Jurnal Eduhealth
Volume 15, Number 03, 2024, DOI 10.54209/eduhealth.v15i03
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

Radiographic Examination Profile In Pediatric Patients

Fadli Felayani[1*], Susi Tri Isnoviasih[2], Ardi Soesilo Wibowo[3], Asri Indah Aryani [4]
[1*,2,3,4]Jurusan Teknik Radiodiagnostik dan Radioterapi, Poltekkes Kemenkes Semarang, Indonesia

Article Info
Keywords:
Radiography,
Pediatric,
descriptive observational research

ABSTRACT
Several unique things differentiate radiographic examinations in pediatrics from adult patients, including patient fixation, the level of patient cooperation, and the need for patient companions. Currently, no literature provides an overview of the patient's age with these three aspects of radiographic examination. This study aims to provide an overview of the relationship between age groups and the implementation of radiographic examinations, which greatly influence the success of the examination. This research is a type of descriptive observational research. Data obtained from three hospitals was collected for one month. The sample for this study was 144 pediatric radiographic examinations. The study results are described in frequency distributions related to patient fixation, level of patient cooperation, and the need for patient companions. The study results showed that patients began to cooperate, and the use of fixation decreased in the age group of three years and above. Patients begin not needing a companion at six years and above. The radiographer must evaluate these three things to prepare the examination with an appropriate approach with the goal of a successful exam without repetition so that the radiation dose is minimal for both the patient and the patient's family. This research can be used as a guide for radiographers in preparing for examinations and initial communication during pediatric radiography examinations.

Corresponding Author:
Fadli Felayani
Jurusan Teknik Radiodiagnostik dan Radioterapi, Poltekkes Kemenkes Semarang, Indonesia
fadli.felayani@gmail.com

INTRODUCTION

Pediatric radiographic examination is a sub-specialty with exciting characteristics that differ from adult patients. What needs to be considered is that children's bodies are in the process of growing, so they have greater sensitivity to radiation exposure. Increased radiation doses can cause increased risk. All professions related to medical radiation exposure to children must take initiatives to reduce doses in children's health services (Nelson, 2014 ; Brown et al., 2021). One step that can be taken is to ensure that the pediatric radiographic examination goes smoothly so there is no need to repeat the examination.

The success of a pediatric radiography examination begins with preparation before the patient enters the room. Preparing the appropriate room and supporting equipment can help the examination's success, for example, the suitability of the fixation tool to be used. Apart from that, the radiographer's proper communication and attitude towards the patient will significantly determine whether the examination will go smoothly or not. Both of these things

Jurnal Eduhealth
Volume 15, Number 03, 2024, DOI 10.54209/eduhealth.v15i03
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

can affect the patient's time in the examination room, which is related to patient comfort (Lampignano & Kendrick, 2017 ; Long et al., 2016; Salleh et al., 2022).

In certain age groups, pediatric patients are unable to understand the purpose and instructions given for the examination. Radiological examinations can be a stressful experience for many children, so they may experience confusion, anxiety, and fear, which can disrupt the course of the examination, causing the diagnostic image quality to be below standard resulting in examination failure and repetition. Therefore, daily care and patience are needed to build a good relationship with the patient. Providing explanations that are easy for pediatric patients to understand is essential for maintaining trust and cooperation (Baron et al., 2016; Lampignano & Kendrick, 2017). There are policy guidelines regarding the acceptable quality of diagnostic radiography in the pediatric population that is set to ensure the three objectives of producing adequate and uniformly acceptable images, providing accurate radiological interpretation of the images, and using a sufficiently low radiation dose per radiograph (Bhushan Thukral, 2015).

The role of the patient's parents or companions in this condition is vital; they can be a link of communication with the patient and can help fixate the patient. The patient's parents continue to accompany their child during the examination. This can be very helpful because the presence of parents comforts patients, making them calmer and more cooperative. However, not all radiology departments give permission; this is related to radiation protection for unauthorized people. However, giving permission can help the examination run smoothly in certain conditions, such as pediatric patients(Bhushan Thukral, 2015; Linder, 2017).

However, not all patients become cooperative and run smoothly in the presence of the patient's parents because each child is different and unique. Often, patients remain rebellious and refuse the examination even though their parents accompany them. Apart from that, each age group has a different level of cooperation; in some age groups, the patient rebels and makes uncontrolled body movements, which can cause significant problems with imaging and blurry radiographic images. In certain conditions, fixation techniques and equipment are required, which are commonly used in pediatric radiographic examinations. Proper fixation can avoid repeated examinations so that the patient's dose remains minimal. Many types of fixation tools can be used, from those available commercially or using tools found in the radiology room, for example, blankets, towels, patient clothes, and others (Linder, 2017)

Based on this explanation, there are essential things to pay attention to ensure the success of pediatric radiography examinations, including understanding the level of patient cooperation, patient fixation, and the need for patient companions. Currently, no literature provides information regarding the age level of pediatric patients in these three aspects. The radiographer understood this problem through long-term experience in treating pediatric patients. Therefore, research was carried out to provide an overview for young radiographers regarding the treatment of pediatric patients in terms of level of cooperation, immobilization needs, and the need for companions for patients of all ages.

METHODS

This research is a type of descriptive observational research. Data was collected from three hospitals for one month in October 2023. Data was collected by observing pediatric

Jurnal Eduhealth
Volume 15, Number 03, 2024, DOI 10.54209/eduhealth.v15i03
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

radiographic examinations and recording, including the patient's age, level of cooperation, need for fixation, and need for the patient's companion. The research sample consisted of 144 pediatric radiographic examinations. Next, the data is processed and grouped based on the patient's age level. Data processing uses descriptive statistics to overview the parameters observed at each age level.

RESULTS AND DISCUSSION

Pediatric patients are grouped into five age groups: babies born to six months old, babies aged more than six months to three years old, children aged more than three years to six years, children aged more than six years to twelve years, children aged over twelve years to nineteen years (Rimsza et al., 2015). The frequency distribution of patient ages in this research sample can be seen in Table 1 below:

Table 1. Pediatric Radiology Patients by Age Group

Age Group	f	%
Babies from birth to six months of age	24	16,67
Babies over six months to three years old	47	32,64
Children aged over three years to six years	17	11,81
Children over six years old to twelve years old	21	14,58
Children over twelve years old to Nineteen years old	35	24,31

It can be seen in Table 1 above that the research sample represents all age groups. The highest number is in the age group of babies over six months to children aged three years, and the smallest is in the age group of children aged over three years to six years. By representing all age groups, this research is likely to provide a representative picture of pediatric radiographic examinations in general.

Next, the data is tabulated based on observation parameters regarding whether the patient is cooperative or not in each age group. The research results regarding age groups and their level of cooperation can be seen in Table 2.

Table 2. Cooperative Rate of Pediatric Radiography Patients Based on Age Group

Age Group	cooperative		Non cooperative	
	f	%	f	%
Babies from birth to six months of age	0	0,00	24	100,00
Babies over six months to three years old	4	8,51	43	91,49
Children aged over three years to six years	14	82,35	3	17,65
Children aged over six years to twelve years	18	85,71	3	14,29
Children aged over twelve years to nineteen years	33	94,29	2	5,71

Table 2 shows that the cooperative level of pediatric radiography patients is increasing in proportion to the increase in the age group from newborns to six months old. All patients are uncooperative, and in the infant age group of more than six months to three years, there are starting to be patients who are cooperative towards radiographic examination directions given by radiographers 8.51%. The level of patient cooperation increased significantly in patients in the three to six-year age group, namely 82.35%, and continued to increase in the

Jurnal Eduhealth
Volume 15, Number 03, 2024, DOI 10.54209/eduhealth.v15i03
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

above age group. Based on patient fixation needs, the frequency distribution of pediatric radiography patients can be seen in Table 3.

Table 3 Fixation Needs of Pediatric Radiographic Patients Based on Age Group

Age Group	Fixation Needs		Without Fixation	
	f	%	f	%
Babies from birth to six months of age	23	95,83	1	4,17
Babies over six months to three years old	43	91,49	4	8,51
Children aged over three years to six years	4	23,53	13	76,47
Children aged over six years to twelve years	2	9,52	19	90,48
Children aged over twelve years to nineteen years	0	0,00	35	100,00

In Table 3, it can be seen that patient fixation is needed by 95.83% of patients in the group of babies from birth to six months of age, and in babies over six months to three years old, the need for patient fixation is still very high, namely 91.49%. However, in children aged more than three years to six years and above, the patient's need for fixation decreases. Further analysis was carried out on the parameters of the need for a patient's family companion during pediatric radiographic examinations, which can be seen in Table 4

Table 4. Need for Companionship for Pediatric Radiography Patients Based on Age Group

Age Group	Need for Companionship		without Companionship	
	f	%	f	%
Babies from birth to six months of age	14	58,33	10	41,67
Babies over six months to three years old	46	97,87	1	2,13
Children aged over three years to six years	13	76,47	4	23,53
Children aged over six years to twelve years	5	23,81	16	76,19
Children aged over twelve years to nineteen years	6	17,14	29	82,86

In Table 4, it can be seen that the need for patient companions already exists in the age group of babies from birth to six months at 58.33% and is most significant in the age group for babies over six months to children aged three years at 97.87%. In the highest age group, between twelve years and nineteen years, 17.14% of pediatric radiography patients are accompanied by the patient when undergoing examination.

The data above illustrates the frequency distribution of pediatric radiography patients related to the level of patient cooperation, need for fixation and need for patient companions related to age group. Based on these data, we can further discuss the phenomena that exist in each general group related to the parameters observed in this research as follows:

Babies from birth to six months of age

In this age group, it is very understandable that all patients are non-cooperative patients who are not able to follow the examination directions. At this age, patients cannot understand information or provide the expected response to information. In the neonatal phase, the patient may be more conditioned because he is sleeping more often so he can be positioned

Jurnal Eduhealth
Volume 15, Number 03, 2024, DOI 10.54209/eduhealth.v15i03
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

more easily. However, making certain projections that change the patient's body position from a supine position to another position, for example, lateral, decubitus, or inversion, may cause the baby to cry and cause the patient to move. In these conditions, appropriate immobilization is required. At a greater age, approaching six months, the patient already has much movement and knows the closest people around him, making it possible for the patient to cry and move during the examination.

In this age group, 95.83% of patients require a fixation device. This is, of course, related to the data, which shows that this group of patients is entirely uncooperative. However there is a unique phenomenon that 4.17% of patients do not require fixation devices during the examination. This may occur in the neonatal phase, when the examination is in a sleeping condition so that no fixation equipment is needed. This can also be used as a reference for radiographers, who in this age group can take advantage of the patient's sleep phase to ensure a smooth examination while avoiding the use of fixation equipment and radiation doses that are not beneficial for the patient's family.

In this age group, data was also obtained that 58.33% of patients needed a patient companion. The need for patient companions functions in patient fixation. A fairly large number, 41.67%, do not need a patient companion. These namely patients do not need fixation assistance from the family and patients who only need fixation equipment available in the examination room, for example, swaddles, blankets, and pillows. These data show that in this age group, radiographers need to see a role that is appropriate to the needs of the examination by considering radiation protection for the patient's family. The evaluation is carried out by considering three conditions. The most ideal condition is that the companion is asked to leave to avoid exposure to radiation. This can be done if the patient does not resist during the examination or if the fixation is sufficient to keep the child from moving during the examination. If this is not possible, the patient's companion is allowed to enter but maintains a distance from the patient and the X-ray Unit. This is done if the patient is anxious and nervous but becomes calm and cooperative when family is accompanying him. In the final condition, the companion is asked to help fixate the patient; this is the last step if the patient is not cooperative and the existing fixation equipment is unable to keep the patient immobile. In this condition, the patient's companion needs to be given appropriate radiation protection equipment. This is in accordance with what (Ahmad Fuady, 2022)said, that during this period, children are very dependent on their parents.

Babies over six months to three years old

In this age group, the majority of patients (91.49%) were not cooperative. The patient is aware of the presence of family and strangers around him, is able to show anxiety and restlessness, and is able to express anger and dislike towards something. However, the data also shows that 8.51% of patients were cooperative in the examination; this may occur in patients approaching the age of three years because, generally, at the age of two years, children can communicate using limited and simple language, some children are already able to understand commands and directions. So, patients in this age group need to be evaluated by communicating with the patient to adjust the appropriate procedural approach.

Fixation was required in 91.49% of patients in this age group. That is in line with the high level of patient cooperation. The use of appropriate fixation tools really helps the success

Jurnal Eduhealth
Volume 15, Number 03, 2024, DOI 10.54209/eduhealth.v15i03
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

of the examination. At this age, patients already can refuse and fight because children begin to develop an awareness of themselves and try to test their will and abilities (Sriyanto & Sutrisno, 2022). At this age children have rapid development in the motor aspect (Ahmad Fuady, 2022), so it becomes a problem for radiographers because they will refuse and fight during the examination. A total of 8.51% of patients in this age group did not require a fixation device; this figure is the same as the number of cooperative patients. That means that cooperative patients in this group of patients do not need a fixation device. Radiographers need to carefully evaluate the patient's condition because each child is different and unique. Making the radiograph correctly on the first try prevents the need for repeat X-rays and keeps the radiation dose to a minimum. Several commercially available fixation devices are used to help minimize movement in pediatric clients (Linder, 2017).

In this group of patients, 97.87% needed a patient companion. In this age group, patient companions are very necessary as communication links with patients. Patients who are afraid and anxious can also be calmed by a companion(Bhushan Thukral, 2015). Furthermore, patient companions usually assist with patient fixation. Apart from that, there are 2.13% who do not need a patient companion. This shows that children's psychological development is different; some children are able to understand the direction and purpose of being in the examination room. Radiology exams can be a stressful experience for many children who may feel anxious, nervous, or even afraid. This can result in less than-optimal examinations, ranging from examinations that are somewhat limited due to patient movement to examinations that are stopped early, thereby reducing image quality and diagnostic confidence(Baron et al., 2016).

Children aged over three years to six years

In this age group, 82.35% of patients were cooperative in radiological examinations, and 17.65% were uncooperative. Children at this age generally understand directions and commands and the reason for being in the radiology examination room. However, the data shows that there are a small number of uncooperative patients, which shows that radiographers cannot assume that children over three years of age will easily follow directions during the examination. Anxiety and restlessness may be the cause of a small number of patients being uncooperative. A decrease also followed the decrease in the number of patients who were uncooperative in the number of patients using fixation devices, namely only 23.53%, which is the same percentage as the number of patients who still needed a companion to carry out the examination. These three things are very relevant because most children are old enough to know the purpose of the examination, and a small number still show unwilling behavior to carry out the examination, so family assistance and fixation equipment are needed. According to(Jannah, 2015), this period is called pre-school age, which has characteristics of being stubborn and trying to master and control the environment. However, what can be utilized in the approach process is that they have learned the basics of social behavior, getting to know other people and their work in this phase. They also have a high curiosity; therefore, they need to approach the explanation in simple language and look pleasant about the purpose of the examination.

Jurnal Eduhealth
Volume 15, Number 03, 2024, DOI 10.54209/eduhealth.v15i03
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

Children aged over six years to twelve years

In this age group, children can communicate and understand well what is happening around them, so the level of cooperation is high at 85.71%, and the need for fixation equipment is low at 9.52%. However, the need for patient companions remains large (23.81%). This may be because patients need assurance of safety and comfort with the presence of their family nearby during the examination. Even though he is old enough, the anxiety and anxiety about what will be done to him is still there, so we still have to respect the patient's wishes by giving his family permission to remain in the examination room. However, the principle of radiation protection remains a must. Efforts are made to minimize the dose received by the patient's family by providing radiation protection and placing them at a long distance with an X-ray Unit if possible. As with the previous age group, radiographers must not equate a child's psychological condition when undergoing an examination. Communication with patients and families is needed to prepare appropriate examinations. This approach requires patience, talking, and building a good relationship with the child. Explaining instructions to children in a way they can understand is critical in developing trust and cooperation (Lampignano & Kendrick, 2017). According to Fuady (2022) ; Fadlin (2021); Jannah (2015), this phase is called the intellectual phase, where noble children can understand to accept certain attitudes and behavior demands from other people under certain conditions apart from children have an awareness of their "self." Moreover, begin to learn the ability to control yourself. This makes it easier for the radiographer to condition the child to undergo the examination because the child already understands the purpose of the examination.

Children aged over twelve years to nineteen years

In this age group, patients tend to carry out examinations like adult patients. The unique thing is that the data obtained showed that 5.71% of patients were uncooperative, and 17.14% of patients needed family assistance during the examination. However, not all patients needed a fixation device. This is closely related to the psychological development phase, where children begin to make efforts to become more independent (Ahmad Fuady, 2022). These figures show that whether a patient is cooperative does not entirely depend on age but can be caused by other things, such as the patient's condition. We need to remember that patients come with various health problems, which may affect their psychological condition. Pain due to the disease and fear can affect the patient's readiness to undergo an examination (Bhushan Thukral, 2015). As in the previous age group, the presence of a patient companion in the examination room must be adequately studied to consider the benefits and risks of harm due to radiation exposure.

Increasing age shows an increase in the percentage of cooperative patients. This also applies to using fixation devices and the family's need to accompany the examination. Special attention must be given to pediatric patients under three years old because this shows a high level of patient uncooperation, a need for fixation, and the presence of the family as the patient's companion. Radiographers need time and patience to assess these three things. Keep in mind that every child has different emotional and psychological development. Communication with the patient's parents or family is constructive in saving time; the radiographer can ask for information about the child's readiness to undergo examination. The

radiographer also needs to assess the appropriate role of the patient's family. If possible, the family is asked to leave the examination room. However, if this is not possible, the radiographer must minimize exposure to the patient's companions by positioning and using radiation protection equipment. Although the figures show a clear trend regarding age and level of cooperation, fixation devices, and patient companions, a small percentage is different and unique in this regard. This shows that every child is unique and cannot be equated. This is because children's development is influenced by many things, including biological, cognitive, and emotional factors, which are different for each individual (Izzaty, 2017). Good communication with patients and parents supports the examination's success; a radiographer needs therapeutic communication skills(Idayati et al., 2020). All of these exposures require an approach to each patient to determine the appropriate needs to ensure the success of the examination and maintain image quality.

CONCLUSION

As the age of pediatric patients increases, the level of cooperation in undergoing examinations increases, and the need for fixation equipment and patient companions decreases. Most patients aged three years and under are uncooperative and require fixation devices and patient companions. However, a small number of patients can cooperate and do not need fixation devices and patient companions under three years of age. This shows that every pediatric patient is different; radiographers need an approach to assess these three things to support the success of radiographic examinations.

ACKNOWLEDGEMENT

We thank our family and all the Purwokerto radiology study program staff at Semarang Ministry of Health Polytechnic.

REFERENCE

Ahmad Fuady. (2022). Perkembangan psikologis anak : *Panduan Praktis Pengasuhan dan Pendidikan Anak dari Sudut Pandang Psikologo* (I. Ghoirishah & B. L. Yoseanto, Eds.; 1st ed.). PT. Human Persona Indonesia.

Baron, B. M., Joslin, S., & Kim, J. S. (2016). *Enhancing the Imaging Experience for Pediatric Patients*.

Bhushan Thukral, B. (2015). *Problems and preferences in pediatric imaging*. https://doi.org/10.4103/0971-3026.169466

Brown, Z., Perry, M., Wozniak, A. W., & Cappello, T. (2021). *Decreasing Radiation Exposure in Pediatric Clavicle and Metatarsal Fractures*: A QI Initiative. Journal of Pediatric Orthopaedics, 41(3), 177–181. https://doi.org/10.1097/BPO.0000000000001725

Fadlin, I. (2021). *Perkembangan Psikologis Anak Usia Pendidikan Dasar; Emosional, Kognitif, dan Psikomotor*. Jurnal Al-Fikrah, 10(2), 180–192. https://doi.org/10.54621/JIAF.V10I2.161

Idayati, I., Vellyana, D., & Sondang, S. (2020). *Pengetahuan Dengan Kemampuan Komunikasi Terapeutik Perawat Pada Pasien Anak Usia Prasekolah*. Jurnal Kesehatan, 9(2).

Izzaty, R. E. (2017). Prilaku Anak Pra Sekolah (1st ed.). PT. Alex Media Komputindo.

Jannah, M. (2015). *Tugas-Tugas Perkembangan Pada Usia Kanak-Kanak*. Gender Equality: International Journal of Child and Gender Studies, 1(2), 87–98. https://doi.org/10.22373/EQUALITY.V1I2.792

Lampignano, J., & Kendrick, L. E. (2017). *Bontrager's Handbook of Radiographic Positioning and Techniques* (9th ed.). Elsevier Inc.

Linder, J. M. B. (2017). *Safety Considerations in Immobilizing Pediatric Clients for Radiographic Procedures*. Journal of Radiology Nursing, 36(1), 55–58. https://doi.org/10.1016/j.jradnu.2016.04.021

Long, B. W., Smith, B. J., Rollins, J. H., & Curtis, T. (2016). *Merrill's Atlas Of Radiographic Positioning & Procedures (Thirteenth Edition)*. Elsevier, Mosby.

Nelson, T. R. (2014). *Practical Strategies to Reduce Pediatric CT Radiation Dose*. Journal of the American College of Radiology, 11(3), 292–299. https://doi.org/10.1016/j.jacr.2013.10.011

Rimsza, M. E., Hotaling, C. A. J., Keown, M. E., Marcin, J. P., Moskowitz, W. B., Sigrest, T. D., & Simon, H. K. (2015). *Definition of a pediatrician*. Pediatrics, 135(4), 780–781. https://doi.org/10.1542/peds.2015-0056

Salleh, M., Shamsuddin, N., Supar, S., Sharip, H., & Yamin, L. (2022). *Assessment Of Radiographers' Knowledge And Attitude Towards Image Quality And Radiation Dose Optimization In Pediatric Digital Radiography*. Journal of Medical Imaging and Radiation Sciences, 53(4), S38–S39. https://doi.org/10.1016/j.jmir.2022.10.126

Sriyanto, A., & Sutrisno, S. (2022). *Perkembangan dan Ciri-Ciri Perkembangan pada Anak Usia Dini*. Jurnal Fascho : Jurnal Penelitian Dan Pendidikan Anak Usia Dini, 1(2).