JOURNAL OF RADIOGRAPHY AND RADIATION SCIENCES

EXPLORING MACHINE LEARNING POTENTIALS TO IMPROVE MEDICAL IMAGING SERVICES OF CHILDREN AND ADOLESCENTS IN LOW-RESOURCE SETTINGS

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https://doi.org/10.48153/jrrs/2024/QRGN1013

Article info
First Submission
18th June 2024

Revised
5th July 2024

Accepted
12th July 2024

ABSTRACT

The existing body of evidence in literature raises concerns over the growing overuse, underuse, and misuse of medical imaging. These trends worsen among children and adolescents because they present a unique individuality within the medical imaging landscape. Overuse of medical imaging implies giving patients care that they do not need, underuse means failing to provide patients the correct care that they need while, misuse of medical imaging implies making errors that can harm people's health. Giving the correct medical imaging service and the right radiation dose to children and adolescents transcends the boundaries of radiation protection and good medical practice. Several challenges persist in providing quality medical imaging services, radiation protection, and safety for children and adolescents in low-resource settings, especially in Sub-Sahara Africa. However, these challenges are surmountable if machine learning potentials are used to improve medical imaging services for children and adolescents in low-resource settings. Digital literacy and data readiness are indispensable requirements to achieve the desired objective because a machine learning model is only as good as its training data set.

Keywords: Artificial intelligence, radiation safety, radiation protection, children.

There is growing evidence of overuse, underuse, and misuse of medicine and medical imaging globally [1,2,3,4]. These trends worsen among children and adolescents because they present a unique individuality

within the medical imaging landscape [5]. Overuse of medical imaging implies giving patients care that they do not need, underuse means failing to provide patients the right care that they need while, misuse of medical imaging implies making errors that can harm people's health [6]. The idea of giving the right medical imaging service and the right radiation dose transcends the boundaries of radiation protection and good medical practice in children and adolescents [6]. Several challenges persist in the areas of providing quality medical imaging services, radiation protection, and safety for children and adolescents in low-resource settings, especially in Sub-Sahara Africa [7]. The apparent lack of clinical imaging guidelines or referral guidelines to reduce the wasteful use of radiation on children as well as sub-optimal radiation doses to children due to the lack of standardized radiation dose optimization strategies for children are key issues of concern despite rapid technological advances in medical imaging [5,7]. Available empirical data shows that only 6 % of children and adolescents are covered for diagnostic reference levels (DRLs) in Low and Middle-Income Countries including Africa [8].

A study on linguistic paradigms embeddable in machine learning models on the subject of overuse, underuse, and misuse of medical imaging with a focus on its radiation protection implications among children and adolescents in low-resource settings could be explored. Vocal child and adolescent age groups who can converse with the medical imaging professional could be fielded. The common understandable language in the context of the environment could be used in the training data set.

The common language to be used is for diagnostic purposes, other inputs derived from the reaction of children and adolescents who are patients with ailments could also be included to inform the machine learning model. An in-depth review of current scientific literature on the subject of overuse, underuse, and misuse of medical imaging can be used to verify and validate the model in addition to common linguistic content. The model will be tuned to underscore the importance of linguistic inputs as a correlation and regression parameter. Also, Genetic Algorithm inspired operators such as mutation, crossover, and selection could be used for optimal dosage solutions.

Linguistic paradigms embedded in machine learning can reveal the overuse, underuse, and misuse of medical imaging among children and adolescents. Results from studies of this nature can be used for management, decision-making, and training of medical imaging professionals for radiation protection and improved patient care in child and adolescent imaging in a low-resource setting. However, this recommended study may not be used as a black box as it will be biased to contextual and cultural interpretation.

The machine learning model in this context enables easy inference to evidence of overuse, underuse, and misuse of medical imaging services among children and adolescents who are often a neglected category of patients [7]. This will strengthen radiation protection and safety measures and reduce overuse, underuse, and misuse in the linguistic context. There will be a need for more vocabulary to feed the model for more accurate inference in every context of its application. To achieve the desired objective, digital literacy and data readiness are indispensable requirements because the machine learning model is only as good as its training data. Thus, a need for capacity building in this regard among health professionals in medical imaging.

Competing interests:

The authors declare no competing financial or non-financial interests.

Author contributions:

All authors conceived the idea of this manuscript as this was intended to be an international conference paper that was interrupted by the COVID-19 pandemic. The paper comprises medical imaging experts (Dr. Chigozie Nwobi, and Dr. Geofery Luntsi), radiation safety expert (Dr. Flavious B. Nkubli) and machine learning experts (Dr. Abasiama Akpan and Mr. Jeremiah Mabazor) whose contributions made it a whole. The corresponding author, Dr. Flavious was responsible for drafting the manuscript, the final draft was reviewed and edited by Jeremiah and Abasiama and final approval for submission of the manuscript was given by all authors.

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