



Children and Young People in Radiology

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24.1 Introduction

Radiologic imaging is an example of a common yet potentially complex medical experience requiring children and young people (CYP) and families to engage with the healthcare system for a relatively time-limited but potentially stressful event. Used to diagnose, monitor and screen, or treat a condition the range of available imaging procedures often place CYP in the unusual position of entering a strange environment where the expectation to cooperate and participate is high and the individual's ability to cope is challenged. Views on what makes a pediatric imaging procedure a *success* are dependent on the differing goals and values of all of the stakeholders, including the CYP. Prepared from the viewpoint of a child life specialist, the best interests of CYP are at the center of the discussion presented in the chapter. Ideas of ways in which to plan environments that align with the experience of the CYP as a competent and capable participant are emphasized.

Application of an ecological model draws attention to the nature of the interactions of the CYP *with* existing systems, particularly highlighting the status of the individual as an active agent. While the present discussion will deal primarily

with factors in the immediate context of an imaging procedure, acknowledgement of the advocacy role of pediatric radiology nurses to advance the interests of the CYP through policy and procedural change is also offered. Therefore, approaches for appreciating the potential strengths of the CYP undergoing an imaging procedure will be outlined followed by a presentation on ways to engage their competence and capacity through welcoming relationships, inviting collaboration, and recognizing success. Ultimately, the goal of fostering a successful outcome that also acknowledges the best interests of the CYP will be the focus of the chapter.

24.2 Ecological Model

In viewing the experience of the child from an ecological perspective, we are encouraged to look beyond the immediate context of the developing CYP. If we can pause to observe the CYP within the larger context and attend to the environmental interconnections that impact CYP, we can consider that the healthcare system has a unique influence. Bronfenbrenner's ecological model [1] is a useful lens to examine the experience of the CYP and family as they are guided into the domain of radiologic procedures within the larger system of healthcare. For as we view the individual within a set of interacting systems, the ways the systems ultimately interact with the

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CYP become visible. The role of the radiology nurse in supporting a CYP and family includes the establishment of supportive relationships, health promotion, teaching and advocacy, coordination and collaboration, as well as engagement with policy and procedure activities of the larger healthcare system. A framework for care that places the CYP at the center can result in policies and practices that ultimately result in optimizing a positive experience for the individual while attaining a clinically relevant result.

Briefly, Bronfenbrenner's ecological model [1] illustrates five layers of interrelated systems. The microsystem, where the CYP is an active participant while undergoing a radiological procedure, represents an interplay of the CYP and family's individual characteristics with the physical and social environment of the setting. The mesosystem refers to the *process* of interrelationships with the exosystem—represented by practices, procedures, and policies that result from staff and CYP's experience and ultimately impact the CYP's experience. An example of a feature of the exosystem is the quality, availability, and uptake of information and resources to engage families and CYP prior to a radiology appointment. The macrosystem refers to overarching attitudes, beliefs, and ideals of a society, in this case relating to health and healthcare. These interact with the mesosystem processes and affect a CYP and family's experience, for example, relating to the expectations that CYP have before engaging with pediatric radiology procedures. Finally, the chronosystem represents the whole system as it moves through time and historical change. Respect for the rights of CYP is an example of an attitudinal change over decades affecting the whole healthcare system including serving the best interests of the child, children's right to be involved in decisions, education and the right to play [2].

24.3 Perceptions of the Radiology Environment

Children and young people are distinct from adults in many ways including the lens through which they perceive the environment. Entering a

radiology department for the first time exposes CYP and their caregivers to unfamiliar sights, sounds, and experiences [3]. Technological in nature, the human elements of a radiology space can be overlooked by adults whose attention is focused on managing the procedural requirements of imaging. Imaging staff, as well as caregivers, have their own expectations that may or may not align with that of a CYP. In placing the CYP at the center of this discussion, the aim is to point out features of the environment that may influence CYP's reactions to the radiology environment and the imaging experience.

The state-of-the-art technology of X-ray, ultrasound, MRI, CT, and other imaging modalities can be both fascinating and intimidating at the same time. Consideration of the features of technology as seen through the eyes of CYP requires attention to the size, shape, color, placement, and even the lighting of the equipment. The theory of affordances [4] suggests that CYP immediately perceive the potential actions and functions of materials and that this perception influences how they respond. In nature environments, for example, a tree stump may be valued for its affordance for jumping and balancing; the angles of a tree branch may represent a wild animal or a sword. Imagine what CYP may perceive upon their first encounter with imaging technology, when lying prone or when the lights are dimmed? Many pediatric facilities incorporate child-friendly design into the imaging spaces such as paint colors, images, music, and even virtual reality goggles. However, where these features are not supported, CYP may be left to their own imagination and influenced by additional elements of the environment or past experiences.

The sensory elements of spaces can also influence a CYP's response. For children, the passage of time, particularly when unoccupied, is relative. Exposure to smells from cleaners and alcohol swabs, sounds like beeps, voices and footsteps, changes in temperature, shifts between bright and dim lighting can bombard a young person. Chairs that are too big, counters and sinks too high and adult oriented media and materials overlook the range of interests, particularly of small children. Young people may be expected to

adapt to adult dimensions and sometimes intentionally childish design features too. However, for youth, their interests and needs are distinctive relative to younger children and require additional consideration. The adequacy of environmental accommodations for both children and youth, although commonly featured in pediatric facilities, may be deficient in adult spaces or disregard the interests of mature pediatric patients.

The behavioral expectations of imaging procedures primarily include the ability to hold still for a period of time. When this request follows a sequence of requirements in preparation for the procedure, the CYP's tolerance for the demands of the procedure can be compromised. Changing out of clothes and into an examination gown, ingesting substances or fluids, enduring the insertion of an intravenous line or urinary catheter, perhaps donning a lead apron while interacting with many unfamiliar people, and waiting for an undetermined amount of time all play into the reaction of children undergoing an imaging procedure. Additional expectations align with the specifics of the procedure—tolerating gel for an ultrasound, lying in the frog-legged position, and exposure to loud sounds of an MRI are examples of features of radiology environments in need of attention in order to meet the needs and interests of a pediatric population. Further, the identification of specific strengths and stressors for individuals and their family must be explored for their influence on reactions and responses in radiology environments.

Stepping away from an adult perception of the environment and everyday interactions requires the intentional invitation of CYP's voices and perspectives into the healthcare environment. Recognition that adult perceptions and expectations are likely to differ from a CYP is one component of this discussion. Another is accepting that we may need to follow the CYP's lead in

order to accomplish the task at hand. Bröder et al. [5] suggest we give credit to CYP as active players in their own health and allow for a movement toward the inclusion of CYP as collaborators in healthcare decisions.

24.4 Placing the Child or Young Person at the Center

Appreciation for the interests and needs associated with individual patients seen in pediatric settings is complicated due to the wide range of developmental abilities observed in CYP presenting for radiologic procedures. A message often communicated in the pediatric literature reminds us that children are not small adults [6]. Most relevant to this discussion is that individual CYP should not be reduced to the catch-all *age equals developmental ability* and should be approached for their unique interests, needs, and abilities too. Upon initial encounters with CYP, the manner in which you greet and interact with individuals does affect the reception you will experience in return. At the very least, enhanced awareness of the importance of exploring the capacity and competency of individual children and youth is warranted in anticipation of a successful procedure. Three related ideas—image of the child, child agency, and health literacy friendly—are introduced as ways of thinking about healthcare environments that are respectful of the CYP as an essential player in health promotion (Fig. 24.1).

24.4.1 Image of the Child or Young Person

The image of the CYP that one favors related to competence and capacity to actively participate does have an influence on the ways that a CYP is

Fig. 24.1 Thinking about children and young people as essential players in health promotion



approached, engaged in communication, and included in health-related activities. Strict adherence to a developmental perspective, for example, can limit our view of CYP to be in a constant state of development—perhaps never quite as capable as we might want them to be—particularly within the context of complex medical experiences. Whether we view a CYP as competent and capable (or not), reflects the level of social agency we attribute to individuals, the level of participation we are willing to offer, and ultimately our propensity to collaborate with CYP throughout an imaging process. To see CYP as partners in healthcare can position the power of the relationship away from adult-directed and toward a collaborative approach to practice with CYP.

In describing child life specialists (CLS) as a key member of the team in pediatric radiology, Metzger et al. [7] demonstrate an attitude of the competent and capable child through a case study of an evaluation of 8-year-old *Michael* preparing for an arthrogram and MRI. Clearly, the evaluation is conducted to assess the child's potential to tolerate the procedures without sedation. Through a systematic process of building rapport, exploring interests and concerns, and gathering additional background information, the CLS determines *Michael* understands the procedures and what is expected of him. Notably, because of the CLS propensity to collaborate, she is also able to pinpoint *Michael*'s personal perspective of success: attending a football game that evening. "He is nervous but motivated to not receive sedation by the desire to go to a football game that evening, something he cannot do if he is sedated today [7, p. 154]."

24.4.2 Child or Young Person Agency

Montreuil and Carnevale [8] conducted a concept analysis of children's agency within the healthcare literature. Application of the term agency as referring to children as agents who have the capacity to act was found to have changed over time, vary by discipline and by paradigmatic orientation. Early reference to child agency was identified as related to "one's ability to engage in

self-care in order to enhance treatment and prevent illness" [8, p. 506]. Seen through a developmental lens, children were viewed as transitioning from being the recipients of care toward greater abilities for self-care that developed along with a greater sense of self. Later, constructivist or participatory views included children as contributing to or having the right to participate and be involved as developers and evaluators of interventions (particularly related to health research). Due to the inconsistent use of the term found by Montreuil and Carnevale, the authors put forth a tentative definition of agency as follows: "Children's capacity to act deliberately, speak for oneself, and actively reflect on their social worlds, shaping their lives and the lives of others" [8, p. 510].

In the case of *Michael* mentioned earlier [7], he was invited to ask questions, suggest his preferred methods for coping (e.g., sitting up and watching the IV start, play a football trivia game during the arthrogram, watch a movie during the MRI), and rehearse coping behaviors as the CLS walked with him through the step-by-step process of the demanding and time-consuming series of procedures. Reflection on the Montreuil and Carnevale [8] understanding of agency relative to healthcare in general allows for additional consideration of ways in which CYP, like *Michael*, express their knowledge and understanding of health and healthcare-related information and behaviors.

24.4.3 Health Literacy Friendly

Health literacy in CYP is just beginning to receive attention in the literature [5]. Usually, child health literacy is derived from adult concepts of health literacy, including basic reading, writing, and numeracy skills and a combination of health-related knowledge, competencies as well as motivation; as such, the unique character and life situations of young people may be overlooked. In systematically reviewing the literature, Bröder et al. [5] have documented this gap and encourage opportunities for CYP that acknowledge the active role they do play in their health. Bröder et al. [5] introduce a suitable phrase,

Fig. 24.2 Collaboration with children and young people



“health literacy friendly services,” in reference to ways in which the role of CYP in developing their health literacy can be acknowledged and supported through inclusive and collaborative approaches. By prioritizing the viewpoint of the CYP, we are better able to focus on what is important to the individual as they progress through a complex system of care.

Again, we can refer to the case of Michael [7] and recognize his interest and ability (competence and capacity) to engage in a complex process of preparation and planning to increase his health-related knowledge, understanding and ability to participate in his healthcare. The health-literacy friendly initiatives provided by the radiology team supporting Michael throughout the experience demonstrate an inclusive and collaborative approach that allow for the recognition of his motivation to succeed in order to meet a personal goal for the day. Patient and family education and support that intentionally invites the unique motivations of the CYP into the process can seize both the attention and trust of the CYP and increase the chances of achieving a successful procedural outcome and positive experience. Approaches discussed in the following section highlight the value of welcoming relationships, inviting collaboration, and recognizing success in the development of collaborative approaches to radiological practice (Fig. 24.2).

24.5 Collaboration with Children and Young People

Together, the three concepts—image of the child, child agency, and health literacy friendly—were introduced to encourage a movement toward considering the CYP as an essential player in healthcare procedures. Looking at the individual as a subject who holds the capacity to engage with procedural processes, rather than an object for

radiologic examination, starts at the moment of relationship. The teaching, advocacy, coordination, and collaboration processes can occur to support a successful imaging experience and outcome when the CYP is welcome as a partner in health promotion. Upon consideration of policy and procedural practices from a collaborative framework, radiology nurses can examine and modify existing procedural practices to position the voices and perspectives of children explicitly in the forefront of practice.

The timing of the initiation of the relationship among the CYP, family, and radiology professionals is dependent on the specific context of the referral for a radiologic procedure. Additionally, each imaging modality features its own idiosyncratic processes that cannot be fully addressed in this brief chapter. However, the underlying thesis of the necessity of consulting with and informing CYP is supported when attention to the establishment of trust and communication in relationships with young people is embraced. Whether the discussion features *this* radiology modality or *that* imaging modality, consideration of the CYP as an essential player in their healthcare procedures who is capable and competent requires experienced radiology professionals prepared to appreciate the perspectives of the CYP upfront: “Clinical decision-making must be based on the requirements of each patient, guided by the latest sources of information available, including local guidelines and newly published trial data” [9, p. 2]. In order to create this positive experience, we must incorporate all we know about the CYP and caregiver experiences into the clinical decision-making process [10].

24.5.1 Welcoming Relationships

Whether initiated by a primary care physician, clinical specialist, or emergency room team, the

introduction of the caregivers to the forthcoming procedure should include a conversation underscoring the importance of inviting the CYP into the preparation and planning for a successful experience. Bates [10] suggests the referring physician begin to educate the caregivers through the provision of the particulars of the imaging procedure beyond the diagnostic label. When general details of the process of the preparation and procedural requirements are shared upfront, ideally supported with appropriate educational materials, then adequate time for caregivers to prepare questions, raise concerns, and consider the implications of the procedure on their CYP's capacity to participate is provided.

Follow-up contact initiated by a radiology nurse equipped to address questions, concerns and initiate the inclusion of the CYP as an active participant in the procedure is a next step. The CYP will be included in this process when caregivers are comfortable that the existing supports will allow the CYP to demonstrate their interest and ability to participate. Following the introduction of the planned procedure, radiology nurses can be proactive in building a relationship with the CYP through an intentional exploration of who the individual is apart from their medical concerns. The establishment of a positive relationship begins as the radiology nurse explores existing interests and knowledge held by the CYP. Conversation around the CYPs interpretation of the purpose, process, and meaning of the procedures can uncover existing and potential strengths and stressors. Ultimately, the capacity of the radiology nurse to recognize and employ the potential motivation of the CYP relative to the achievement of a successful experience is fundamental.

Although child life specialists (CLS) are not available for all radiology centers, lessons shared can support practice across professions. CLS have offered the following perspectives to account for their ease in establishing meaningful relationships even during brief encounters with CYP [11]. Showing genuine interest, creating a sense of connection, and offering real opportunities for choice and control are all part of the approach of CLS as they initiate relationships

[11]. They carry materials with them to convey a sense of who they are to the CYP and family and to support an ongoing interaction. Bubbles, books, interactive games, and multi-media materials and models are some tools the CLS may use to facilitate a relationship. Ideas for hands-on materials, gadgets, and images can be found using search terms such as *interesting gadgets in radiology* on Google or *medical/health care play* on Pinterest.

24.5.2 Inviting Collaboration

With some effort, materials introduced early to capture CYP attention provide a welcoming environment that allows for a collaborative interaction to advance. As with CLS, radiology nurses may also select an intriguing collection of materials that can be used as an invitation into an interaction. As mentioned earlier, imaging modalities can be fascinating as well as intimidating. In early childhood education the term *provocation* is used to reference the deliberate invitation of children into thinking about something or experimenting with ideas and materials [12]. Similarly, from the field of educational psychology, placing abstract learning concepts into meaningful and interesting contexts, personalizing learning, and offering choices serves to increase CYP sense of control and self-determination [13]. In making the process of preparation for a radiology procedure collaborative to CYP, the radiological nurse has a role in making the whole process meaningful for the CYP.

When introducing the radiology environment, the interests and exploration behavior (curiosity) of the CYP can be observed and combined with open-ended dialogue to provide opportunities for offering choice and control relative to the play activities or in preparation for the procedure. Callery and Coyne suggest familiar educational principles are applied in approaches to interventions to engage CYP in decisions: "appropriate, structured and based on active rather than passive learning" [14, p. 606]. Initially, exploring a basket of play imaging models with people figures, materials and devices with moveable parts, or

books with images can take the pressure off direct interactions by shifting attention off the CYP and onto the materials. Additionally, as nurses progress through an explanation or tour of the radiology environment they may enter into the preparation process. The aim is to facilitate an understanding of ways in which the process can be presented to spark the interest, motivation, and need for control of the individual.

24.5.3 Recognizing Success

Through conversations exploring who the CYP is you can discover the values, beliefs, interests, and ambitions of the individual and make determinations regarding the potential behavioral response that may occur during a radiological exam. However, the competence of the radiology nurse relative to the recognition of the potential motivations of CYP is fundamental. Recall the case of Michael [7]. Although he had limited familiarity with hospital environments and was observed as anxious, he took on the challenge of learning about the procedure and his role in achieving his goal of no sedation in order to attend a football game that evening. In an effort to encourage radiological nurses to think about the *why* behind the observed behavior of CYP undergoing challenging radiology procedures, a social-cognitive approach to achievement motivation is reviewed [15]. In reviewing this model, an experienced radiology nurse will no doubt recall specific experiences that speak to patterns of the behavior CYP experienced in the radiology environment; think of those individuals who maintain a posture of curiosity and an eagerness to learn throughout a procedure in contrast to individuals who present unprepared to face the complex expectations of the environment.

From a social-cognitive approach, Dweck and Leggett identify two patterns of cognition-affect-behavior in which they describe how goals influence the interpretation and reaction of individuals to events [15]. A *performance-oriented* individual is characterized as showing a pattern of seeking positive judgements and avoiding negative judgements on their competence. The goal is

about *proving* their ability. However, when facing what they perceive to be obstacles, their competence becomes compromised due to maladaptive thinking, affect, and behaviors. In sum, their adaptive and competent behaviors deteriorate into helplessness. In contrast, a *learning-oriented* individual has the goal to improve their competence. When faced with obstacles, they pursue mastery through increasing effort and generating strategies to reach a solution to challenges. Whereas performance-oriented individuals attribute difficulties to their lack of ability to succeed, learning-oriented individuals see challenges to be solved through increased effort [15]. It seems the performance-oriented individuals see threat in challenge where learning-oriented individuals see opportunity. Therefore, in recognizing success, the maintenance of CYP dignity and advancing mastery through learning are two elements of success to keep in mind as relationships with CYP are established.

Given the many opportunities for challenge inherent in the processes involved in preparing for and undertaking a radiological procedure, radiology nurses need to be equipped to present the best options to match the underlying needs of individuals in order to attain the successful experience for the CYP. When each CYP is approached with the belief in their competence and capacity, then the radiology nurse opens the door to creating conditions for collaboration and the identification of pathways leading to a successful experience. Increasing a CYP sense of control and self-determination involves sensitivity to the goal orientation of the individual by placing the radiological experience into meaningful and interesting learning contexts, personalizing learning, and offering choices within a collaborative relationship.

24.6 Summary

The primary question of how we can make the radiology experience of children and young people a positive one is complex. This chapter was written from a child life perspective noting that the responsibility of the CLS lies primarily with

the child and family. Therefore, an explicit acknowledgement that radiology nurses have the additional responsibility of managing complex radiology procedures is necessary: The combination of nursing responsibilities includes both the technical and human elements of a radiology procedure. This suggests that in order to collaborate with children and young people, planning to intentionally include their voice is required. Wyatt et al. conducted a meta-analysis and determined that shared decision-making in pediatric interventions rarely targeted children and focused on parents [16]. Indeed, there is work to be done to establish practices that allow radiology nurses to present the best options to CYP matched to their specific needs in order to attain the successful experience for the CYP.

Application of an ecological model draws attention to the nature of the interactions of the CYP *with* existing systems, particularly highlighting the status of the individual as an active agent.

Suggested approaches to addressing current and future policy and practices arising from this discussion include the following.

1. A movement toward considering the CYP as an essential player in healthcare procedures is encouraged. Quality improvement projects to capture current ways that concepts such as image of the child, child agency, and health literacy friendly are interpreted may reveal a diverse response and opportunities to engage in transformative learning events that align, for example, with the rights-based principles in the CRC [2] that acknowledge the rights of children to be involved in decisions, education, and play.
2. Recognition that adult perceptions and expectations are likely to differ from a CYP is one component of this discussion to be examined by radiology nurses at all levels. Reflection and critical examination of the values, beliefs, and attitudes held toward CYP that impact approaches to advocacy for the CYP may highlight ways to enhance efforts to support successful radiology experiences.
3. Examination of current practices on ways to engage children and young people's competence and capacity through welcoming relationships, inviting collaboration, and recognizing success may result in the development of new policies and procedures targeting greater attention to these particular aspects of pediatric services.
4. The capacity of the radiology nurse to recognize and employ the potential motivation of the CYP relative to the achievement of a successful experience is fundamental. In making the process of preparation for a radiology procedure collaborative, the radiological nurse has a role in making the whole process meaningful for the CYP. The prospect of assessing the competence of radiology nurses in addressing questions, concerns and initiate the inclusion of the CYP as an active participant in the procedure is likely an area for future investigation.
5. Health literacy friendly services should be included to support the needs of all users of the radiology environment. Radiology teams can complete an environmental scan of the area and a review of educational documents and media from the viewpoint of the user from a range of developmental stages. Acknowledgement of the diverse and changing needs and interests of growing children and youth can be made visible through the provision of developmentally appropriate approaches to the environment and learning.

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