Revue des Sciences de la Santé (Rev. Sci. Sant.)
ISSN: 3078-6959 (Online); 3078-8226 (Print)
Volume-3 Issue-1, 2024

Reduction of excessive exposure by raising practitioners to the principles of patient radiation protection in pediatric practice at the Ngaliema clinic in Kinshasa, Democratic Republic of the Congo

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RESUME:
Il s'agit d'un partage d'expérience de nos initiatives et efforts visant à réduire les doses d'exposition inutiles grâce à l'utilisation de moyens didactiques de sensibilisation des praticiens aux bonnes pratiques de radio pédiatrie. Notre approche a d'abord été d'évaluer l'état des pratiques pour identifier les insuffisances de non-conformité aux normes; Nous avons ensuite sensibilisé les praticiens à la nécessité de respecter les principes de radioprotection des patients, en particulier des patients pédiatriques, avant de pouvoir enfin mesurer l'impact à moyen terme de nos actions correctives. Les résultats obtenus au stade de l'évaluation font principalement référence à une absence de culture de radioprotection caractérisée par l'absence de toute approche organisationnelle de celle-ci. En outre, un faible niveau de conscience et de connaissance de la nécessité de respecter les principes fondamentaux de la radioprotection. Les observations à mi-parcours faites au stade de la prise de conscience ont mis en évidence une nette amélioration en termes de connaissances, de prise de conscience et de changement d'attitudes, ce qui a permis une évolution positive des pratiques.
Mots clés : facteurs prédisposant, comportement suicidaire, jeunes.

ABSTRACT :
This is a sharing of experience of our initiatives and efforts to reduce the doses of unnecessary exposures through the use of didactic means of awareness of practitioners to good radiopediatric practices.
Our approach was to first assess the state of practices to identify the inadequacies of non-compliance with standards; then, we proceeded to sensitize practitioners on the need to respect the principles of radiation protection of patients, especially, pediatric patients before finally, to measure the impact mid-term of our corrective actions.
The results obtained at the evaluation stage mainly referred to an absence of radiation protection culture characterized by the absence of any organizational approach to it. Also, a low level of awareness and knowledge about the need to observe the main principles of radiation protection. The mid-term observations made at the awareness stage noted a marked improvement in terms of knowledge, awareness and change of attitudes that allowed for a positive evolution of practices.
Keywords : predisposing factors, suicidal behavior, young people.

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I. INTRODUCTION

Radiology plays a decisive diagnostic role in the therapeutic management of many cases in pediatrics. However, performing a radiological examination in children implies a rigorous approach to the practice that must be thought and adapted by all stakeholders from the justification of the act to its realization. Among the measures to be taken are those relating to radiation protection aimed at ensuring the protection of the child against the possible harmful effects of x-rays. As a reminder, in case of strong, prolonged or repeated exposure to ionizing radiation, genetic mutations may appear as well as cancers. Especially in children or the risk of induction of effects is related to the importance of growing young cells.
The first concern of any practitioner must be not to do a radiating examination if it is not essential; the second imperative is to put in the conditions to pass the exam from the first acquisition.
Examination rationale is therefore the first principle of radiation protection: it is the operation establishing the net benefit of an examination in relation to the potential harm related to exposure to ionizing radiation. The communication of the elements of the file, the discussion with the correspondents and the knowledge of the possible substitutions must make consider all the alternatives to the irradiation.
Optimization of practices is the second principle of radiation protection when an examination is necessary (justified): it is the operation to obtain the desired diagnostic information using the lowest exposure dose possible (ALARA: As Low As Reasonably Achievable"). All factors must be taken into consideration to minimize the risk of exposure and to provide good quality snapshots.
In addition to poor health policy, under-equipment and quality assurance problems, organizational deficiencies, the absence of specific regulations, the low level of professional commitment of practitioners and the declining, these competences constitute major obstacles to the respect of the principles of radioprotection.

II. MATERIAL AND METHODS

II.1. Medical Imaging and Pediatric Services at Ngaliema Clinic

Ngaliema Clinic is a public institution with the status of the National Secondary Reference Hospital. The Ngaliema Clinic offers general and specialized care services.

DOI: *https://doi.org/10.71004/rss.024.v3.i1.29*
Journal Website: *www.rss-istm.net*
Reçu le 26/08/2024 ; Révisé le 26/09/2024 ; Accepté le 30/10/2024

Publié Par : Institut Supérieur des Techniques Médicales de Kinshasa (ISTM/KIN)

Figure 1 (a and b): Imaging Service Digital Radiography System with Direct Acquisition (DR) System

a. The rationale for the acts involved in ensuring that claims were made on the basis of the balance between the benefits of an examination, its relevance and the risks involved.
b. The optimization of the practices in which it was necessary to judge the practices so that the delivered dose is as low as possible is to be realized by:

   - An adaptation of the device acquisition parameters
   - A reduction of the field of exploration to the strict necessary
   - An adaptation of the number of radiographic incidences to the examination in question

c. The knowledge and the culture of radioprotection: it was to evaluate here the knowledge of the practitioners with regard to radioprotection of the patients:

   - When did their training (initial or continuous) go back to radiation protection?
   - What do they know about and retain the main principles of radioprotection of patients, in particular, that of pediatric patients;
   - Do they always have in mind the concept of X-ray protection during their services, especially when it comes to pediatric patients?

At the sensitization stage, we used some didactic means that made it possible to raise awareness of the place and importance of radiation protection through:

- Individual and group interviews and exchanges of different categories of practitioners;

Figure 2: Awareness by group on the necessary corrective actions

- Provision of small videos on the effects of ionizing radiation and notions of radiation protection as well as awareness of compliance with standards;
- Making and displaying awareness leaflets with some slides of documents and videos already viewed.

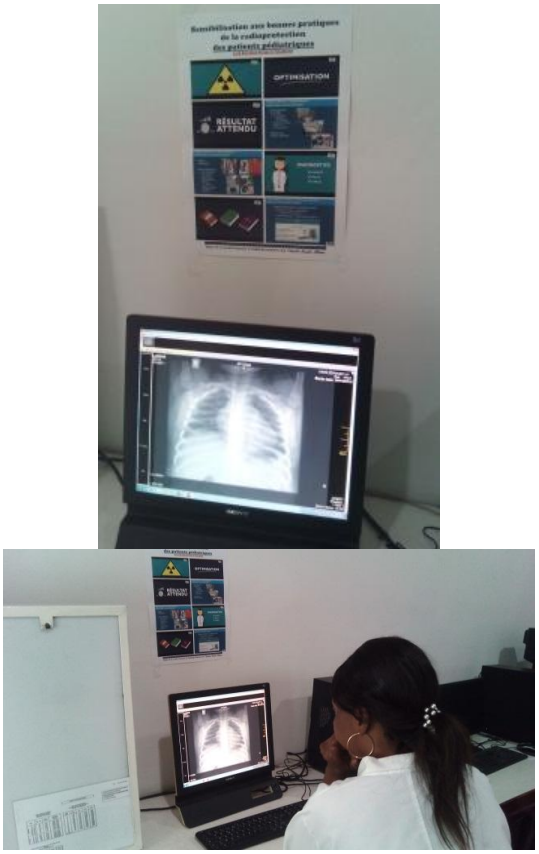

Figure 3: (a & b): Workplace Awareness Posters for Radiologists

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Figure 4: (a & b): Awareness posters on the consultation table for pediatric physicians

III. RESULTS

III.1. At the practice evaluation stage

Compared to the justification, we first observed that several examinations were long or permanently in the medical imaging department without the results being recovered. Hence the question of knowing what was the use of exposing some children if we do not exploit the results of the explorations carried out on them. All these exposures may be considered unnecessary and therefore unjustified.

Figure 5: accumulation of the results not recovered

With respect to optimization, prior to awareness raising, we found a tendency for technical neglect and ignorance of good practices characterized by:

- The high number of repetitions of expositions on the same patient;
- Frequent irradiations without limitation of the volumes or regions to be examined;
- Unjustified multiplication of incidences for inappropriate reasons;
- Lack of special approach to the management of pediatric patients.

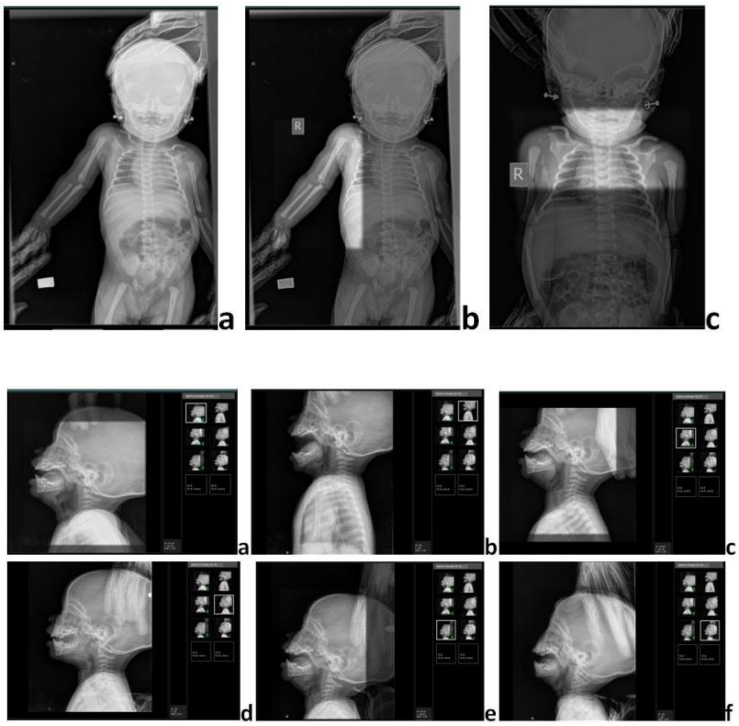

Figure 6: Illustration of repetition and lack of limitation of the region to be examined

III.2. After the awareness stage

After awareness of good practices and initiation to corrective actions we observed:

- A decrease in inappropriate and unjustified requests for X-ray examinations in children;
- A control of the parameters of acquisition and management of patients by the use of all means contributing to avoid unnecessary irradiation and the success of examinations;

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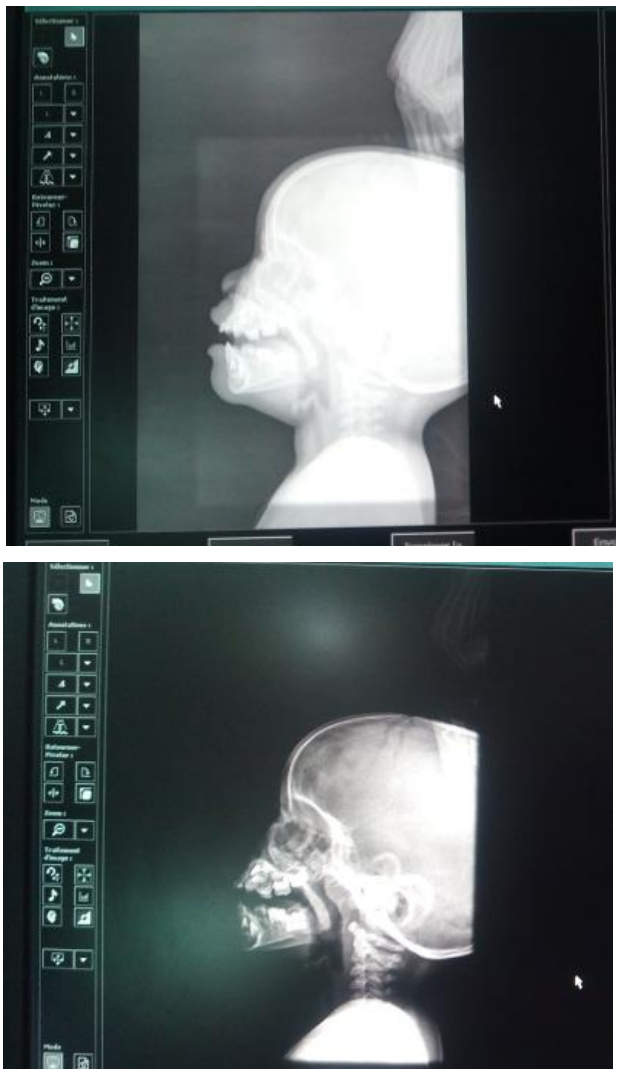

Figure 7: Illustration of the results of the application of some good practices: Effort in exam success (a) and Ability to correct the contrast without having to repeat the exam (b&c)

- Radiographers' awareness of the need to apply the principles of optimizing practice and taking into account peculiarities concerning children.

IV. DISCUSSION

The summary observations presented in this sharing of experience are the mid-term results of our approach to improve pediatric radiological practices. Therefore, the quantified results of these observations can only be available after statistical processing in preparation. However, the trends observed in the positive evolution of practitioners' attitudes are promising.
In addition, the reasons for setting up the "Diagnostic Reference Levels in Radiology (NRD)" systems, following the dispersion of doses among different practitioners and services, underlined the importance of awareness of practitioners. Also, through our presentation on the ethical and deontological approach of the quality insurance, a presentation that won us the prize for innovation at the 10th French-speaking Congress of Medical Imaging and Radiotherapy DAKAR 2018, we have demonstrated, among other things, the need for the training and awareness of practitioners for effective implementation of any quality approach.
Sensitization and corrective actions contribute (probably) to dose reduction by avoiding the repetition of additional exposures, reducing exposure volumes and protecting unaffected sensitive organs.

V. CONCLUSION

A good radiographic technique in the child implies an adaptation of the technical procedure, the apparatus, the choice of the parameters and the possible accessories. But it is especially the approach and the general philosophy of the realization of the examinations which must be thought and adapted, according to the pediatric applications, as well in the chief of the radiologic doctors as in that of the radiographers. The ultimate goal is to achieve an optimal compromise combining an image quality that meets the medical problem and minimal aggression of the child, especially with regard to the dose of radiation received (ALARA principle- As Low As Reasonably Achievable).
Our approach was to first assess the state of practices to identify the inadequacies of non-compliance with standards; then, we proceeded to sensitize practitioners on the need to respect the principles of radiation protection of patients, especially, pediatric patients before finally, to measure the impact mid-term of our corrective actions.
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