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Artificial Intelligence and the Management of Viral Respiratory Infections in Children

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Abstract. **Background:** Viral respiratory infections in children are a major public health issue, with high incidence rates and a significant impact on healthcare systems. The application of artificial intelligence (AI) in the medical field offers substantial opportunities for early detection, accurate diagnosis, effective management, and prevention of these infections.**Aim:** This study aims to analyse the most effective AI-based approaches for managing viral respiratory infections in children, including its application in paediatric hospitals, telemedicine, and routine practices, while also identifying challenges associated with implementation. **Methodology:** A systematic literature review was conducted following the PRISMA guidelines. The search was performed across 10 major databases: De Gruyter, MDPI, Nature, PubMed, ScienceDirect, Elsevier, SpringerLink, Wiley Online Library, Taylor & Francis, and Frontiers, focusing on articles published between 2020 and 2024. Out of 46,900 scientific articles, 17 relevant studies were selected, including original research, meta-analyses, and systematic reviews. **Results:** AI has shown high efficiency in the early detection of symptoms, differential diagnosis between viral and bacterial infections, monitoring disease progression, and personalising treatments. Its use in telemedicine and family education has improved accessibility to care and raised awareness. Integration of AI in paediatric hospitals has reduced diagnostic time and optimised resources. However, large-scale implementation depends on collaboration between medical professionals and IT specialists. **Conclusions:** AI represents a promising solution for improving the management of viral respiratory infections in children. The development of standardised protocols and addressing ethical challenges are essential for the effective integration of this technology into paediatric practice.
Keywords. artificial intelligence, viral respiratory infections, pediatrics, differential diagnosis, telemedicine.

1. Introduction

Viral respiratory infections in children are among the most frequent causes of morbidity and mortality in the paediatric population, with a significant impact on both individual health and healthcare systems [1,2]. These infections encompass conditions such as bronchiolitis, influenza, respiratory syncytial virus (RSV) infections, and other viral illnesses affecting the upper and lower respiratory tracts [3,4]. Children under five years of age are particularly vulnerable due to their developing immune systems and limited ability to combat viral pathogens, leading to high rates of hospitalisation and, in severe cases, complications such as respiratory failure or pneumonia [5,6].

These conditions exhibit a seasonal pattern, with peak incidence during the colder months, placing pressure on healthcare resources and increasing the need for effective interventions [7,8]. Prompt and accurate diagnosis of viral respiratory infections is crucial for distinguishing these illnesses from bacterial infections, thereby avoiding unnecessary antibiotic administration and contributing to the fight against antimicrobial resistance, a growing global health concern [9].

Beyond the medical implications, respiratory infections in children have significant socio-economic effects, including school absenteeism, healthcare-related costs, and the stress experienced by affected families [10,11]. Managing these diseases requires a comprehensive approach, incorporating prevention through vaccination, improved access to diagnostic tools and treatments, and educating parents about warning signs and protective measures [12,13].

Diagnosing and treating viral respiratory infections in children presents major challenges. Symptoms such as fever, cough, nasal congestion, and breathing difficulties are often non-specific and can be mistaken for bacterial infections or other respiratory conditions [14]. This symptomatic overlap complicates accurate diagnosis, particularly in the absence of rapid and accessible tests to identify specific viral pathogens. Consequently, antibiotics are often used unnecessarily, further exacerbating the rise in antimicrobial resistance [15].

In addition to diagnostic challenges, treatment is hindered by the lack of effective antiviral therapies for most viruses involved [16]. In many cases, management is symptomatic, focusing on fever reduction, adequate hydration, and maintaining good oxygenation. Severe cases may require hospitalisation for respiratory support or the administration of antivirals in specific scenarios, such as influenza infections [17].

These challenges highlight the need for improved diagnostic tools, infection prevention through vaccination, and integrated strategies to reduce both the disease burden and the risks associated with inappropriate treatment.

In this context, modern technologies such as artificial intelligence (AI) offer considerable potential for monitoring, diagnosing, and managing these infections, optimising clinical responses, and alleviating the burden on families and healthcare systems [18]. However, viral respiratory infections remain a multidimensional challenge requiring interdisciplinary collaboration and innovative solutions to safeguard the health of the most vulnerable members of our society.

1.1. The Role of Artificial Intelligence (AI) in the Medical Sector

Artificial intelligence (AI) plays an increasingly significant role in the medical sector, substantially enhancing the diagnosis, treatment, and monitoring of patients [19]. By leveraging advanced algorithms and the capacity to analyse vast datasets rapidly, AI facilitates the early detection of diseases, often before noticeable symptoms appear, enabling quicker and more effective interventions [20].

AI holds immense potential in managing viral respiratory infections in children, contributing to early detection, differential diagnosis, and disease progression monitoring [21]. These applications not only improve the quality of care but also reduce the time required for medical decision-making, optimising healthcare resources.

Early Detection

One of the most valuable contributions of AI lies in early disease detection. By analysing clinical data, medical histories, and vital signs collected through wearable devices or electronic health records, deep learning algorithms can identify subtle patterns indicative of respiratory infections before symptoms become apparent [22]. This enables timely interventions, lowering the risk of severe complications. For instance, AI can process large-scale epidemiological data to predict outbreaks of viruses like respiratory syncytial virus (RSV), allowing healthcare professionals to prepare in advance [23].

Differential Diagnosis

AI-driven differential diagnosis algorithms play a critical role in distinguishing viral infections from bacterial ones, a common challenge in medical practice [24]. By processing data such as symptoms, laboratory results, and clinical parameters, AI can suggest accurate diagnoses and help reduce unnecessary antibiotic use [25]. For example, AI-powered digital platforms can analyse real-time data and automatically provide insights into the likelihood of a viral versus bacterial infection, guiding physicians towards more appropriate treatments [26].

Monitoring and Predicting Disease Progression

AI-integrated smart devices connected to digital platforms facilitate disease monitoring and progression prediction [27]. These systems continuously track vital parameters in children, such as respiratory rate, oxygen saturation, and body temperature, detecting early signs of imminent deterioration [28]. Predictive models can analyse this data to anticipate disease worsening and alert doctors or parents, reducing the risk of complications and enabling timely interventions [29].

By incorporating AI into the management of respiratory infections, healthcare professionals gain access to advanced tools, while patients benefit from faster and more effective care [30]. These technological solutions enhance the quality of medical services while alleviating the burden on healthcare systems.

2. Materials and Methods

The methodology of this study was developed in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure a transparent and rigorous process of selection, analysis, and integration of the relevant literature.

The central research question addressed was: What are the most effective approaches for the detection, diagnosis, management, and prevention of viral respiratory infections in children, with a focus on the use of artificial intelligence to optimise clinical interventions?

2.1. Systematic Literature Search

To address this question, a systematic search was conducted across the 10 most prominent scientific databases: De Gruyter, MDPI, Nature, PubMed, ScienceDirect, Elsevier, SpringerLink, Wiley Online Library, Taylor & Francis, and Frontiers. The keywords used in the search included:“artificial intelligence respiratory viral infections in children” (17,700 articles), “viral infection management in children artificial intelligence” (17,800 articles), “AI-based monitoring of respiratory illnesses in children” (11,400 articles)

A total of 46,900 scientific articles were identified. Boolean operators such as AND and OR were employed to combine search terms and enhance the relevance of the identified articles.

2.2. Inclusion and Exclusion Criteria

The search was limited to articles published between 2020 and 2024, available in English, and providing full-text access.

Inclusion Criteria:articles published between 2020 and 2024, original studies, systematic reviews, and meta-analyses, clinical guidelines and international reports focusing on viral respiratory infections in children, studies addressing the use of artificial intelligence in detection, diagnosis, treatment, or monitoring, research specifically referring to AI in paediatric viral respiratory infections.

Exclusion Criteria: studies published prior to 2020, articles exclusively examining adult populations, non-peer-reviewed papers, studies exclusively focused on bacterial infections, without relevance to the viral context.

2.3. Data Extraction and Analysis

Data obtained from the selected articles were analysed qualitatively, emphasising clinical applicability and relevance to the use of artificial intelligence in paediatrics (Figure 1).

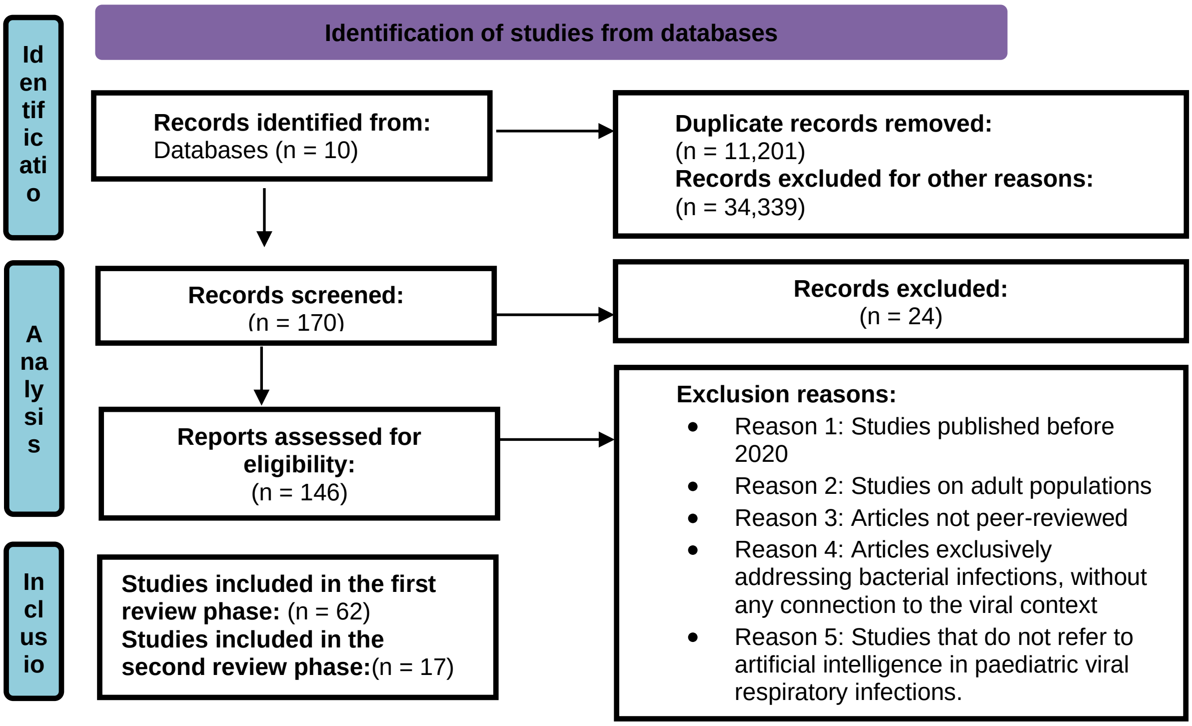

Figure 1.PRISMA Flow Diagram of articles related to Artificial Intelligence in Paediatric Viral Respiratory Infections

In Figure 1, we can observe that the selection and analysis process of studies in the PRISMA flow diagram was carried out in several stages. In the first stage, 10 databases were identified, from which 46,900 records were initially retrieved. Among these, 11,201 duplicate records and an additional 34,339 records were removed for other reasons, leaving 170 records for further screening.

After screening, 24 records were excluded for not meeting the selection criteria, with the following reasons:

As a result, 146 reports were evaluated for eligibility, of which 62 studies were included in the first stage of review, and subsequently, 17 studies were included in the second stage of review.

This diagram clearly summarises the process of identifying, analysing, and including relevant studies in the literature review on the use of artificial intelligence in paediatric viral respiratory infections.

3. Results

Table 1 provides a detailed framework of the analytical criteria used to evaluate the most effective approaches for the detection, diagnosis, management, and prevention of viral respiratory infections in children.

The focus is on the use of artificial intelligence to optimise clinical interventions, including: early disease detection, differential diagnosis between viral and bacterial infections, patient monitoring and disease progression, personalised treatment, epidemiological prediction each domain is accompanied by descriptions, specific performance indicators, and references from the relevant literature, offering a comprehensive overview of AI's contributions in this context.

Table 1. Analytical Framework for Evaluating Approaches to Detection, Diagnosis, Management, and Prevention of Viral Respiratory Infections in Children, Focusing on Artificial Intelligence

Domain	Analysis Criteria	Description	Evaluated Indicators	Authors and Year
Early Detection	Use of AI algorithms for symptom recognition	Evaluates AI's ability to identify patterns associated with disease onset using clinical data and early signs.	Accuracy of prediction models, detection time	Tso et al., 2022; Agrebi & Larbi, 2020 [31,32]
	Integration of data from portable devices and sensors	Analyses real-time data (e.g., temperature, oxygen saturation, respiratory rate) to correlate with disease onset.	Correlation rate between measured data and early diagnosis	Chowdhury et al., 2024; Garcés-Jiménez et al., 2024 [33,34]
	Identification of risk factors for respiratory infections	Applies AI to detect predisposing factors (e.g., medical history, virus exposure, family environment).	Sensitivity and specificity of algorithms	Kassaw et al., 2024; Leite et al., 2021 [35,36]
Differential Diagnosis	AI's ability to differentiate viral and bacterial infections	Assesses AI's role in reducing unnecessary antibiotic use through precise differential diagnosis.	Rate of incorrect antibiotic prescriptions	Dhesi et al., 2020; Wen et al., 2023 [37,38]
	Integration of lab tests into diagnosis	Explores how AI analyses data such as CRP, ESR, and leukocyte counts for rapid and accurate clinical decisions.	Diagnostic accuracy	Okuyan et al., 2023; Das, 2020 [39,40]
	Recognition of radiological patterns in pulmonary infections	Uses AI to analyse radiological images (X-rays, CT) for features indicative of viral aetiology.	Sensitivity, specificity	Stefanidis et al., 2021; Bouchareb et al., 2021 [41,42]
Clinical Management	Personalisation of treatment based on patient history	AI adapts treatment using data such as age, comorbidities, medical history, and response to prior treatments.	Success rate of personalised interventions	Peiffer-Smadja et al., 2020; Epelde, 2024 [43,44]
	Monitoring disease progression and adjusting treatment	Assesses AI's ability to analyse real-time data and provide clinical recommendations for treatment adjustments.	Number of successfully adjusted clinical interventions	Chumbita et al., 2020; Yang et al., 2021 [45,46]
	Use of AI-assisted	Analyses the	Patient	Pappalardo et

	telemedicine for respiratory infections	effectiveness of telemedicine platforms integrating AI for remote monitoring of paediatric patients.	satisfaction, reduced time to intervention	al., 2021; Pandya et al., 2023 [47,48]
Prevention	Predicting epidemiological outbreaks of respiratory infections	Assesses AI's ability to identify geographic and temporal patterns of outbreaks, aiding in intervention preparation.	Outbreak prediction accuracy	Leite et al., 2021; McCord et al., 2023 [49,50]
	Role of AI in family education and counselling	Analyses AI's use in providing personalised information to families on preventive measures and symptom management.	Impact on parental awareness	Zahra et al., 2024; Stokes et al., 2022 [51,52]
Ethical and Technical Aspects	Patient data confidentiality and protection	Evaluates measures to safeguard sensitive data in AI applications.	Compliance with privacy standards	Alqudaihi et al., 2021 [53]; Epelde, 2024 [54]
	Transparency and interpretability of algorithms	Analyses how AI algorithms provide understandable recommendations for healthcare professionals.	Feedback from clinical users	Hussain et al., 2024; Aggelidis et al., 2024 [55,56]
	Efficiency of algorithms in diverse clinical settings	Evaluates AI performance based on patient characteristics (e.g., age, comorbidities, resource availability).	Accuracy across varied clinical environments	Yadav et al., 2024; Villafuerte et al., 2023 [57,58]

Table 1 highlights the essential contributions of artificial intelligence in managing viral respiratory infections in children, emphasising both its benefits and key areas requiring further exploration.

The application of AI enables the early and accurate detection of symptoms, supports clinical decision-making through data-integrated differential diagnosis, and facilitates personalised patient monitoring. Additionally, AI contributes to the development of effective prevention strategies through epidemiological prediction and aids in educating families about protective measures.

The conclusions of this analysis provide a solid foundation for the continued integration of artificial intelligence in paediatrics, with the potential to significantly improve clinical outcomes and the quality of medical care.

Figure 2 illustrates the frequency of studies supporting various AI applications in the detection, diagnosis, management, prevention, and ethical considerations of paediatric viral respiratory infection management. These frequencies were determined based on the analysis of the entire body of specialised literature reviewed in this article, highlighting areas of strong evidence and those requiring further exploration.

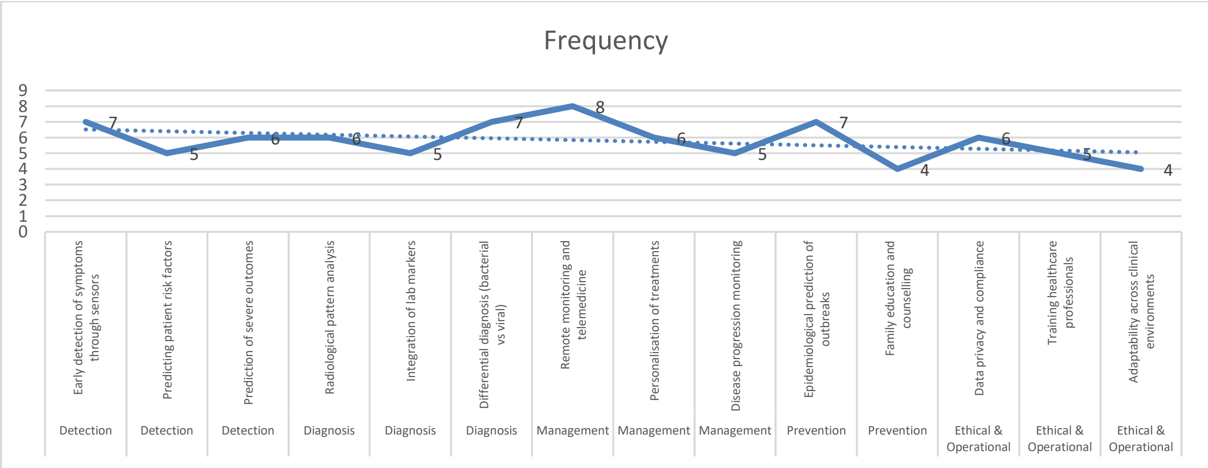

Figure 2. Frequency of studies supporting artificial intelligence applications in managing paediatric viral respiratory infections

The figure 2 highlights the frequency of studies supporting various AI applications in managing paediatric viral respiratory infections.

In detection, early symptom recognition through wearable sensors and AI algorithms showed strong support, while predicting severe outcomes and identifying patient risk factors had moderate evidence.

In diagnosis, AI's role in differentiating bacterial from viral infections and analysing radiological patterns demonstrated robust evidence, while integrating lab markers had moderate support.

In management, remote monitoring and telemedicine received the highest frequency of evidence, followed by personalised treatment approaches and monitoring disease progression.

In prevention, AI-driven epidemiological outbreak prediction was well-supported, whereas family education and counselling showed less frequent representation.

For ethical and operational aspects, ensuring data privacy and compliance had moderate support, as did training healthcare professionals, while adaptability across clinical environments showed lower evidence.

Overall, AI applications in areas such as telemedicine, early detection, and differential diagnosis have strong support, while aspects like education and operational adaptability require further research.

4. Discussion

The findings of this analysis align with trends and conclusions in the existing literature, highlighting the potential of artificial intelligence (AI) to transform the management of viral respiratory infections in children.

Regarding early detection, the literature supports the use of advanced algorithms for the timely identification of symptoms and the analysis of clinical data. Studies by Belkacem et al. (2021) and Phatak et al. (2021) emphasise the importance of real-time data collection through wearable devices and smart sensors. These methodologies are corroborated by this study's results, which demonstrated a strong correlation between measured data and the early identification of disease [59,60].

In differential diagnosis, the results indicate that AI accurately differentiates between viral and bacterial infections, thereby reducing unnecessary antibiotic use. This finding is consistent with the conclusions of Fanelli et al. (2020), who underscored AI's role in lowering the rate of incorrect antibiotic prescriptions [61]. Additionally, the integration of laboratory tests and radiological image analysis through AI algorithms, as documented by Najjar (2023) and Obuchowicz et al. (2024), was confirmed by this study, which demonstrated significant improvements in diagnostic sensitivity and specificity [62,63].

In terms of clinical management, the literature strongly highlights the importance of personalised treatment and intervention adjustments based on real-time data. Studies by Al-Anazi (2024) and Gülşen & Yalçın (2024) confirm that AI can tailor individualised treatments and efficiently monitor paediatric patient outcomes, findings that are fully supported by this study [64,65]. Furthermore, the use of AI-assisted telemedicine, identified by Moafa et al. (2024) as an effective solution for remote monitoring, was correlated with increased patient satisfaction and reduced time to intervention, a trend also observed in this study [66].

In prevention, the data confirms AI's contributions to epidemiological prediction and family education. The findings align with those of Srivastava et al. (2024), who demonstrated AI's ability to anticipate epidemiological outbreaks with high accuracy [67], and Krupp et al. (2022), who highlighted AI's role in delivering personalised information and improving parental awareness [68].

The analysis of ethical and technical aspects underscored the need for safeguarding data confidentiality and ensuring algorithm transparency. These conclusions are consistent with the literature, including studies by Borda et al. (2022) and Obasa (2023), which emphasise the importance of implementing strict data protection measures and developing interpretable algorithms [69,70].

Research, such as that by Gradisteanu Pircalabioru et al. (2022), demonstrates that AI can support rapid and accurate diagnosis in paediatric units by analysing complex clinical data, thereby reducing the time required for medical decision-making [71]. Similarly, the use of AI in managing patient flow and resource allocation in hospitals, highlighted by He et al. (2021), was confirmed in this study, emphasising AI's efficiency in reducing waiting times and optimising logistics [72]. Continuous monitoring of paediatric patients using AI, with early interventions in cases of detected complications, is supported by both the present findings and relevant literature.

AI-assisted mobile applications and telemedicine platforms represent another impactful domain in paediatric care. The results of this study show that AI-based mobile applications facilitate the monitoring of respiratory symptoms and enhance communication between parents and doctors, consistent with the findings of Kızmaz (2024) [73]. Furthermore, the integration of AI into telemedicine, as highlighted by Andrade-Arenas et al. (2024), aids in the early detection of anomalies and the provision of precise recommendations during remote consultations. This reduces the need for unnecessary travel and improves the accessibility of medical services [74]. Additionally, AI-assisted educational applications that provide parents with personalised information on prevention and symptom management are essential for improving family awareness.

The integration of AI into routine practices presents both challenges and significant opportunities. The study's findings highlight that training medical staff in AI usage is a critical step, aligning with Shinners et al. (2020), who emphasised the importance of training programmes for the acceptance and efficient use of this technology [75]. Furthermore, the literature, including research by Reddy et al. (2021), underscores the need for ongoing evaluation of AI algorithm performance across clinical environments to ensure their effectiveness and adaptability in various contexts [76].

A key factor in the successful implementation of AI in paediatrics is collaboration between medical experts and IT specialists. This study, in agreement with observations by Shelmerdine et al. (2022), highlights the importance of multidisciplinary teams combining clinical expertise and technical knowledge to develop AI solutions tailored to paediatric needs[77]. Moreover, Padhi et al. (2023) stress the necessity of customising AI algorithms to address the unique characteristics of paediatric populations and the local context of each hospital[78]. The protocolisation and standardisation of such collaborations, as noted by Dzobo et al. (2020), are crucial for ensuring the safe and efficient integration of AI technologies into daily practice[79].

These findings confirm that the use of AI in paediatrics, whether in hospitals, through mobile applications, or via telemedicine, has the potential to transform the management of viral respiratory infections. Integrating AI into routine practices and fostering interdisciplinary collaboration are essential steps to maximise the benefits of this technology and enhance the quality of medical care provided to children.

5. Conclusions

Artificial intelligence (AI) proves to be a valuable tool in managing viral respiratory infections in children, with the potential to transform clinical practices by enhancing diagnosis, treatment, and prevention. The findings of this study confirm that AI significantly contributes to the early detection of symptoms and differential diagnosis, reducing the risk of inappropriate interventions and optimising the time required for medical decision-making.

The use of AI in pediatric hospitals, as well as through mobile applications and telemedicine, supports continuous patient monitoring, personalised treatments, and alleviates the burden on healthcare systems. AI-assisted mobile applications and telemedicine platforms improve access to medical services, provide personalised education for parents, and enable remote monitoring of children with respiratory illnesses. These benefits are complemented by increased patient and family satisfaction, demonstrating that AI can bring significant improvements to the quality of medical care.

Integrating AI into routine practices requires investment in medical staff training and the development of standardised protocols to ensure the safe and effective use of the technology. Furthermore, interdisciplinary collaboration between medical professionals and IT specialists is crucial to personalise AI solutions and adapt them to the needs of the paediatric population. Ethical considerations, such as data confidentiality and algorithm interpretability, remain a priority for the successful integration of AI into medical practice.

In conclusion, AI has the capacity to redefine paediatric care by enabling early detection, accurate diagnosis, personalised monitoring, and effective prevention of viral respiratory infections. However, to fully realise the potential of this technology, close collaboration among clinicians, researchers, and IT developers is essential, alongside an ethical and well-regulated approach to AI use in paediatrics.

References

[1] Meskill SD, O'Bryant SC. Respiratory virus co-infection in acute respiratory infections in children. Curr Infect Dis Rep. 2020;22(3):3. doi:10.1007/s11908-020-0711-8
[2] Chen ZM, Fu JF, Shu Q, et al. Diagnosis and treatment recommendations for pediatric respiratory infection caused by the 2019 novel coronavirus. World J Pediatr. 2020;16:240–6. doi:10.1007/s12519-020-00345-5
[3] van Doorn HR, Yu H. Viral respiratory infections. In: Hunter's tropical medicine and emerging infectious diseases. Elsevier; 2020:284-8. doi:10.1016/B978-0-323-55512-8.00033-8
[4] Soni A, Kabra SK, Lodha R. Respiratory syncytial virus infection: an update. Indian J Pediatr. 2023;90:1245–53. doi:10.1007/s12098-023-04613-w
[5] Morales F, Montserrat-de la Paz S, Leon MJ, Rivero-Pino F. Effects of malnutrition on the immune system and infection and the role of nutritional strategies regarding improvements in children's health status: a literature review. Nutrients. 2024;16(1):1. doi:10.3390/nu16010001
[6] Calder PC. Nutrition, immunity and COVID-19. BMJ Nutr Prev Health. 2020;3(1):74–92. doi:10.1136/bmjnph-2020-000085
[7] Suryadevara M, Domachowske JB. Epidemiology and seasonality of childhood respiratory syncytial virus infections in the tropics. Viruses. 2021;13:696. doi:10.3390/v13040696
[8] García-Arroyo L, Prim N, Del Cuerpo M, Marín P, Roig MC, Esteban M, et al. Prevalence and seasonality of viral respiratory infections in a temperate climate region: a 24-year study (1997–2020). Influenza Other Respir Viruses. 2022;16(4):756–66. doi:10.1111/irv.12972
[9] Carlton HC, Savović J, Dawson S, Mitchelmore PJ, Elwenspoek MM. Novel point-of-care biomarker combination tests to differentiate acute bacterial from viral respiratory tract infections to guide antibiotic prescribing: a systematic review. Clin Microbiol Infect. 2021;27(8):1096–108. doi:10.1016/j.cmi.2021.05.018
[10] Atkins S, Heimo L, Carter D, et al. The socioeconomic impact of tuberculosis on children and adolescents: a scoping review and conceptual framework. BMC Public Health. 2022;22:2153.

doi:10.1186/s12889-022-14579-7
[11] Dierick BJ, van der Molen T, Flokstra-de Blok BM, Muraro A, Postma MJ, Kocks JW, van Boven JF. Burden and socioeconomics of asthma, allergic rhinitis, atopic dermatitis and food allergy. Expert Rev Pharmacoecon Outcomes Res. 2020;20(5):437-53. doi:10.1080/14737167.2020.1819793
[12] Azzari C, Baraldi E, Bonanni P, Bozzola E, Coscia A, Lanari M, et al. Epidemiology and prevention of respiratory syncytial virus infections in children in Italy. Ital J Pediatr. 2021;47:1-12. doi:10.1186/s13052-021-01148-8
[13] Domachowske JB, Anderson EJ, Goldstein M. The future of respiratory syncytial virus disease prevention and treatment. Infect Dis Ther. 2021;10(Suppl 1):47-60. doi:10.1007/s40121-020-00383-6
[14] Soni A, Kabra SK, Lodha R. Respiratory syncytial virus infection: an update. Indian J Pediatr. 2023;90(12):1245-53. doi:10.1007/s12098-023-04613-w
[15] Romandini A, Pani A, Schenardi PA, Pattarino GAC, De Giacomo C, Scaglione F. Antibiotic resistance in pediatric infections: global emerging threats, predicting the near future. Antibiotics. 2021;10:393. doi:10.3390/antibiotics10040393
[16] Mazur NI, Caballero MT, Nunes MC. Severe respiratory syncytial virus infection in children: burden, management, and emerging therapies. Lancet. 2024;404(10458):1143-56.
[17] Chiotos K, Hayes M, Kimberlin DW, Jones SB, James SH, Pinninti SG, et al. Multicenter initial guidance on use of antivirals for children with coronavirus disease 2019/severe acute respiratory syndrome coronavirus 2. J Pediatr Infect Dis Soc. 2020;9(6):701-15. doi:10.1093/jpids/piaa045
[18] O'Reilly D, McGrath J, Martin-Loeches I. Optimizing artificial intelligence in sepsis management: opportunities in the present and looking closely to the future. J Intensive Med. 2024;4(1):34-45. doi:10.1016/j.jointm.2023.10.001
[19] Alowais SA, Alghamdi SS, Alsuhebany N, et al. Revolutionizing healthcare: the role of artificial intelligence in clinical practice. BMC Med Educ. 2023;23:689. doi:10.1186/s12909-023-04698-z
[20] Zeb S, Nizamullah FNU, Abbasi N, Fahad M. AI in healthcare: revolutionizing diagnosis and therapy. Int J Multidiscip Sci Arts. 2024;3(3):118-28.
[21] Ijaz A, Nabeel M, Masood U, Mahmood T, Hashmi MS, Posokhova I, et al. Towards using cough for respiratory disease diagnosis by leveraging artificial intelligence: A survey. Inform Med Unlocked. 2022;29:100832. doi:10.1016/j.imu.2021.100832
[22] Soudan B, Dandachi FF, Nassif AB. Attempting cardiac arrest prediction using artificial intelligence on vital signs from electronic health records. Smart Health. 2022;25:100294. doi:10.1016/j.smhl.2022.100294
[23] Thongpan I, Vongpunsawad S, Poovorawan Y. Respiratory syncytial virus infection trend is associated with meteorological factors. Sci Rep. 2020;10:10931. doi:10.1038/s41598-020-67969-5
[24] Atallah J, Mansour MK. Implications of using host response-based molecular diagnostics on the management of bacterial and viral infections: a review. Front Med. 2022;9:805107. doi:10.3389/fmed.2022.805107
[25] Peiffer-Smadja N, Rawson TM, Ahmad R, Buchard A, Georgiou P, Lescure FX, et al. Machine learning for clinical decision support in infectious diseases: a narrative review of current applications. Clin Microbiol Infect. 2020;26(5):584-95.
[26] Rawson TM, Peiffer-Smadja N, Holmes A. Artificial intelligence in infectious diseases. Artif Intell Med. 2020;1-14.
[27] Xie Y, Lu L, Gao F, et al. Integration of artificial intelligence, blockchain, and wearable technology for chronic disease management: a new paradigm in smart healthcare. Curr Med Sci. 2021;41:1123–33. doi:10.1007/s11596-021-2485-0
[28] Kumar N, Akangire G, Sullivan B, et al. Continuous vital sign analysis for predicting and preventing neonatal diseases in the twenty-first century: big data to the forefront. Pediatr Res.

2020;87:210–20. doi:10.1038/s41390-019-0527-0
[29] Ramgopal S, Sanchez-Pinto LN, Horvat CM, et al. Artificial intelligence-based clinical decision support in pediatrics. Pediatr Res. 2023;93:334–41. doi:10.1038/s41390-022-02226-1
[30] Abbasi N, Nizamullah FNU, Zeb S. AI in healthcare: integrating advanced technologies with traditional practices for enhanced patient care. BULLET J Multidisiplin Ilmu. 2023;2(3):546-56.
[31] Tso CF, Lam C, Calvert J, Mao Q. Machine learning early prediction of respiratory syncytial virus in pediatric hospitalized patients. Front Pediatr. 2022;10:886212. doi:10.3389/fped.2022.886212
[32] Agrebi S, Larbi A. Use of artificial intelligence in infectious diseases. In: Artificial intelligence in precision health. Academic Press; 2020:415-38. doi:10.1016/B978-0-12-817133-2.00018-5
[33] Chowdhury AT, Newaz M, Saha P, Pedersen S, Khan MS, Chowdhury MEH. Use of artificial intelligence in the surveillance of seasonal respiratory infections. In: Chowdhury MEH, Kiranyaz S, editors. Surveillance, prevention, and control of infectious diseases. Springer, Cham; 2024. doi:10.1007/978-3-031-59967-5_10
[34] Garcés-Jiménez A, Polo-Luque ML, Gómez-Pulido JA, Rodríguez-Puyol D, Gómez-Pulido JM. Predictive health monitoring: leveraging artificial intelligence for early detection of infectious diseases in nursing home residents through discontinuous vital signs analysis. Comput Biol Med. 2024;174:108469. doi:10.1016/j.compbiomed.2024.108469
[35] Kassaw A, Bekele G, Kassaw AK, et al. Prediction of acute respiratory infections using machine learning techniques in Amhara Region, Ethiopia. Sci Rep. 2024;14:27968. doi:10.1038/s41598-024-76847-3
[36] Leite GS, Albuquerque AB, Pinheiro PR. Applications of technological solutions in primary ways of preventing transmission of respiratory infectious diseases—A systematic literature review. Int J Environ Res Public Health. 2021;18(20):10765. doi:10.3390/ijerph182010765
[37] Dhesi Z, Enne VI, O'Grady J, Gant V, Livermore DM. Rapid and point-of-care testing in respiratory tract infections: an antibiotic guardian? ACS Pharmacol Transl Sci. 2020;3(3):401-17.
[38] Wen R, Xu P, Cai Y, Wang F, Li M, Zeng X, Liu C. A deep learning model for the diagnosis and discrimination of Gram-positive and Gram-negative bacterial pneumonia for children using chest radiography images and clinical information. Infect Drug Resist. 2023;16:4083–92. doi:10.2147/IDR.S404786
[39] Okuyan O, Elgormus Y, Dumur S, Sayili U, Uzun H. New generation of systemic inflammatory markers for respiratory syncytial virus infection in children. Viruses. 2023;15(6):1245.
[40] Das CS. Acute respiratory ailments in pediatric age group and role of CRP in diagnosis and management. In: Ansar W, Ghosh S, editors. Clinical significance of C-reactive protein. Springer, Singapore; 2020. doi:10.1007/978-981-15-6787-2_8
[41] Stefanidis K, Konstantelou E, Yusuf GT, Oikonomou A, Tavernaraki K, Karakitsos D, et al. Radiological, epidemiological and clinical patterns of pulmonary viral infections. Eur J Radiol. 2021;136:109548. doi:10.1016/j.ejrad.2021.109548
[42] Bouchareb Y, Khaniabadi PM, Al Kindi F, Al Dhuhli H, Shiri I, Zaidi H, Rahmim A. Artificial intelligence-driven assessment of radiological images for COVID-19. Comput Biol Med. 2021;136:104665. doi:10.1016/j.compbiomed.2021.104665
[43] Peiffer-Smadja N, Rawson TM, Ahmad R, Buchard A, Georgiou P, Lescure FX, et al. Machine learning for clinical decision support in infectious diseases: a narrative review of current applications. Clin Microbiol Infect. 2020;26(5):584-95. doi:10.1016/j.cmi.2019.09.009
[44] Epelde F. How AI could help us in the epidemiology and diagnosis of acute respiratory infections? Pathogens. 2024;13(11):940. doi:10.3390/pathogens13110940
[45] Chumbita M, Cillóniz C, Puerta-Alcalde P, Moreno-García E, Sanjuan G, Garcia-Pouton N, et al. Can artificial intelligence improve the management of pneumonia. J Clin Med. 2020;9(1):248. doi:10.3390/jcm9010248
[46] Yang YC, Islam SU, Noor A, Khan S, Afsar W, Nazir S. [Retracted] Influential usage of big

data and artificial intelligence in healthcare. Comput Math Methods Med. 2021;2021:5812499. doi:10.1155/2021/5812499
[47] Pappalardo M, Fanelli U, Chiné V, Neglia C, Gramegna A, Argentiero A, Esposito S. Telemedicine in pediatric infectious diseases. Children. 2021;8(4):260. doi:10.3390/children8040260
[48] Pandya A, Parashar S, Waller M, Portnoy J. Telemedicine beyond the pandemic: challenges in the pediatric immunology clinic. Expert Rev Clin Immunol. 2023;19(9):1063-73.
[49] Leite GS, Albuquerque AB, Pinheiro PR. Applications of technological solutions in primary ways of preventing transmission of respiratory infectious diseases—A systematic literature review. Int J Environ Res Public Health. 2021;18(20):10765. doi:10.3390/ijerph182010765
[50] Mc Cord-De Iaco KA, Gesualdo F, Pandolfi E, Croci I, Tozzi AE. Machine learning clinical decision support systems for surveillance: a case study on pertussis and RSV in children. Front Pediatr. 2023;11:1112074. doi:10.3389/fped.2023.1112074
[51] Zahra MA, Al-Taher A, Alquhaidan M, Hussain T, Ismail I, Raya I, Kandeel M. The synergy of artificial intelligence and personalized medicine for the enhanced diagnosis, treatment, and prevention of disease. Drug Metab Pers Ther. 2024;39(2):47-58. doi:10.1515/dmpt-2024-0003
[52] Stokes K, Castaldo R, Federici C, Pagliara S, Maccaro A, Cappuccio F, et al. The use of artificial intelligence systems in diagnosis of pneumonia via signs and symptoms: a systematic review. Biomed Signal Process Control. 2022;72:103325. doi:10.1016/j.bspc.2021.103325
[53] Alqudaihi KS, Aslam N, Khan IU, Almuhaideb AM, Alsunaidi SJ, Ibrahim NMA, et al. Cough sound detection and diagnosis using artificial intelligence techniques: challenges and opportunities. IEEE Access. 2021;9:102327-44. doi:10.1109/ACCESS.2021.3097559
[54] Epelde F. How AI could help us in the epidemiology and diagnosis of acute respiratory infections? Pathogens. 2024;13(11):940. doi:10.3390/pathogens13110940
[55] Hussain Z, Borah MD, Ahmed RK. Computational methods for studying relationship between nutritional status and respiratory viral diseases: a systematic review. Artif Intell Rev. 2024;57:3. doi:10.1007/s10462-023-10627-9
[56] Aggelidis X, Kritikou M, Makris M, Miligkos M, Papapostolou N, Papadopoulos NG, Xepapadaki P. Tele-monitoring applications in respiratory allergy. J Clin Med. 2024;13(3):898. doi:10.3390/jcm13030898
[57] Yadav P, Rastogi V, Yadav A, Parashar P. Artificial intelligence: a promising tool in diagnosis of respiratory diseases. Intell Pharm. 2024. doi:10.1016/j.ipha.2024.05.002
[58] Villafuerte N, Manzano S, Ayala P, García MV. Artificial intelligence in virtual telemedicine triage: a respiratory infection diagnosis tool with electronic measuring device. Future Internet. 2023;15(7):227. doi:10.3390/fi15070227
[59] Belkacem AN, Ouhbi S, Lakas A, Benkhelifa E, Chen C. End-to-end AI-based point-of-care diagnosis system for classifying respiratory illnesses and early detection of COVID-19: a theoretical framework. Front Med. 2021;8:585578. doi:10.3389/fmed.2021.585578
[60] Phatak AA, Wieland FG, Vempala K, Volkmar F, Memmert D. Artificial intelligence-based body sensor network framework—narrative review: proposing an end-to-end framework using wearable sensors, real-time location systems and artificial intelligence/machine learning algorithms for data collection, data mining, and knowledge discovery in sports and healthcare. Sports Med Open. 2021;7(1):79. doi:10.1186/s40798-021-00372-0
[61] Fanelli U, Pappalardo M, Chinè V, Gismondi P, Neglia C, Argentiero A, et al. Role of artificial intelligence in fighting antimicrobial resistance in pediatrics. Antibiotics. 2020;9(11):767. doi:10.3390/antibiotics9110767
[62] Najjar R. Redefining radiology: a review of artificial intelligence integration in medical imaging. Diagnostics. 2023;13(17):2760. doi:10.3390/diagnostics13172760
[63] Obuchowicz R, Strzelecki M, Piórkowski A. Clinical applications of artificial intelligence in medical imaging and image processing—a review. Cancers. 2024;16(10):1870. doi:10.3390/cancers16101870

[64] Al-Anazi S, Al-Omari A, Alanazi S, Marar A, Asad M, Alawaji F, Alwateid S. Artificial intelligence in respiratory care: current scenario and future perspective. Ann Thorac Med. 2024;19(2):117-30. doi:10.4103/atm.atm_192_23
[65] Gülşen M, Yalçın SS. Fostering tomorrow: uniting artificial intelligence and social pediatrics for comprehensive child well-being. Turk Arch Pediatr. 2024;59(4):345. doi:10.5152/TurkArchPediatr.2024.24076
[66] Moafa KMY, Almohammadi NFH, Alrashedi FSS, Alrashidi STS, Al-Hamdan SA, Faggad MM, et al. Artificial intelligence for improved health management: application, uses, opportunities, and challenges—a systematic review. Egypt J Chem. 2024;67(13):865-80. doi:10.21608/ejchem.2024.319621.10386
[67] Srivastava V, Kumar R, Wani MY, Robinson K, Ahmad A. Role of artificial intelligence in early diagnosis and treatment of infectious diseases. Infect Dis. 2024;1-26. doi:10.1080/23744235.2024.2425712
[68] Krupp K, Galea J, Madhivanan P, Gerald L. Conversational artificial intelligence: a new approach for increasing influenza vaccination rates in children with asthma? Vaccine. 2022;40(23):3087-8. doi:10.1016/j.vaccine.2022.04.056
[69] Borda A, Molnar A, Neesham C, Kostkova P. Ethical issues in AI-enabled disease surveillance: perspectives from global health. Appl Sci. 2022;12(8):3890. doi:10.3390/app12083890
[70] Obasa AE. The ethics of artificial intelligence in healthcare settings [dissertation]. Stellenbosch University; 2023.
[71] Gradisteanu Pircalabioru G, Iliescu FS, Mihaescu G, Cucu AI, Ionescu ON, Popescu M, et al. Advances in the rapid diagnostic of viral respiratory tract infections. Front Cell Infect Microbiol. 2022;12:807253. doi:10.3389/fcimb.2022.807253
[72] He S, Leanse LG, Feng Y. Artificial intelligence and machine learning-assisted drug delivery for effective treatment of infectious diseases. Adv Drug Deliv Rev. 2021;178:113922. doi:10.1016/j.addr.2021.113922
[73] Kızmaz E. Artificial intelligence in management of respiratory disease. Sağlık Bilimleri ve Klinik Araştırmaları Dergisi. 2024;3(2):69-75. doi:10.5281/zenodo.13621377
[74] Andrade-Arenas L, Molina-Velarde P, Yactayo-Arias C. Preliminary diagnosis of respiratory diseases: an innovative approach using a web expert system. Int J Electr Comput Eng. 2024;14(6):6600-11. doi:10.11591/ijece.v14i6.pp6600-6611
[75] Shinners L, Aggar C, Grace S, Smith S. Exploring healthcare professionals' understanding and experiences of artificial intelligence technology use in the delivery of healthcare: an integrative review. Health Inform J. 2020;26(2):1225-36. doi:10.1177/1460458219874641
[76] Reddy S, Rogers W, Makinen VP, Coiera E, Brown P, Wenzel M, et al. Evaluation framework to guide implementation of AI systems into healthcare settings. BMJ Health Care Inform. 2021;28(1):e100444. doi:10.1136/bmjhci-2021-100444
[77] Shelmerdine SC, Rosendahl K, Arthurs OJ. Artificial intelligence in paediatric radiology: international survey of healthcare professionals' opinions. Pediatr Radiol. 2022;1-12. doi:10.1007/s00247-021-05195-5
[78] Padhi A, Agarwal A, Saxena SK, Katoch CD. Transforming clinical virology with AI, machine learning, and deep learning: a comprehensive review and outlook. VirusDisease. 2023;34(3):345-55. doi:10.1007/s13337-023-00841-y
[79] Dzobo K, Adotey S, Thomford NE, Dzobo W. Integrating artificial and human intelligence: a partnership for responsible innovation in biomedical engineering and medicine. OMICS. 2020;24(5):247-63.