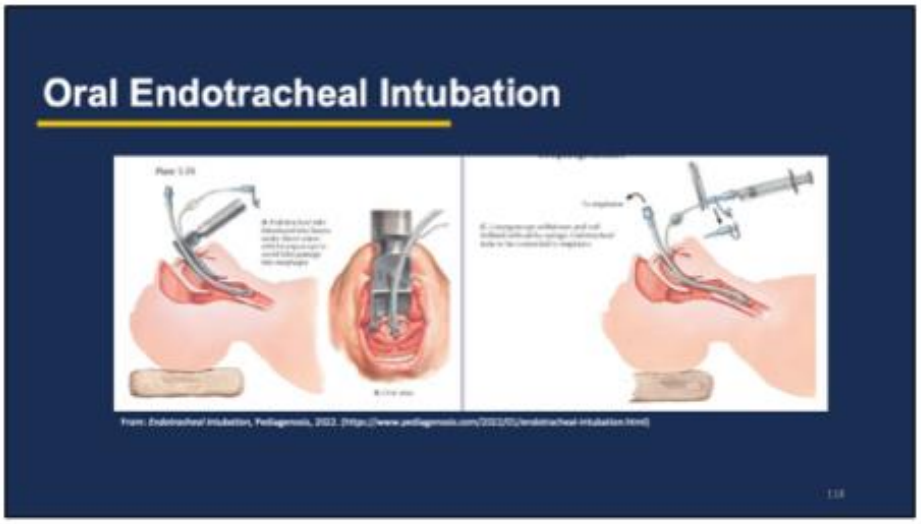

Anesthesia Differences
IV induction
• Administration of anesthetic medications through an IV placed preoperatively (e.g., propofol)
• Used for:
• Older pediatric patients
• Younger patients coming from an inpatient unit who already have an IV
• Patients with history of malignant hyperthermia
• Fast onset, passes through the excitement phase quickly
• Safer
• Especially for those with respiratory complications
• Less common (<20% at LHSC)
Mask/inhalation induction
• Administration of anesthetic medications through inhalation/mask (e.g., sevoflurane)
• Preferred choice due to decreased pediatric anxiety when compared to IV insertion
• Common in young pediatric patients
• IV is initiated once patient is under the effects of anesthesia
• Slow onset
• More common (>80% at LHSC)
(Dave, 2019; Nair, 2021)
113


Mask/Inhalation Induction
Child is brought to the OR and placed on the OR bed
• May or may not be accompanied by a parent or CLS
Pulse oximeter is applied, if tolerable by child
Mask is placed in the vicinity of the child's face with volatile anesthetic gases running
• There is a risk of being exposed to anesthetic gases
114

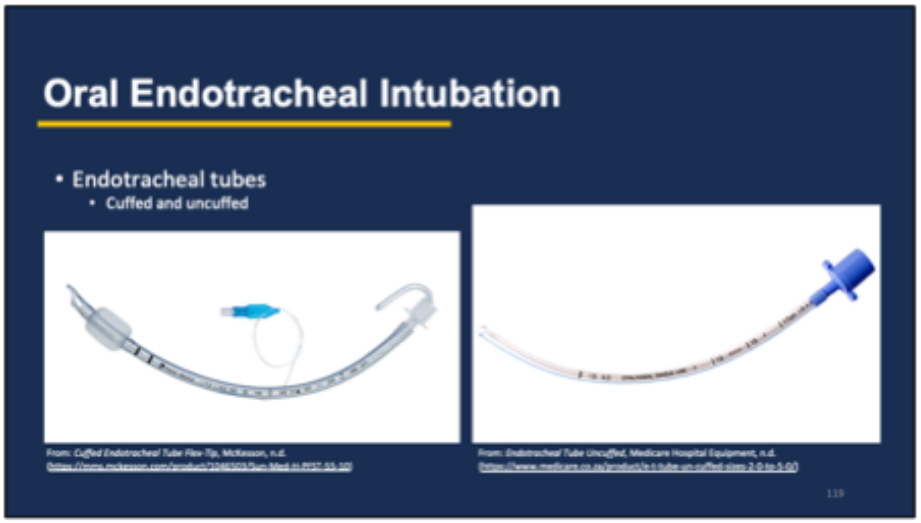

Mask/Inhalation Induction
Once child is "asleep"
• Parent and/or CLS leaves
• Remaining monitors applied
• IV access
Once IV access is achieved anesthesia will proceed like IV induction
• Med administration
• Intubation
115


Mask/Inhalation Induction
From: Pediatric Anesthesia: Chapter 1 – Inhalation Induction, World Federation of Societies of Anesthesiologists, 2018.
116

- Two types:
  - Oral-endotracheal (through the mouth)
  - Naso-endotracheal (through the nose)
- How does anesthesia choose (Cornelius et al., 2009):
  - Patient
    - E.g., facial trauma, fractures
  - Access to surgical site
  - Post-operative considerations
    - E.g., swelling or compromised level of consciousness

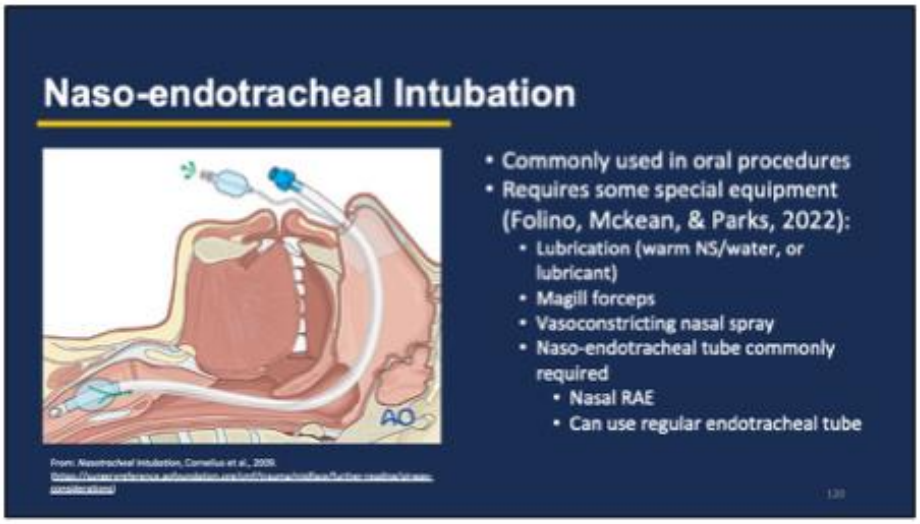


- This image shows oral intubation with a laryngoscope
  - Most learners should be familiar with this from the adult orientation, so little time will be spent here.



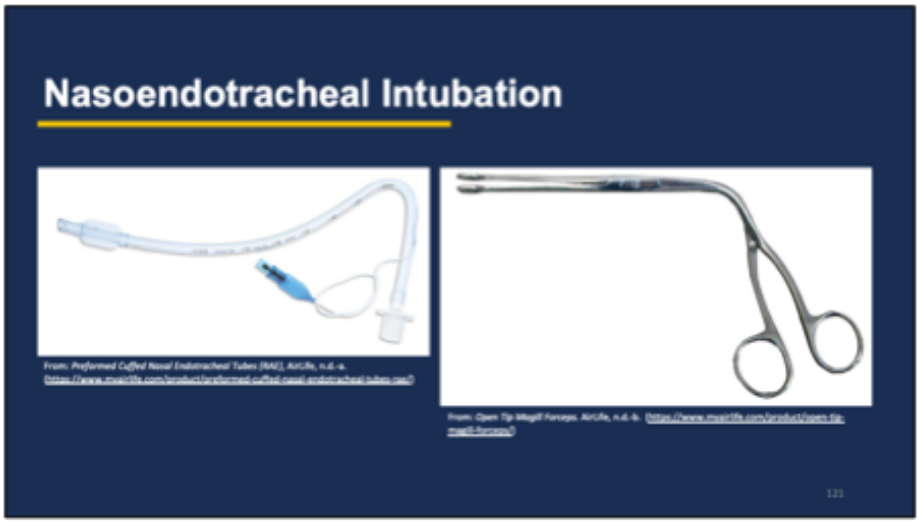
- Process of oral intubation is the same as in adults, with 1 exception…
- Have both uncuffed and cuffed tubes to show the learners
- Why use a cuffed vs. uncuffed?
    - There used to be a notion that one should only use uncuffed tubes on children below 8-10 years old, related to the narrowing of the airway (near the cricoid cartilage) (Weiss, 2007). It was thought that the endotracheal tube would fit the airway enough, however this is not always the case (Weiss, 2007).
        - Disadvantage to uncuffed tubes:
            - Up to 22-30% of uncuffed tubes need to be exchanged for one more appropriately sized (Kim et al., 2023; Weiss, 2007)
            - Large air leakage, leading to unreliable ventilation and oxygenation, inaccurate capnograph and environmental pollution of anesthetic gases into the OR (Weiss, 2007).
            - Too large uncuffed tubes can cause laryngeal injury or ischemia (Kim et al., 2023; Weiss, 2007)
            - May not protect against aspiration if tube is too small (Kim et al., 2023)
    - This practice has begun to change with a shift towards cuffed tubes (Kim et a;., 2023; Weiss, 2007)
    - Advantages of cuffed tubes:
        - Lower risk of air leakage (Kim et al., 2023)
        - Less need for tube exchanges (Kim et al., 2023)
        - Lower risk of aspiration (Kim et al., 2023)
        - Adjustable to the airway due to cuff (Kim et al., 2023)
    - Disadvantage of cuffed tubes:
        - Need for intracuff pressure monitoring (safe range <20-25cmH_2O) (Kim et al., 2023)
            - Use manometer
            - May only need 0.5-1.0 ml of air for cuffs sizes 3.0-5.0mm

119

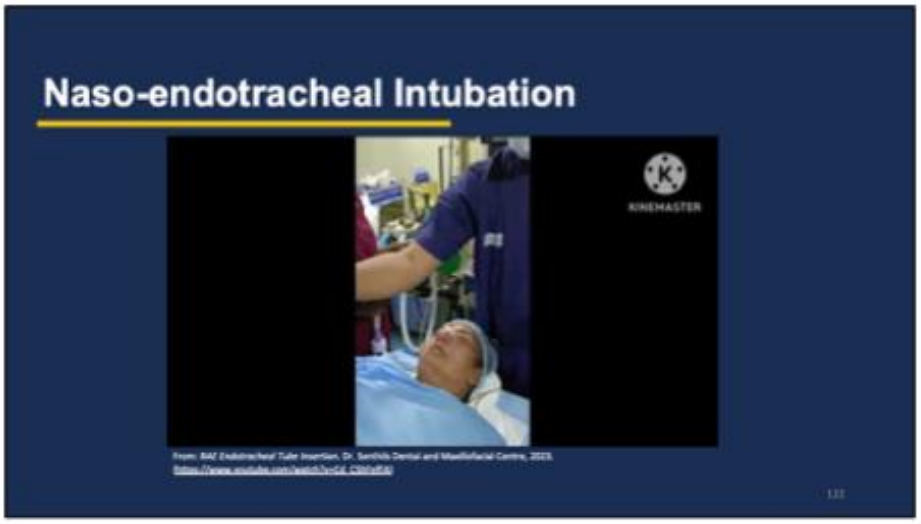


- Equipment to show:
  - Magill forceps
  - Nasal RAE
- Nasotracheal Intubation
  - Intubation through the nose
  - Commonly used in maxillofacial, intraoral, oropharyngeal, and dental procedures (Folino, Mckean, & Parks, 2022)
  - Contraindicated in (Folino, Mckean, & Parks, 2022):
    - Midface instability
    - New or history of skull base fractures
      - Point out skull base within nasal cavity
    - Known bleeding disorder
    - Nasal airway obstruction
    - Recent nasal surgery
    - History of epistaxis (nosebleeds)
  - Tube is inserted into a patent nostril (Folino, Mckean, & Parks, 2022)
    - Determine from patient reports, or assessment
  - Complications (Folino, Mckean, & Parks, 2022)
    - Nose bleeds
    - Bacteremia
    - Perforation
      - Retropharyngeal perforation
      - Soft palate perforation
      - Piriform sinus perforation

120



- Equipment to show:
  - Magill forceps
  - Nasal RAE
- Nasal RAE (left picture)
  - Has a large bend in the tube
  - The diameter is proportional to the length of the tube
    - Smaller diameter = shorter tube
  - If the anesthesiologist requires a smaller diameter, but still requires the length they may resort to a normal endotracheal tube (Folino, Mckean, & Parks, 2022)
- Magill forceps (right picture)
  - Is used to move the tube from the nasopharynx down into the airway
  - The finger holes and hinge are in the same direction, allowing the anesthesiologist to adjust the tube from the side of the patient's mouth as to not obstruct their view
  - can also be used to remove foreign bodies from the airway



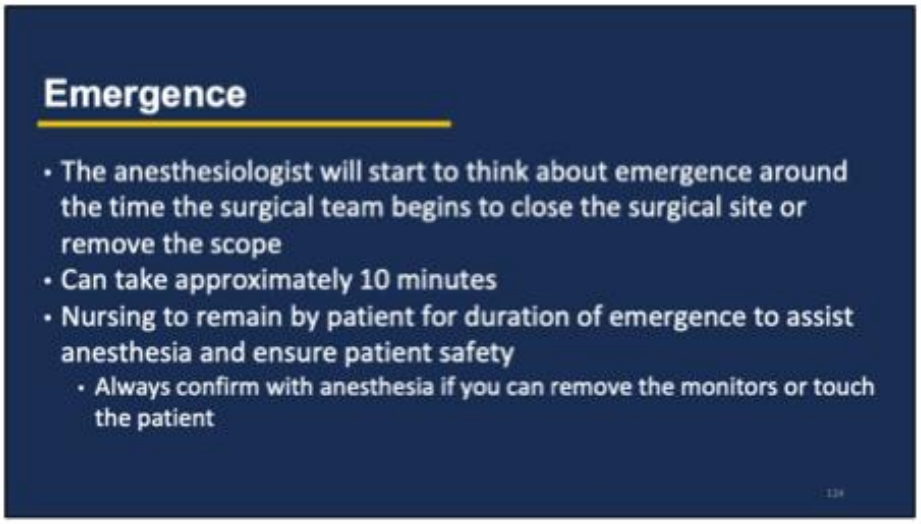
- https://www.youtube.com/watch?v=Cd_CShFpfFA
- Technique (Folino, Mckean, & Parks, 2022):
  - Patient is pre-oxygenated, and given anesthetic medications
  - Topic anesthesia may be applied to the nostril
  - Vasoconstrictor applied
  - Lubrication of the end of the ET tube
  - Insertion into the nares, with posterior pressure to advance tube to nasopharynx and OR table
    - If increased resistance anesthesiologist may switch sides
  - When tube reaches oropharynx, anesthesiologist will use the laryngoscope to visualize the tube and the vocal cords
    - Ensure advancement
    - Will use Magill forceps to advance tube past vocal cords
      - Note the orientation of the forceps
  - Cuff is inflated and attached to ventilator
  - Tube is secured away from surgical field
    - Often orientated towards patient forehead

Pediatric Anesthesia Cart

- **Drawer 1**: blades, masks, filters
- **Drawer 2**: airways and inflatable masks
- **Drawer 3**: laryngeal masks, endotracheal tubes (cuffed and uncuffed)
- **Drawer 4**: SpO2 monitors, feeding tubes, BP cuffs, esophageal temp probes
- **Drawer 5**: red dots (EKG dots), stylets, suction catheters

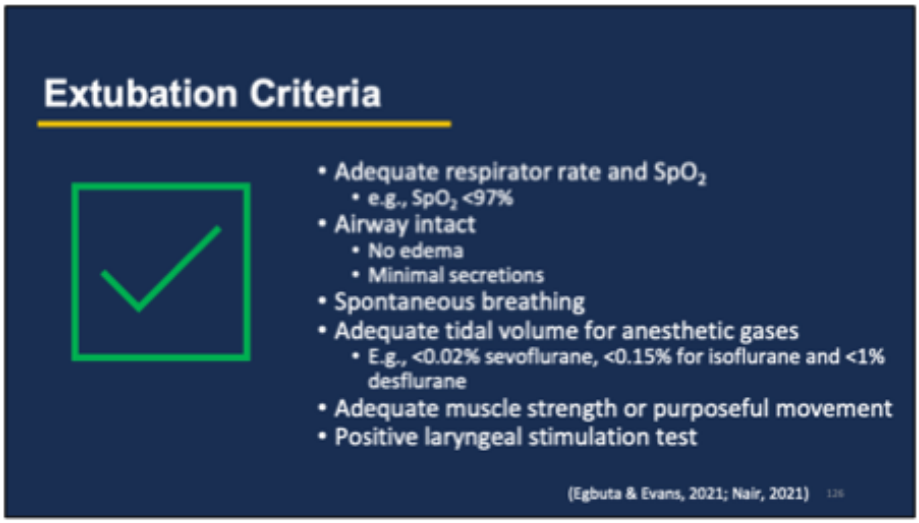
123

- For pediatric anesthesia supplies a cart from MDR is required. The cart has endotracheal tubes, oral airways, masks, etc.
- We will look at the drawers after the presentation when we start the hands-on portion of the orientation.


Emergence
• The anesthesiologist will start to think about emergence around the time the surgical team begins to close the surgical site or remove the scope
• Can take approximately 10 minutes
• Nursing to remain by patient for duration of emergence to assist anesthesia and ensure patient safety
• Always confirm with anesthesia if you can remove the monitors or touch the patient
124

- Delayed emergence:
  - Delayed emergence causes (Nair, 2021):
    - Self-administered drugs prior to surgery
    - Impaired metabolism of intraoperative medications (e.g., succinylcholine and pseudocholinesterase deficiency)
    - Increased intra-cranial pressure
  - Symptoms (Nair, 2021)
    - Lack of responsiveness despite discontinuation of medications and sufficient time for metabolism and elimination

125



Adequate respirator rate and SpO_2
- e.g., SpO_2 <97%

Airway intact
- No edema
- Minimal secretions

Spontaneous breathing

Adequate tidal volume for anesthetic gases
- E.g., <0.02% sevoflurane, <0.15% for isoflurane and <1% desflurane

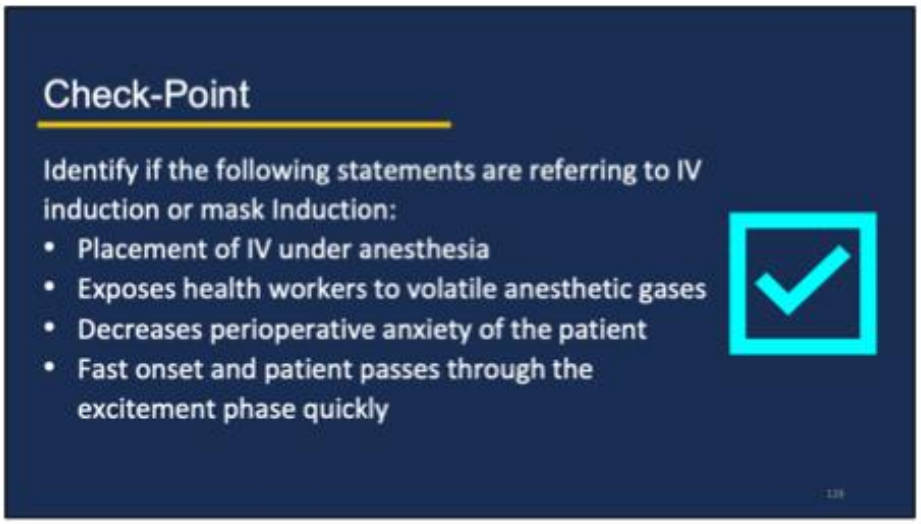
Adequate muscle strength or purposeful movement

Positive laryngeal stimulation test
- Gentle manipulation of the tracheal tube to determine if there is a cough and respirator pause of <5 seconds
- A failed laryngeal test can mean that the patient is still in stage 2 Excitatory phase and has an increased risk of laryngospasm, breath holding and apneic spells

Three types:
- Deep extubation
- Intermediate extubation
- Awake extubation

- Decision to do do a deep or awake extubation is guided by the anesthesiologist's personal experience and institutional culture (Egbuta & Evans, 2021).

- Deep extubation is associated with higher risk of adverse events, although some report that this concern is not warranted (Egbuta & Evans, 2021).



Identi' if the following statements are referring to IV induction or mask Induction:

Placer 'nt of IV under anesthesia

MASK INDUCTION

Expos health workers to volatile anesthetic gases

MASK Induction

Decre· 'es perioperative anxiety of the patient

MASK INDUCTION

Fast o 'et and patient passes through the excitement phase quickly

IV INDUCTION

IV Induction

Advantages:

Safe for patients who have malignant hyperthermia

If patient has an IV already less stimulation from use of the mask

Fast onset, passes through the excitement phase quickly

Safer

Especially for those with respiratory complications

No risk of other healthcare workers being exposed to anesthetic gas

Disadvantages:

Potential anxiety experience with IV insertion

Mask Induction

Advantages:

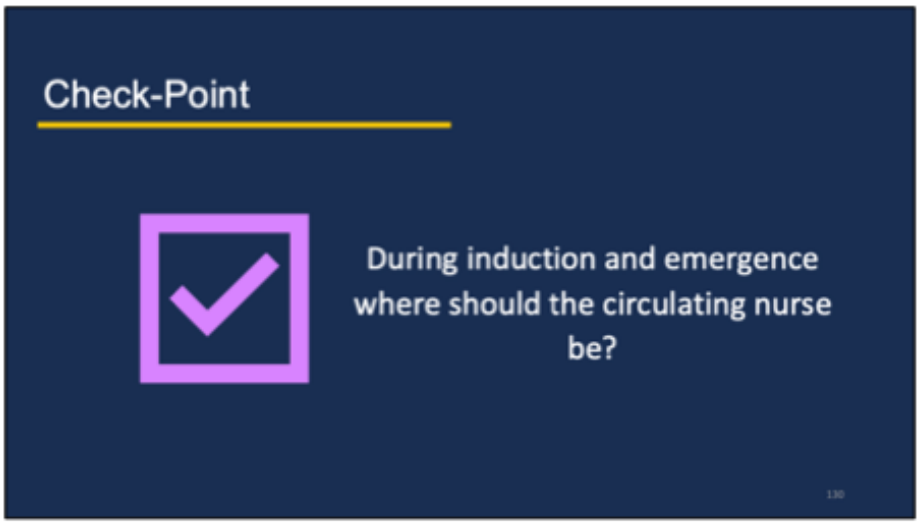
Can place the IV after induction with anesthetic gas

Decreased perioperative anxiety related to no IV insertion

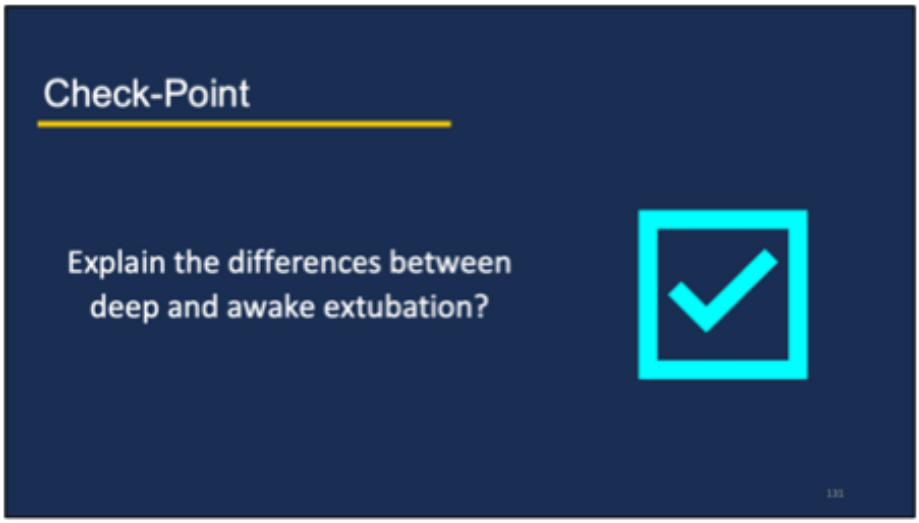
Disadvantage:

Slow onsite

129



With the patient assisting anesthesia, if not respiratory therapist is assisting.



Deep Extubation

Airway refluxes are still inactive

Minimal coughing or bronchospasm from the patient when completed correctly

DO NOT STIMULATE THE CHILD IF DEEP EXTUBATED!

i.e., do not touch the patient! Do not remove monitors! Stand beside the patient ready to assist if asked.

May choose a deep extubation in the following scenarios (Egbuta & Evans, 2021):

To prevent coughing or bucking

Reactive airways such as those with an upper respiratory infection or asthma

- Deep extubation is associated with higher risk of adverse events, although some report that this concern is not warranted (Egbuta & Evans, 2021).

Awake Extubation

Airway refluxes are suppressed due to active cortex

Safer if there is an aspiration risk

May choose awake extubation in the following scenarios (Egbuta & Evans, 2021):

Difficult mask ventilation

Difficult tracheal intubation

High risk of re-intubation

High aspiration risk

Risk of inadequate ventilation (e.g., premature or small size (<2kg))

Obese patients

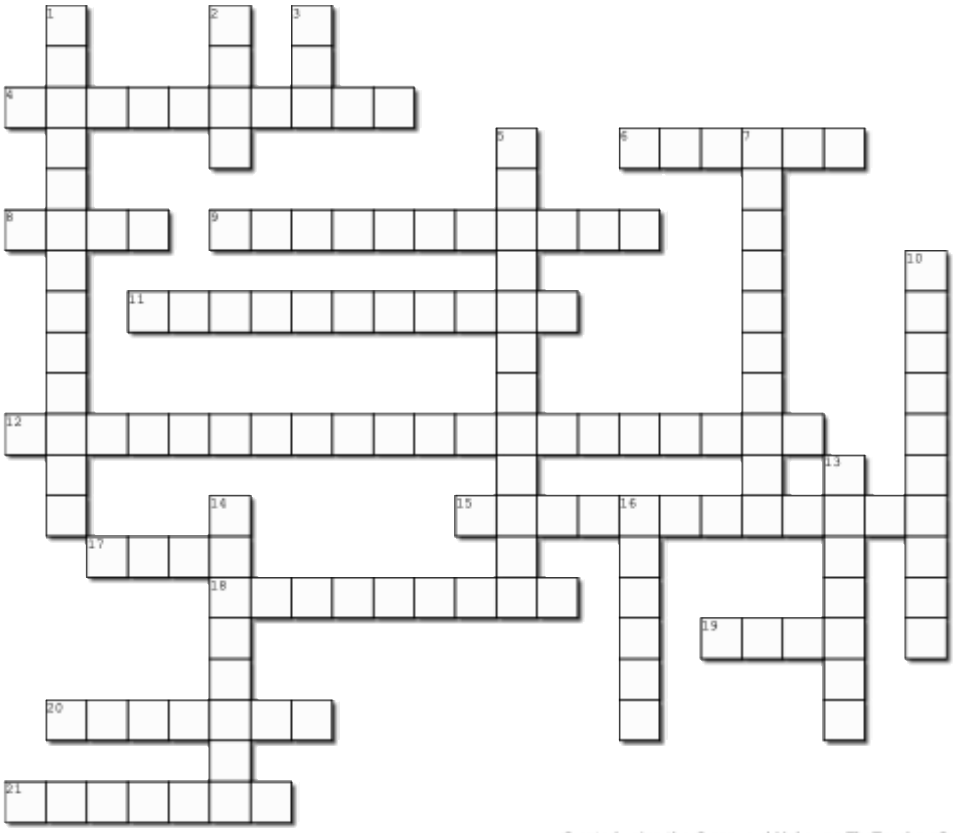
Sleep-disordered breathing


Crossword
132

Name: _____

Pediatric Orientation

Complete the crossword puzzle below



Created using the Crossword Maker on TheTeachersCorner.net

Across

4. A primary stressor for those under 1 years old is this
6. This factor may cause an increase in pediatric heart rate
8. In hours how many hours before surgery can an infant have breast milk
9. CLS use this technique to assist children with the social and emotional impacts hospitalization and illness can have
11. This is a common piece of equipment used in the OR to maintain normothermia
12. 50-75% of children coming for surgery experience this
15. This type of emergency causes the airway to be occluded, and is considered an airway emergency
17. In pre-term newborns this organ is underdeveloped increasing their risk for infection, and temperature dysregulation
18. Family Centered Care included the child and this person
19. When selecting instruments for pediatric patients what patient factor must be considered
20. The age group from birth to 28 days of life is called this
21. A respiratory rate of 22-37 breaths/min is for a child of what age group

Down

1. A systolic blood pressure of 94-124 mmHG is the blood pressure of what age group
2. A common intervention for toddlers to reduce anxiety is this
3. This is the abbreviation for when a caregiver accompanies a child into the OR
5. For premature newborns this is their actual age minus the weeks preterm (two words)
7. This airway structure is floppier and shorter in pediatric when compared to adults
10. What stage of anesthesia is marked by disinhibition, delirium, uncontrolled movement, irregular respirations, and tachycardia
13. When completing the preoperative assessment on an adolescent patient, who should you direct your questions to
14. Before arrival of a pediatric patient into the OR you must do this to the room temperature
16. For pediatric patients a temperature of 36.2°C is considered this

Answer Key to Crossword

Across

Number	Answer
4	Separation
6	Stress
8	Four
9	Play Therapy
11	Fluid Warmer
12	Perioperative Anxiety
15	Laryngospasm
17	Skin
18	Caregiver
19	Size
20	Neonate
21	Toddler

Down

Number	Answer
1	Preadolescence
2	Play
3	PPI
5	Corrected Age
7	Epiglottis
10	Excitement
13	Patient
14	Increase
15	Normal

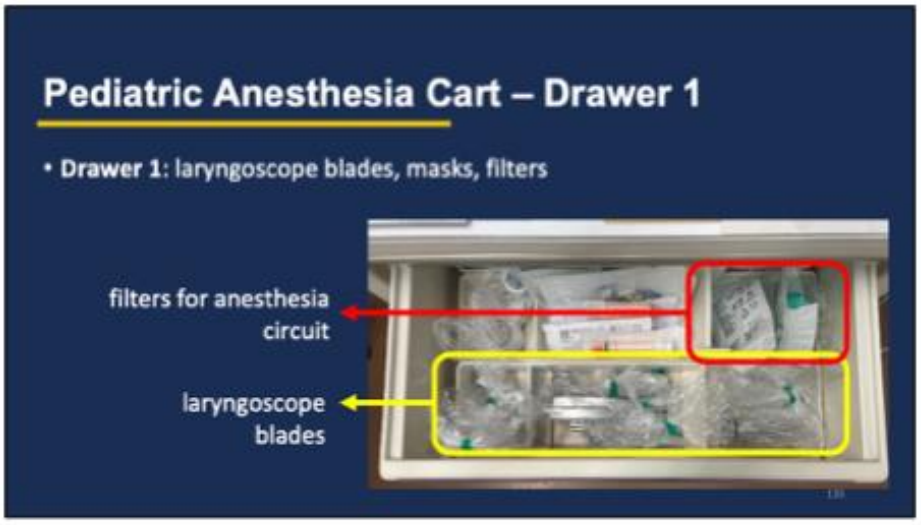

Demo and Practice
133

Pediatric Anesthesia Cart

- **Drawer 1**: blades, masks, filters
- **Drawer 2**: airways and inflatable masks
- **Drawer 3**: laryngeal masks, endotracheal tubes (cuffed and uncuffed)
- **Drawer 4**: SpO2 monitors, feeding tubes, BP cuffs, esophageal temp probes
- **Drawer 5**: red dots (EKG dots), stylets, suction catheters

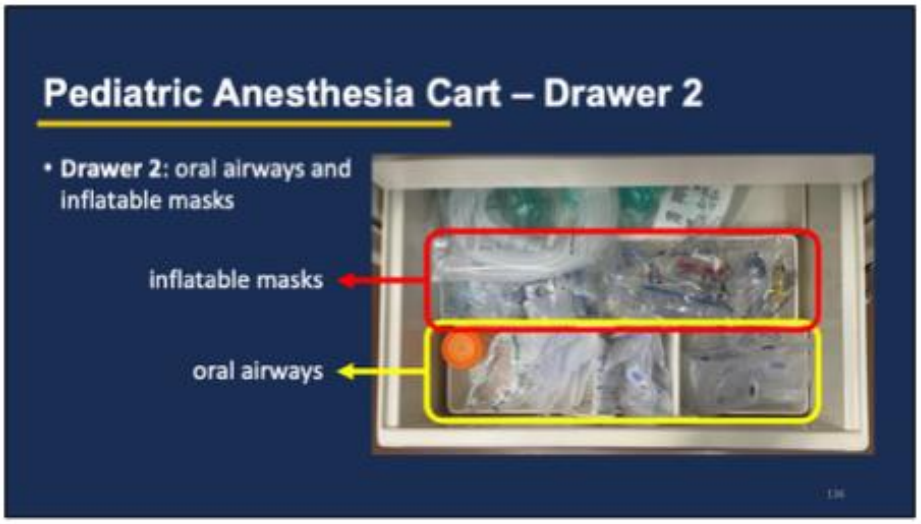
- For pediatric anesthesia supplies a cart from MDR is required. The cart has endotracheal tubes, oral airways, masks, etc.
- We will look at the drawers in the next few slides...

134



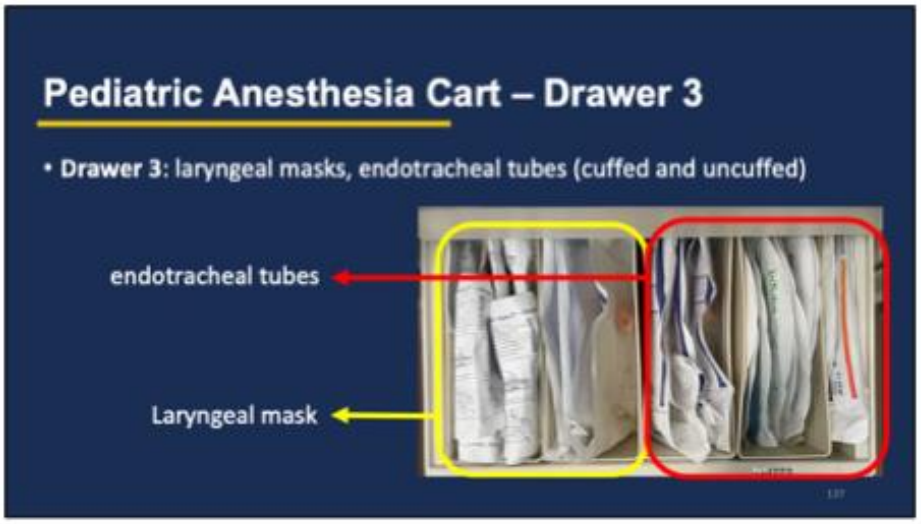
- Have examples of the laryngoscope blades and smaller handle

135

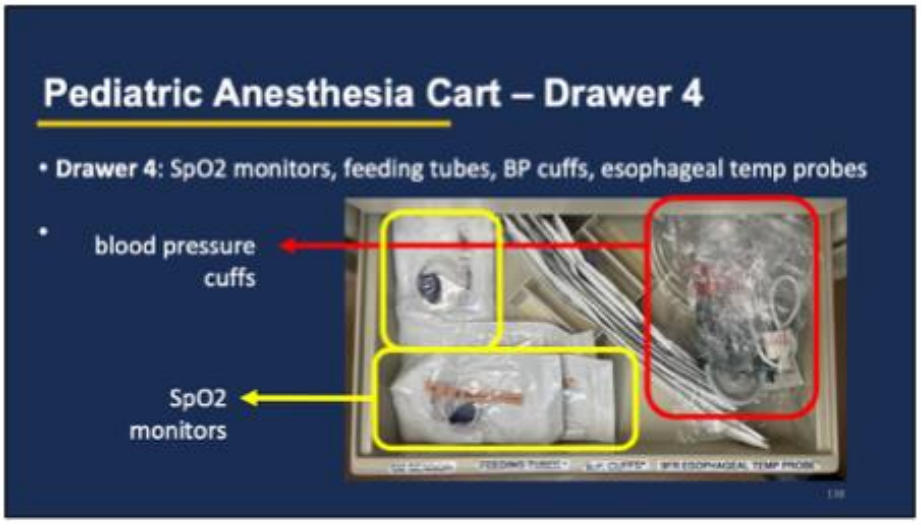


- Have examples of the oral airways that are included (e.g., pink, blue and black).
- In the orange container there is a purple airway for really small children.

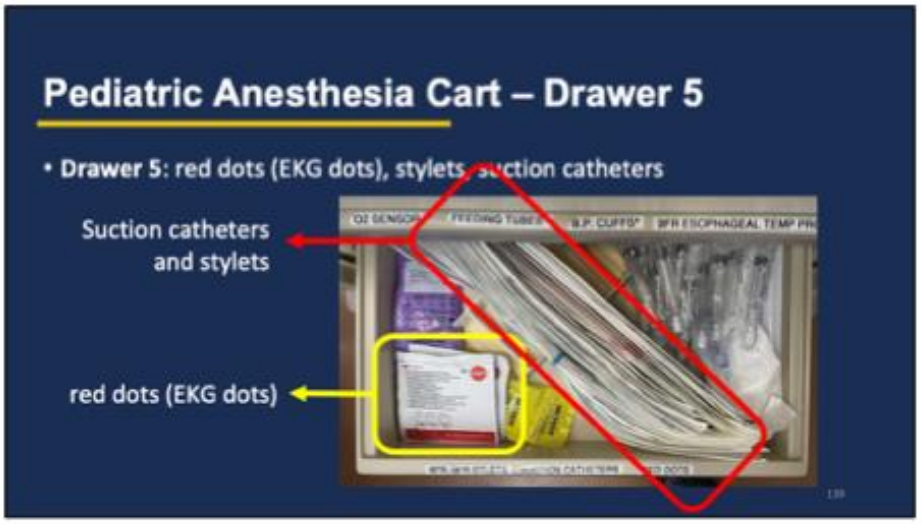
136



- Have examples of the endotracheal tubes and laryngeal mask



- Will bring examples of oral airways and blood pressure cuffs



- Will bring example of red dots and stylets for staff to look at

References

3M. (n.d.-a). *3M Bair Hugger 700 series warming unit rolling cart* [Image]. https://www.3m.com/3M/en_US/p/d/v000152988/

3M. (n.d.-b). *3M Bair Hugger pediatric underbody blanket, model 33501* [Image]. https://www.3m.com/3M/en_US/p/d/b00004399/

3M. (n.d.-c). *3M Bair Hugger large pediatric underbody blanket, model 33500* [Image]. https://www.3m.com/3M/en_US/p/d/b00004318/

3M. (n.d.-d). *3M Bair Hugger upper body blanket, model 42268* [Image]. https://www.3m.com/3M/en_US/p/d/b00004299/

3M. (n.d.-e). *3M Bair Hugger lower body blanket, model 42368* [Image]. https://www.3m.com/3M/en_US/p/d/b00004299/

AirLife. (n.d.-a.) *Preformed cuffed nasal endotracheal tubes (RAE).* https://www.vyaire.com/product/preformed-cuffed-nasal-endotracheal-tubes-rae/

Airlife. (n.d.-b.). *Open tip Magill forceps.* https://www.vyaire.com/product/open-tip-magill-forceps/

American Academy of Pediatrics. (2018). *Corrected age for preemies.* https://healthychildren.org/English/ages-stages/baby/preemie/Pages/Corrected-Age-For-Preemies.aspx

American Heart Association. (2016). *Pediatric advanced life support provider manual.*

American Heart Association. (2020). *PALS – Vital signs in children* [Reference card].

Adewale, L. (2009). Anatomy and assessment of the pediatric airway. *Pediatric Anesthesia, 19*(s1), 1–4. https://doi.org/10.1111/j.1460-9592.2009.03013.x

Bamalan, O.A., Moore, M.J., & Meneses, R.G. (2023). Vernix caseosa. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK519536/

Basics of Pediatric Anesthesia. (n.d.). *Ideal induction with distraction* [Photograph]. https://basicsofpediatricanesthesia.com/section-ii-anesthetic-management/preanesthetic-preparation-of-the-%E2%80%A6pediatric-patient/ideal-induction/


References
141


References


References
Little Warriors. (n.d.) Developmental ladder explained.
London Health Sciences Centre. (n.d. a). Welcome to child life services.
London Health Sciences Centre. (n.d. b). Child life programs and services.
London Health Sciences Centre. (2022). Fasting guidelines for paediatric patients. Available on request.
London Health Sciences Centre. (2024). Appendix H: Age specific vital signs parameters in pediatrics (Draft). Available on request.
LHSCCanada. (2019). A youthful lens on day surgery [Video]. YouTube.
Luehmann, N. C., Staudach, M. E., Way, B., Collier, P. J., Han, R. C., Riggs, T. W., & Novotny, N. M. (2019). Benefits of a family-centered approach to pediatric induction of anesthesia. Journal of Pediatric Surgery, 54(1), 189–193.
Malik, F., & Marwaha, R. (2022). Developmental stages of social emotional development in children. StatPearls Publishing.
Mary Bridges Children's. (n.d.). Surgery [Photograph].
McKesson. (n.d.). Cuffed endotracheal tube Rae-tec [Image].
Medicare Hospital Equipment. (n.d.) Endotracheal tube uncuffed [Image].
Mayo Clinic. (2024). Premature birth.
143


References
Malling, A. C., Ali, R., Scott, J. M., & Laupsa, D. J. (2002). Effects of preoperative warming on the incidence of wound infection after clean surgery: a randomized controlled trial. American Journal of Ophthalmology, 134(1), 178–179.
Murphrey, M.B., Miao, J.H., & Zito, P.M. (2022). Histology, stratum corneum. StatPearls Publishing.
Nair, G. (2021). Pediatric Anesthesia [PowerPoint Presentation]. Available upon request.
Nemeth, M., Miller, C., & Bräuer, A. (2021). Perioperative hypothermia in children. International Journal of Environmental Research and Public Health, 18(14), 7541.
North Shore Health Network. (n.d.). Patient and family centered care [Photograph].
Parella, J. J. (2018). Preoperative care of children: Strategies from a child life perspective. AORN Journal, 108(5), 11–22.
Pediagenosis. (2022). Endotracheal intubation.
Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: Application to Healthy Patients Undergoing Elective Procedures: An Updated Report by the American Society of Anesthesiologists Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration. (2017). Anesthesiology (Philadelphia), 126(3), 376–393.
Shutterstock. (n.d.). Childhood, adolescence, adulthood, old age: generations.
SickKids. (n.d.). Child life at SickKids. Available:
Siddiqui, B.A., & Kim, P.Y. (2023). Anesthesia stages. StatPearls Publishing.
144


References
Singh, P.P. (n.d.). The pediatric upper airway is prone to obstruction. APP-NYA.
Somodevilla, C. (n.d.). [Teenagers] [Photograph]. New York Times.
Stay 2. (n.d). Whalom ride cruiser [Image].
Tangerine Reva. (n.d.). What age is a toddler?
Visscher, M. O., Adam, R., Brink, S., & Odio, M. (2015). Newborn infant skin: Physiology, development, and care. Clinics in Dermatology, 33(3), 271–280.
WakeMed Health & Hospitals. (2019). Parental presence in the operating room. [Video]. YouTube.
Weiss, M. (2007). Uncuffed versus cuffed endotracheal tubes. APA Meeting San Francisco.
West, N., Christopher, N., Stratton, K., Gögüs, M., & Brown, J. (2020). Reducing preoperative anxiety with child life preparation prior to intravenous induction of anesthesia: A randomized controlled trial. Paediatric anaesthesia, 30(2), 169–180.
Williamson, M.S. (n.d.). [Premature Newborn] [Photograph]. https://www.nbcnews.com/think/opinion/five-opponents-babies-born-limits-viability-ncna27537
Yousef, H., Alhajj, M., Fakoya, A.O., & Sharma, S. Anatomy, skin (integument), epidermis. StatPearls Publishing.

Appendix E: Demonstration and Simulation Facilitator Guide

The following demonstrations and simulations of pediatric anesthesia and surgical considerations in the OR are in addition to the pediatric orientation PowerPoint presentation and should be completed after the presentation.

Demonstration – Pediatric Anesthesia Considerations

Pediatric Anesthesia Cart

Supplies:

- Pediatric anesthesia cart
- Pediatric laryngoscope handle and blades
- Pediatric oral airways
- Endotracheal tubes (oral and nasal, and cuffed and uncuffed)
- Pediatric laryngeal mask airway
- Pediatric blood pressure cuffs
- Pediatric SpO2 monitors
- Pediatric EKG electrodes

Instructor to review pediatric anesthesia cart.

- Location → in Medical Device Reprocessing (MDR)
    - Ensure that there is a pediatric anesthesia cart available
    - If no cart is available, rely on the PowerPoint presentation and ensure that learners get to see the physical cart at another point in orientation
- What cases do we need the pediatric anesthesia cart for?
    - All pediatric cases, as it contains pediatric anesthesia equipment that is not stocked on the routine anesthesia cart

- Review contents of pediatric anesthesia cart
    - Specifics are outlined towards the end of the PowerPoint presentation
    - If no cart is available, rely on the PowerPoint presentation and ensure that learners get to see the physical cart at another point in orientation

Mask Induction and Oral Intubation Demonstration

Supplies:

- Cuffed and uncuffed oral endotracheal tubes
- Stylet
- 10ml syringe
- Anesthesia face mask
- Laryngoscope handle and pediatric blades
- Glideslope with pediatric blades
- Bottle of normal saline
    - This is used to allow easier insertion of the endotracheal tube with the pediatric mannequin
    - Not normally used for oral intubations
- Two instructors are ideal (one to be the nurse, and one the anesthesiologist)
- Pediatric mannequin that allows for intubation or adult intubation model

Scenario:

A pediatric patient (age will be appropriate to the pediatric model available) comes to the OR for a tonsillectomy. The patient is from day surgery and does not have an IV, therefore anesthesia has chosen to do a mask induction. The patient's parent will accompany them to the OR assisted by the Child Life Speciality.

***Instructions for Demonstration*:**

1. The instructor will introduce the scenario and resume the nursing position in the demonstration. The other nurse assisting will be anesthesia.
2. Before the patient enters the room, the instructor will demonstrate the cuffed and uncuffed oral endotracheal tubes. The instructor will inflate the cuffed tube and show the learners the small amount of air needed to inflate.
3. The patient enters the room their parent on a stretcher and is moved onto the OR bed. The stretcher is removed from the OR, and the parent is instructed to remain by the child's side.
4. Nursing places a safety strap over the patient's thighs 2 inches above the knees for intubation. This ensures the patient will not accidentally fall off the OR bed.
5. A saturation monitor is placed on the patient by nursing.
    a. The patient is given a description of the monitor (depending on age). For example, infant SpO_2 monitors resemble a band-aid, nursing can state this to the patient. For older patient the SpO_2 monitor is the same one as used for adults.
    b. For infants: The SpO_2 monitor that resembles a band aid is to be placed on a finger, a toe, or around a patient's hand or foot, depending on patient size, with the monitor (red light) on the nail bed, the bottom of the foot, or the palm.
        i. Infant SpO_2 monitor placement video: pediatric SpO2 monitor placement health care - Google Search
    c. For infants and older, the SpO_2 monitors can be placed on a finger, or on a toe of the pediatric patient.
    d. For most patients, all other monitors will be placed on the patient following mask induction.

6. Parental Presence for Induction
    a. The parent is present to assist in soothing the patient and encourage cooperation.
    b. The parent should stand at the side of the patient towards the patient's head.
    c. Anesthesia will instruct the parent as appropriate to hold their child (e.g., for infants), provide support, or engage with the child (e.g., play with toys that were brought to the OR).
7. Mask Induction
    a. Option 1:
        i. Anesthesia will place the mask near the patient's nose and mouth.
        ii. Nursing is to be with the patient, providing comfort and distraction
            - During this time, anesthesia and/or nursing will ask the patient to count from 10, sing a song, tell a story, etc.
        iii. If necessary, restraining limbs gently may be needed if the pediatric patient is upset or resistant to the anesthesia face mask. This is for patient safety so as not to fall off the OR bed or to protect the patient's face from monitoring devices.
            - If assisting is restraining the patient, do not place hands on joints. The instructor will demonstrate the correct way to hold a patient's arm by applying light force above and below the joints.
            - One can also limit motion by using an arm to block the patient's hand from reaching their face.
            - The procedure used will depend on the patient's size, the situation, and those present to assist.

iv. Once the patient has lost consciousness, the mask will be placed onto the patient's face, and a good mask seal will be obtained by anesthesia.

- Anesthesia will assess the patient's level of consciousness.

b. Option 2:

i. The instructor will demonstrate how to hold the mask on the pediatric patient.

- The same principles apply to an adult.
- Light pressure is to be used when applying the face mask to ensure the mask is on the patient's face and a seal is maintained.
    - Too much pressure may make the patient feel uncomfortable and increase anxiety.
- You should be able to see the end-tidal CO_2 wave on the monitors if there is a good face mask seal.
- This is usually an anesthesia task; however, if the patient cooperates, they can delegate it to nursing.

i. The patient will lose consciousness fast this way due to more anesthetic gas being inhaled and less being dispersed into the environment.

ii. Once the patient has lost consciousness, anesthesia will apply more pressure to ensure a good mask seal will be obtained.

c. Once the pediatric patient has lost consciousness the parent will be accompanied out by Child Life.

8. (optional) Placement of laryngeal mask (LMA). This is anesthesia-dependent. Some anesthesiologists prefer an LMA while placing an IV. The LMA ensures that the patient receives oxygen. LMA placement also removes the need for someone (e.g., nursing,

respiratory therapist, medical student or resident) to hold the mask on the patient. It allows for greater assistance with monitor placement and IV insertion.

9. Nursing to put on remaining patient monitors. The instructor will demonstrate this.
    a. Attach 3 or 5 lead ECG to patient. Which lead system is used will depend on the patient's medical history. We usually use a 3-lead system unless there is a cardiac history or advised by anesthesia.
    b. Put on blood pressure cuff.
        i. Show the different sizes of pediatric blood pressure cuffs
        ii. The cuff should cover 40% of the mid-upper arm circumference (American Heart Association, 2016).
10. If LMA was not placed by anesthesia, nursing may be asked to hold the mask on the patient for IV insertion. The instructor will reinforce the proper mask seal for learners.
11. IV insertion
    a. Anesthesia will place an IV in the patient for medication administration.
    b. Factors affecting IV placement:
        i. Side of operation, especially with upper limb surgery. IV will go on the opposite limb.
        ii. The side that anesthesia is on (i.e., the side that the anesthesia machine is on).
        iii. Patient medical history
            - Cast placement
            - Limb deformities

12. Oral Intubation

    a. Anesthesia will start to administer medications for intubation via the new IV.
    b. Nursing will hold the mask on the patient if no LMA is placed.
        i. If an LMA is placed, anesthesia will remove the LMA and may put the mask back on the patient's face while they organize their intubation equipment.
    c. Anesthesia will use the laryngoscope or glideslope to visualize the vocal cords.
        i. Instructor to demonstrate both.
            - Emphasize the importance of not moving the patient during intubation and not accidentally hitting anesthesia.
        ii. While anesthesia is visualizing the vocal cords, nursing will be getting the endotracheal tube ready to pass to anesthesia.
            - Ensure it is in the correct orientation, and if it is bent with a stylet, do not adjust the bend.
        iii. When anesthesia is ready (i.e., have visualized the vocal cords), they will reach for the endotracheal tube and intubate the patient.
        iv. Once the tube is placed, nursing to hold the tube at the patient's lips, ensuring the hand is stabilized. Do not let go until the endotracheal tube is secured (i.e., taped in place).
        v. If using a cuffed endotracheal tube, the cuff should be inflated with a syringe. Anesthesia may choose to do this task due to the risk of trauma due to overinflation; please confirm with them before inflating.
        vi. Nursing or anesthesia will connect the endotracheal tube to the circuit.

vii. Anesthesia will tape the endotracheal tube in place. Once the tube is secured, nursing can let go of the endotracheal tube.

viii. The anesthesia circuit will be placed into a securement device (i.e., "Waldo").

13. Once the tube is secured, the nursing and surgical teams can position the patient.

Mask Induction and Nasal Intubation Demonstration

Supplies:

- Cuffed and uncuffed nasal endotracheal tubes
- 10ml syringe
- Magill forceps
- Anesthesia face mask
- Laryngoscope with smaller blades and handle
- Glideslope with smaller blades
- Bottle of normal saline
    - This is used to allow easier insertion of the endotracheal tube with the pediatric mannequin
    - Warm solution can be used in nasal intubation to allow for easier movement of the endotracheal tube
- Two instructors are ideal (one to be the nurse, and one the anesthesiologist)
- Pediatric mannequin that allows for intubation or adult intubation model

Scenario:

A pediatric patient (age will be appropriate to the pediatric model available) comes to the OR for dental surgery. The patient is from day surgery and does not have an IV, therefore anesthesia has chosen to do a mask induction. There will be no parent accompanying the patient.

***Instructions for Demonstration*:**

1. The instructor will introduce the scenario and resume the nursing position in the demonstration. The other nurse assisting will be anesthesia.
2. Before the patient enters the room, the instructor will demonstrate the cuffed and uncuffed nasal endotracheal tubes. The instructor will inflate the cuffed tube and show the learners the small amount of air needed to inflate.
3. The patient enters the room without a parent on a stretcher and is moved onto the OR bed.
4. Nursing should put a safety strap over the patient's thighs 2 inches above the knees for intubation. This ensures the patient will not accidentally fall off the OR bed.
5. A saturation monitor is placed on the patient by nursing.
    a. The patient is given a description of the monitor (depending on age). For example, infant SpO_2 monitors resemble a band-aid, nursing can state this to the patient. For older patient the SpO_2 monitor is the same one as used for adults.
    b. For infants: The SpO_2 monitor that resembles a band aid is to be placed on a finger, a toe, or around a patient's hand or foot, depending on patient size, with the monitor (red light) on the nail bed, the bottom of the foot, or the palm.
        i. Infant SpO_2 monitor placement video: pediatric SpO2 monitor placement health care - Google Search
    c. For infants and older, the SpO_2 monitors can be placed on a finger, or on a toe of the pediatric patient.
    d. For most patients, all other monitors will be placed on the patient following mask induction.

6. Mask Induction
    a. Option 1:
        i. Anesthesia will place the mask near the patient's nose and mouth.
        ii. Nursing is to be with the patient, providing comfort and distraction
            - During this time, anesthesia and/or nursing will ask the patient to count from 10, sing a song, tell a story, etc.
        iii. If necessary, restraining limbs gently may be needed if the pediatric patient is upset or resistant to the anesthesia face mask. This is for patient safety so as not to fall off the OR bed or to protect the patient's face from monitoring devices.
            - If assisting is restraining the patient, do not place hands on joints. The instructor to demonstrate the correct way to hold a patient's arm by applying light force above or below joints.
            - One can also limit motion by using an arm to block the patient's hand from reaching their face.
            - The procedure used will depend on the patient's size, the situation, and those present to assist.
        iv. Once the patient has lost consciousness, the mask will be placed onto the patient's face, and a good mask seal will be obtained by anesthesia.
            - Anesthesia will assess the patient's level of consciousness.
    b. Option 2:
        i. The instructor will demonstrate how to hold the mask on the pediatric patient.
            - The same principles apply to an adult.

- Light pressure is to be used when applying the face mask to ensure the mask is on the patient's face and a seal is maintained.
    - Too much pressure may make the patient feel uncomfortable and increase anxiety.
- You should be able to see the end-tidal CO_2 wave on the monitors if there is a good face mask seal.
- This is usually an anesthesia task; however, if the patient cooperates, they can delegate it to nursing.

ii. The patient will lose consciousness fast this way due to more anesthetic gas being inhaled and less being dispersed into the environment.

ii. Once the patient has lost consciousness, anesthesia will apply more pressure to the make to ensure a good mask seal will be obtained.

7. (optional) Placement of laryngeal mask (LMA). This is anesthesia-dependent. Some anesthesiologists prefer an LMA while placing an IV. The LMA ensures that the patient receives oxygen. LMA placement also removes the need for someone (e.g., nursing, respiratory therapist, medical student or resident) to hold the mask on the patient. It allows for greater assistance with monitor placement and IV insertion.
8. Nursing to put on remaining patient monitors. The instructor will demonstrate this.
    a. Attach 3 or 5 lead ECG to patient. Which lead system is used will depend on the patient's medical history. We usually use a 3-lead system unless there is a cardiac history or advised by anesthesia.
    b. Put on blood pressure cuff.
        i. Show the different sizes of pediatric blood pressure cuffs

ii. The cuff should cover 40% of the mid-upper arm circumference (American Heart Association, 2016).

9. If LMA was not placed by anesthesia, nursing may be asked to hold the mask on the patient for IV insertion. The instructor will reinforce the proper mask seal for learners.
10. IV insertion
    a. Anesthesia will place an IV in the patient for medication administration.
    b. Factors affecting IV placement:
        i. Side of operation, especially with upper limb surgery. IV will go on the opposite limb.
        ii. The side that anesthesia is on (i.e., the side that the anesthesia machine is on).
        iii. Patient medical history
            - Cast placement
            - Limb deformities
11. Nasal Intubation
    a. Anesthesia will start to administer medications for intubation via the new IV.
    b. Nursing will hold the mask on the patient if no LMA is placed.
        i. If an LMA is placed, anesthesia will remove the LMA and may put the mask back on the patient's face while they organize their intubation equipment.
    c. Anesthesia will use the laryngoscope or glideslope to visualize the vocal cords.
        i. Instructor to demonstrate both.
            - Emphasize the importance of not moving the patient during intubation and not accidentally hitting anesthesia.

ii. The nasal endotracheal tube should be placed in normal saline before visualization of the vocal cords. The normal saline acts as a lubrication for the endotracheal tube.

iii. While anesthesia is visualizing the vocal cords, nursing will be getting the nasal endotracheal tube ready to pass to anesthesia.

- Ensure it is in the correct orientation, and if it is bent with a stylet, do not adjust the bend.

iv. When anesthesia is ready (i.e., they have visualized the vocal cords), they will reach for the endotracheal tube and place it in the patient's nares.

v. Once the tube has reached the oropharynx, use the Magill forceps to advance it into the glottis.

vi. Once the tube is placed, nursing to hold the tube at the nares, ensuring the hand is stabilized. Do not let go until the endotracheal tube is secured (i.e., taped in place).

vii. If using a cuffed endotracheal tube, the cuff should be inflated with a syringe. Anesthesia may choose to do this task due to the risk of trauma due to overinflation; please confirm with them before inflating.

viii. Nursing or anesthesia will connect the endotracheal tube to the circuit.

ix. Anesthesia will tape the endotracheal tube in place. Once the tube is secured, nursing can let go of the endotracheal tube.

x. The anesthesia circuit will be placed into a securement device (i.e., "Waldo").

12. Once the tube is secured, the nursing and surgical teams can position the patient.

Simulation Section - Pediatric Mask Induction and Intubation

Each learner will practice mask induction and intubation. The instructor or other nurse will act as anesthesia, and the learner will act as nursing. The above-outlined steps will be followed. As learners complete the nursing component of the simulation, they may participate as anesthesia to allow the instructor to assist the other learners.

The simulations ensure that learners can touch and use all the equipment on the mannequin.

Mask Induction and Oral Intubation Scenario:

Scenario:

A pediatric patient (age will be appropriate to the pediatric model available) comes to the OR for a right ankle open reduction and internal fixation. The patient is from day surgery and does not have an IV, therefore anesthesia has chosen to do a mask induction. There will be no parent accompanying the patient.

Mask Induction and Nasal Intubation Scenario:

Scenario:

A pediatric patient (age will be appropriate to the pediatric model available) comes to the OR for dental surgery. The patient is from day surgery and does not have an IV, therefore anesthesia has chosen to do a mask induction. There will be no parent accompanying the patient.

Demonstration 2: Pediatric Surgical Instruments

The instructor will gather various instruments from the Medical Device Reprocessing unit to demonstrate the difference between the instruments used on adults and pediatric patients.

Supplies:

- Laparoscopic Instruments
  - Neonatal
  - Pediatric
  - Adult
  - 5mm and 10mm telescope
- Addison forceps
- Hemostats
  - Mosquito (MDR Location: Cart 0502/0502A02)
  - Snap (MDR location: Cart 0304/0304D04)
- Balfour Retractor
  - Baby (MDR location: Cart 0302/0302A01)
  - Child (MDR location: Cart 0302/0302A02)
- Scalpel blade 15 versus 10
- Mixter
  - Baby (MDR location: Cart 0304/0304E03)
  - Adult
- Deaver retractor
  - Baby (MDR location: Cart 0304/0304F06)
  - Adult

The instructor will lay instruments on a surgical table to allow students to visualize and touch them. The main comparison is the size of the instruments. Instruments are commonly chosen based on the patient's size and what is appropriate for the procedure. For example, one would not use a large retractor on a small child if it were related to potential patient injury, instrument control, and surgical site visualization.

References

American Heart Association. (2016). *Pediatric advanced life support provider manual*.

UT Health San Antonio. (2014). CCHD pulse oximetry demo on infant. *YouTube*. CCHD Pulse Oximetry Demo on Infant - YouTube