

## EDITORIAL

# Perspectives on managing non-communicable diseases in pediatric health using artificial intelligence

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Artificial intelligence (AI) involves computers replicating human-like cognitive abilities through various algorithms such as machine learning, deep learning, natural language processing, support vector machines, and artificial neural networks.<sup>1</sup> These algorithms empower systems to predict responses, guiding the computer on what to expect.<sup>1</sup> AI offers numerous benefits, including reliability, cost-effectiveness, improved problem-solving capabilities, and reduced data loss,<sup>1,2</sup> with applications across diverse sectors like business, engineering, and healthcare.<sup>2</sup> In healthcare, AI holds significant promise across various areas, including clinical decision-making, drug development, and disease forecasting, particularly in critical care areas like non-communicable diseases (NCDs).<sup>3</sup> NCDs are chronic conditions not transmitted between individuals, characterized by prolonged duration, slow progression, and often incurable nature, posing substantial burdens on individuals, communities, and economies.<sup>4</sup> The global prevalence of NCDs is increasing, contributing significantly to mortality and overall disease burden as highlighted by the Centers for Disease Control and Prevention.<sup>5</sup> Globally, NCDs are responsible for 70% of deaths, with 86%

of premature NCDs-related mortality occurring in low- and middle-income countries. Pediatric populations are particularly vulnerable to the rising incidence of NCDs, with over 2.1 billion children and adolescents affected globally.<sup>6</sup> The primary health concerns affecting individuals in this age bracket include cardiovascular diseases, cancers, chronic respiratory conditions, diabetes, mental health issues, and injuries, whether congenital or acquired. Tackling the rising occurrence of NCDs is paramount to curbing their impact on global health and overall well-being. Focusing on the pediatric population is essential for implementing life-long strategies aimed at preventing and managing these ailments, offering a significant opportunity to uphold health rights. NCDs encompass a spectrum of disorders influenced by genetic, physiological, environmental, and behavioral factors, such as physical inactivity, unhealthy dietary habits, obesity, and the use of tobacco or alcohol.<sup>6</sup> The interplay of these factors contributes to NCDs, with origins often traced back to conditions and behaviors established during early life, childhood and adolescence.<sup>7</sup> The risk of developing such diseases evolves dynamically over one's lifetime, with the cumulative effect of various risk factors playing

a pivotal role in disease onset. AI's ability to analyze complex datasets has proven invaluable in predicting outcomes and advancing personalized treatments.<sup>3</sup> AI facilitates the development of predictive models to identify children at risk of early NCDs, enabling tailored preventive strategies and enhancing treatment efficiency while minimizing side effects.<sup>8,9</sup> These models provide insights into gene-environment interactions and modifiable factors, promoting healthy behaviors and disease management.<sup>8</sup> This can facilitate the adoption of preventive measures and disease management strategies, often emphasizing the promotion of healthy habits such as maintaining a nutritious diet, participating in regular exercise, avoiding tobacco exposure, and receiving regular vaccinations.<sup>3</sup> Early preventive actions can alter the course of a disease and improve its outcome. Information technology, AI and machine learning enable the creation of knowledge-based systems for automatically monitoring pediatric patients with chronic diseases,<sup>7</sup> enhancing patient engagement, education, and remote monitoring ultimately leading to improved health outcomes.<sup>2, 9</sup> Wearable sensors, analyzed using AI algorithms, offer insights into health status, facilitating early detection of health issues and personalized healthcare delivery.<sup>10</sup> AI-powered wearable sensors can continuously monitor individuals with chronic conditions such as diabetes, heart disease, and asthma, alerting healthcare professionals to any changes in their health status.<sup>10</sup> This enables swift interventions and reduces the need for frequent hospital visits. AI-driven chatbots and virtual assistants can additionally provide patients with personalized insights, assistance, and guidance on managing their condition. Ensuring timely diagnosis and effective management of NCDs in children is essential for preventing complications and fostering optimal growth, development, and overall well-being.<sup>11</sup> Early detection of NCDs is crucial for optimal outcomes, and AI-driven diagnostic tools aid clinicians in identifying diseases in their early stages, improving treatment effectiveness.<sup>12</sup> AI algorithms can examine medical images like X-rays, magnetic resonance imaging (MRIs), and computed tomography (CT) scans and multi-modal data (genomics, demographic, clinical

and phenotypic) to identify initial indications of chronic illnesses such as cancer, cardiovascular diseases, and neurodegenerative conditions. AI is also utilized in expediting drug discovery and development, thereby reducing time and costs.<sup>13</sup> Advancements in big data and AI will foster the development of virtual patient representations, known as digital twins (DTs), adapted for well-being DTs or in a state of illness for personalized diagnosis, treatment planning, and care in NCDs.<sup>14, 15</sup> However, challenges such as data privacy, regulatory oversight, algorithmic bias, and high costs need addressing.<sup>15</sup> Despite these challenges, the rapid advancement of AI offers opportunities to transform pediatric NCDs management, enhancing patient involvement, treatment compliance, and overall health outcomes. AI systems will not replace human clinicians on a large scale, but rather will enhance their efforts to care for patients.<sup>2</sup> It is crucial to educate healthcare professionals on AI's role in clinical practice to facilitate successful integration into pediatric care.

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#### *Conflicts of interest*

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

#### *Authors' contributions*

Gianvincenzo Zuccotti and Valeria Calcaterra have given substantial contributions to the study conception and design, to the data collection and analysis, and to the manuscript draft and critical revision for important intellectual content. Both authors read and approved the final version of the manuscript.

#### *History*

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