ORIGINAL ARTICLE

Radiographers' Knowledge versus Practice about Methods of Attracting Pediatric Corporation in Medical Imaging Departments

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Abstract

Purpose: The goal of this study was to evaluate radiographers' knowledge and practice on different methods for attracting pediatrics' cooperation in medical imaging departments for achieving high-quality images without repetition and minimum absorbed dose.

Materials and Methods: For conducting this descriptive-analytical study, a researcher-made questionnaire, including two parts of radiographer knowledge and practical methods, which were applied as a routine in the departments for reduction of pediatrics' stress, was distributed between radiographers.

Results: The results revealed that verbal justification was declared as the most efficient way of informing the parents as compared to the other methods. Establishing verbal communication is the most practical way of engaging the child. Meanwhile, application of immobilization tools, justification of parents by the admission staff, playing music was used, respectively.

Conclusion: Considering these findings, there is a need to equip the imaging department with the appropriate facilities, perform continuous training of radiographers to increase the practice of different techniques and tools.

Keywords: Radiation Protection; Collaboration; Stress Reduction.

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1. Introduction

Children are more sensitive to radiation than adults and under the same exposure condition, their organs receive a more effective dose of radiation than an adult. Due to longer life expectancy and higher sensitivity of tissue, the likelihood of secondary effects caused by ionizing radiation is increased in pediatrics [1].

Children and adults have the same probability of being exposed to diagnostic X-ray imaging. Since children are more vulnerable, imaging dose reduction according to As Low As Reasonably Achievable (ALARA) rule is of high importance [2].

To attain the ALARA goals, maximum possible information should be extracted from a non-repetitive radiographic imaging process [3, 4]. Various factors can lead to the repetition of imaging, including false radiation factors, improper radiography technique, defective imaging devices, faulty emergence and fixation process, and lack of patient's collaboration. Considering the high sensitivity of children to harmful effects of radiation, special precautions should be taken in imaging them [5].

In a diagnostic radiology department, the first and biggest challenge that a radiographer faces in pediatric imaging is the lack of cooperation and fear. Hospital environment, unknown equipment, and an encounter with strange people (medical personnel) can cause stress, fear, anxiety, and hopelessness among pediatrics [6]. Anxiety and stress may cause short-term effects, including the cancellation of radiology and postponement of the test, the use of sedatives and medical complications, as well as long-term complications like post-traumatic stress syndrome and prevention of health care in children [7].

Several practical, behavioral, and environmental measures have been proposed and taken to reduce stress in pediatrics. Such methods included music streaming, parental involvement, and verbal communication, use of immobilization tools, rewarding and space staining [8, 9].

To better encourage a child to cooperate , the exterior environment of the radiology department needs to be made more childlike by taking the following measures: painting the walls with colorful characters [3], using children's painting books in the waiting room, collecting animals, and building a small zoo or aquarium in waiting areas, developing large playgrounds/toys, displaying educational films on various subjects for children, wearing colorful clothing instead of white and formal attire for staff, which can alleviate stress among all patients in the hospital [10].

Parents play a crucial role by providing for comfort and relaxation of the child and, if necessary, helping the child remain motionless during the process [11]. Parents may lack precise knowledge of radiology imaging tests and feel anxious about their child's tests; therefore, before the use of accessories such as immobilizers, it is necessary to explain the cause of preventing unwanted movement and repeating the procedure as well as the usage of this special tool during the radiographic procedure [12].

In this study, radiographers' knowledge on different methods for attracting pediatrics' cooperation and reducing their stress was evaluated. The application extent of these methods was also practically evaluated in various departments. Due to the important role of parental awareness in mitigating pediatrics' stress and increasing their readiness for imaging, the knowledge of radiographers about different approaches of parental informing as well as the practical application of these methods in imaging departments were studied.

2. Materials and Methods

For conducting this descriptive-analytical study, a researcher-made questionnaire was distributed between radiographers. The sample included 30 radiographers working in five specialized pediatric hospitals. Data were collected by the use of a researcher-made questionnaire which mainly had two parts: Questions on technologist knowledge and practical methods which were used as a routine in imaging departments.

The questionnaire items included the impact of various factors such as music streaming, parental presence, verbal communication, use of immobilization tools, rewarding and space coloring, and toys in attracting pediatric cooperation, immobilization tools and techniques, methods and tools for informing parents and children (including child and parent educational brochures, child and parent books, educational video and animation, verbal communication) and the effectiveness of each method. Since children under 8 years old have no life experience and they may show a different reaction to a situation the questions were divided for two groups of pediatric ages (Under and above 8 years old).

Moreover, to assess the performance and awareness of radiographers, questions were made about the type of immobilizer in the department and the training to work with pediatrics.

Finally, the answers were divided into five groups: trivial (score 1), low (score 2), average (score 3), good (score 4), very high (score 5).

The validity and reliability of the questionnaire were evaluated by groups of experts. Data were analyzed using SPSS 26 software by descriptive statistics, Friedman and Wilcoxon tests. $P < 0.05$ was considered as the minimal value for statistical significance.

3. Results

Thirty radiographers participated in this study, including 4 men (13%) and 26 women (87%) with work experience of 1-30 years (average of 8 years).

3.1. Ways to Attract Child's Cooperation

Figure 1 shows the effectiveness of approaches to attract pediatrics' cooperation under 8 years old. From the view points of radiographers, the most efficient methods were parental presence and rewarding (94%) and verbal communication (92%). Staining the space and using toys (90%), immobilization (82%), and finally music play (61.2%) were the other effective methods for pediatric stress reduction, respectively. Friedman statistical analysis was employed to rank the most useful method of engaging children under 8 years of age. Considering that the chi-square value was below the error level of 0.05, the radiographers had a different ranking of child engaging methods. Comparison of ratings shows that the most effective way from radiographers' view was parental presence, verbal communication, painting the space, and using toys. The mean ratings of these methods were 4.70 ± 0.05, 4.60 ± 0.03, and 4.5 ± 0.04, respectively.

As shown in Figure 2, in the range of over 8 years of age, radiographer ranked the verbal communication as the most effective way to engage the child (94%).

Parental presence (86%), staining space and using toys (82%), rewarding (80%), music streaming (72%), and immobilizer devices (68%) were effective to attract cooperation, respectively. Friedman statistical analysis ($P < 0.05$) for ranking the most beneficial methods of child's cooperation who are over 8 years old, showed that the most effective methods were verbal communication with the patient, parental presence, space coloring and toy use with average ratings of 4.70 ± 0.01, 4.30 ± 0.04, and 4.12 ± 0.03, respectively.

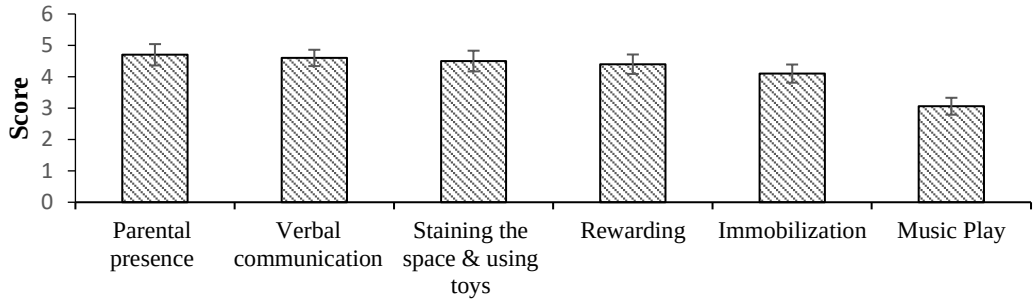

Figure 1. Radiographers' knowledge about the approaches to engage pediatrics under 8 years

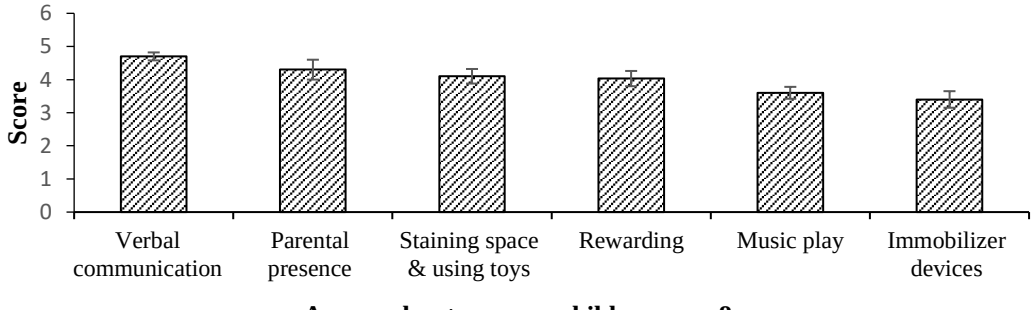

Figure 2. Radiographers' knowledge about approaches to engage pediatric over 8 years

Examination of the responses provided by the radiographer in Figure 3 showed that the most commonly used method in the department to attract pediatrics' cooperation were verbal communication with the pediatric and parental justification with 100% frequency. The following approaches were reported by the radiographer in descending order: staining of space and providing toys (56.6%), rewarding (46.6%), immobilization tools (43.3%), parental justification by admission staff (10%), and music streaming (3.3%).

Sandbag was the most practical device for pediatric fixation. 15 out of 30 participants in the study (50%) had used sandbags to immobilize the limb under imaging and in some cases they used strips and some handmade fixators. 2 (6%) of technologists had been trained on techniques of working with and imaging of pediatrics.

3.2. Justification of Parents, Pediatrics, and their Informing for Imaging

A review of the scores obtained from questions concerning the effectiveness of methods under study to inform parents showed the following practical and efficient methods according to radiographers' knowledge (Figure 4): speaking and communicating verbally (96%), educational animation and brochures for parents (76%), instructive films and parents' books (74%), children's books (62%) and finally informative booklets for children (54%). Friedman statistical analysis was employed to rank the most effective approach to raise parental awareness. Given that the obtained chi-square value is below the error level of 0.05, the radiographer had different ratings of the effectiveness of various methods for informing parents. Comparison of rankings indicated that the most functional methods are verbal communication, instructive brochures for parents and parents' books with mean ratings of 4.8 ± 0.01, 3.8 ± 0.02, and 3.8 ± 0.05, respectively.

Figure 5 shows that the most practically used method by the radiographer in the imaging department was to justify and inform parents verbally (100%), followed by parental instructive brochure (20%) and children's and parents' books (3.3%).

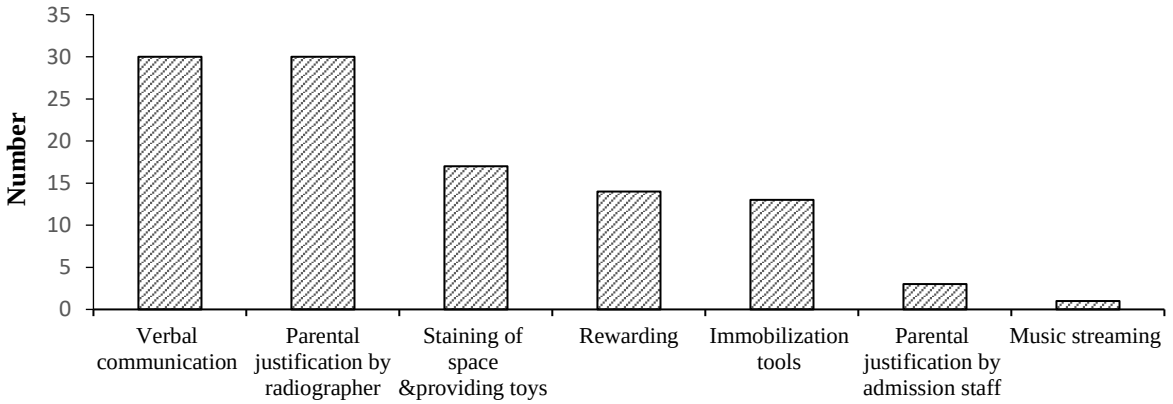

Figure 3. Methods which were practically used in the imaging departments to attract pediatrics' cooperation (age is not considered)

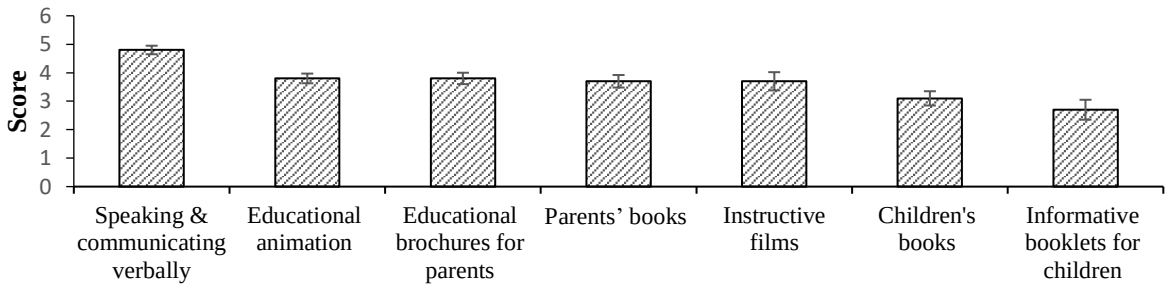

Figure 4. Radiographer knowledge about the effectiveness of parents informing methods

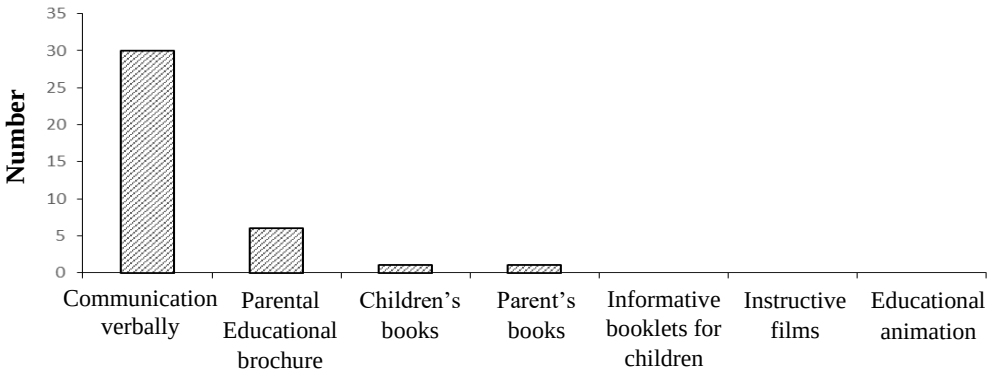

Figure 5. Practical methods used in the imaging departments to justify and inform parents

4. Discussion

The results of this research showed that the most effective way of attracting the participation of pediatrics over 8 years old and the second most useful method in under 8 years of age is verbal communication. It was also identified as the most practical means in the department to inform and notify the parents. These findings were predictable given that verbal communication is the least expensive and most accessible technique among these methods. Patients and their parents form a broad spectrum of age, literacy, awareness, and social skills that demand different approaches to specific cases. The outcome of this study showed that only 6% of experts had received the necessary education in this respect and only having work experience or child were among the factors contributing to better verbal communication. In 2019, Segers *et al.* suggested that an understandable interaction with children could be beneficial for them and reduce parental stress [13]. In 1996, Marino and Kohen highlighted how a small change in word choice with children could cause emotional changes in patient behaviors during medical examinations [14].

The findings of this study indicated that parental presence was the first and second most effective factor in children under and over 8 years of age in reducing stress and increasing cooperation during imaging, respectively. In previous studies in other countries, children sought the presence of parents, especially mothers, to cope with fear when faced with unfamiliar methods [15]. A key point to consider concerning the presence of parents is the observance of safeguards as well as increased awareness of them from the imaging process.

Although visiting the imaging department is stressful in most children and adolescents, the architecture of the department has been recognized as a contributor to stress relief or exacerbation. Poor design of therapeutic environments can adversely affect the health and well-being of the child, which is why more attention is now being paid to planning optimal environments for unwell pediatrics [16, 17]. In the present study, space staining was identified as the third most applicable method for attracting child cooperation and reducing stress in children under and over 8 years of age.

The proposed rewarding system is based on psychological theories, according to which one's actions are guided primarily by intentions. Thus, an individual's action can be appropriately motivated and participants can have stimuli to receive rewards through good behavior [18]. The findings of this study showed that technologists' knowledge ranked establishment of a post-imaging bonus system as the first method for pediatrics under 8 years and the fourth most effective method for over 8 years old. It has also been introduced as the third practical method to alleviate stress and increase child cooperation during imaging.

Music therapy is a supportive approach that is used to treat many physical and psychological problems in people of different ages. Hartling *et al.* [19] showed that children exhibited a significant distraction when listening to music compared to similar patients who did not listen to music while subjected to invasive interventions (e.g. injection of syringes). Although the results of various studies [20, 21] underline the effectiveness of musical methods in decreasing children's stress levels, the findings of this study showed that music has the least application (3.3%) to calm children in the imaging departments under study. Furthermore,

according to the statistical analysis, experts believe that music was not an efficient tool to attract pediatrics' cooperation (under or over 8 years of age).

Informing parents can play a critical role in mitigating stress and increasing child cooperation. A study by McEwen *et al.* [22] revealed that parental anxiety decreased significantly in the intervention group who had watched an educational video on pediatric anesthesia. Landier *et al.* [23] in their investigation presenting a handout on pediatric anesthesia to parents stated that their leaflet caused anxiety to < 56% of parents and that 92% of parents were satisfied by receiving the leaflet. Apart from establishing verbal communication, the findings of present study showed a sharp difference between what seems to be important to radiographers and what is practically done in this regard. Radiographers found the following effective strategies: verbal communication with the child (96%), educational animation and booklets for parents (76%), educational films and parents' books (74%), children's book (62%), and finally educational booklets for children (54%); however, establishing verbal communication (100%) followed by parental educational brochures (20%), and children's and parents' books (3.3%) were reported in practice. It seems they are well aware of the importance of different tools to inform parents, but the reason why these tools are not applied should be further studied.

In addition to controlling children's stress, achieving the right position is a critical challenge for the imaging specialist in newborn and child radiography because the infant is unable to cooperate and does not understand simple verbal guidance [24]. The challenge in such a critical context stems from the fact that the radiographer's task is to ensure patient safety, minimize patient mobility and discomfort. One way of enforcing the limitation or immobilizing the pediatric is to use commercially available tools that are employed to limit motor artifacts caused by non-cooperation of children or infants [25]. Appropriate equipment and facilities are needed for children ranging from premature babies to adolescents of adult size, which are often different from those used for adults and include Pigg-O-Stat body immobilizer, foot immobilizer, and Velcro compression strips that are useful for restraining the baby during abdominal and chest imaging. Papoose boards and Velcro compression band may also be used to immobilize or restrict infants and children for radiographic examination. The chest-immobilization device known as "baby-fx" is most commonly used for X-ray chest radiography in pediatric radiology and could also be employed for head and spine imaging [26]. In the present study, 50% of radiographers only used sandbags as a means of immobilization and others either did not have the device or were reluctant to apply it, which may reflect lack of awareness of radiographers about the variety of immobilization tools and lack of attention due to the tendency to increase the imaging speed. Nevertheless, since the main purpose of immobilization equipment is to restrict unwanted movement that reduces imaging time, avoids unnecessary duplication of radiographic procedures and thus decreases the dose, it is necessary to train radiographers and equip child imaging units with various immobilizing instruments to be used if necessary.

5. Conclusion

The results of this study showed that although the technologists have a relatively high awareness of different approaches of engaging pediatrics and parents, verbal communication and verbal justification of children and parents are the most practical ones in this regard. It is essential to take advantage of appropriate and specific means to raise awareness and train the radiographers on how to take protective measures based on the characteristics of pediatric and parents as well as the type of imaging. To do this, there is a need for continuous training of radiographers to raise their awareness, equipping the imaging department with appropriate and adequate facilities, enacting proper regulations to comfort children, and avoiding duplication of imaging due to radiation protection issues.

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