RECENT TRENDS AND INNOVATIONS IN PEDIATRIC CARE

Abstract

A symbiotic relationship exists between the two giants of humanity: Technology and health sciences. Newer advancements have led to paradigm changes in managing critically sick children. It is fascinating to observe how artificial intelligence (AI) has percolated into myriad aspects of healthcare delivery. Sophisticated medical devices offer a wide range of monitoring and applications available at bedside clinical practice. The advent of novel biomarkers has made diagnosing, predicting and managing many clinical conditions easier and drastically reduced the turnaround time compared to conventional methods. Evidence-based medicine has also led to exciting revelations and transformations in children's age-old practice of managing critical conditions.

With the above advances, the involvement of family members in clinical care and decision-making, as incorporated in the family-centered care models, has improved the clinical outcomes in children. The healthcare sector is poised for transformation on the shoulders of AI, genomics, and remote monitoring technology. Adopting novel opportunities & emerging technologies into our practice goes a long way in achieving optimal patient outcomes. However, one should also be aware of AI's legal, ethical and social implications on health care and ensure compliance with the existing regulatory framework. The paediatrics recent trends & innovations outlined in this chapter are only a glimpse into the ever-changing chasm of medical technologies from bench to bedside.

Keywords: Artificial Intelligence, Biomarkers, Diagnostics, Electronic Health Records, Genomics.

Authors

Dr. Nisha Toteja
Assistant Professor
Department of Pediatrics
All India Institute of Medical Sciences (AIIMS), Guwahati, India.
nishatoteja2000@yahoo.co.in

Dr. Rohit Sasidharan
Assistant Professor
Department of Neonatology
All India Institute of Medical Sciences (AIIMS), Guwahati, India.
rohitsasidharanaiims@gmail.com

I. INTRODUCTION

Modern-day paediatric practice comprises several challenges. Children are not miniature adults and have unique vulnerabilities that pose a significant dilemma for treating clinicians. Till a decade back, most of the evidence base was from the adult population with extrapolation to children. However, with the advent of newer devices with customizable features suited to different sizes and age-specific physiology, it is possible to generate high-quality research in paediatrics[1]. The immense momentum gained in technological advancement has improved the accessibility and quality of care for children[2,3]. Telemedicine, remote patient management systems, portable imaging facilities, newer biomarkers, automation and newer diagnostic methods have been pathbreaking changes of the era [4–6]. Proteomics, genomics and precision medicine enable healthcare institutions to personalize healthcare and improve treatment outcomes[7,8]. AI, machine learning (ML), and immersive technologies will further enhance clinical decision-making and patient care.

The healthcare ecosystem in India is a study in contrasts. One aspect is the transition towards technological reforms regarding critical care patient flows, surge capacities and monitoring critically sick children[9]. The other aspect is the struggle for affordable resources to serve the larger demographic of our economy. COVID-19 has catalyzed the widespread acceptance and adoption of digitization in India[10].

The futuristic take on paediatric healthcare can be summarized as A for artificial intelligence, B for biomarkers, C for computer applications, D for devices, E for evidence-based medicine, F for family-centric care model, and G for genomics and precision medicine.

II. A- ARTIFICIAL INTELLIGENCE

AI refers to any technique which enables computers to mimic human behaviour. It has seamlessly integrated into medical practice and research[11]. The term "artificial intelligence" was first coined by John McCarthy, an American scientist from the Massachusetts Institute of Technology in 1956. The growth of AI has exploded in the last few decades to the current AI dominance in all the major global industries in the 21st century.

The use of AI in the healthcare industry has had far-reaching consequences. It has provided large-scale data handling solutions such as electronic health records (EHR), medical big data management, and innovative health management systems[12]. AI-based clinical tools can augment conventional clinical decision-making in children by enhancing accuracy and standardisation[13,14].

One of the most widely used AI tools is ChatGPT, which is a natural language-processing tool (NPL) with an unsupervised ML algorithm for unstructured and unlabelled data. It is currently being used and misused in multiple aspects of health care, such as literature search, analysis and summarising large volumes of data, preparation of manuscripts and clinical research projects[15,16].

The use of AI has become ubiquitous in clinical medicine. The following are some key areas and applications of AI in pediatric medicine (**Figure 1**).

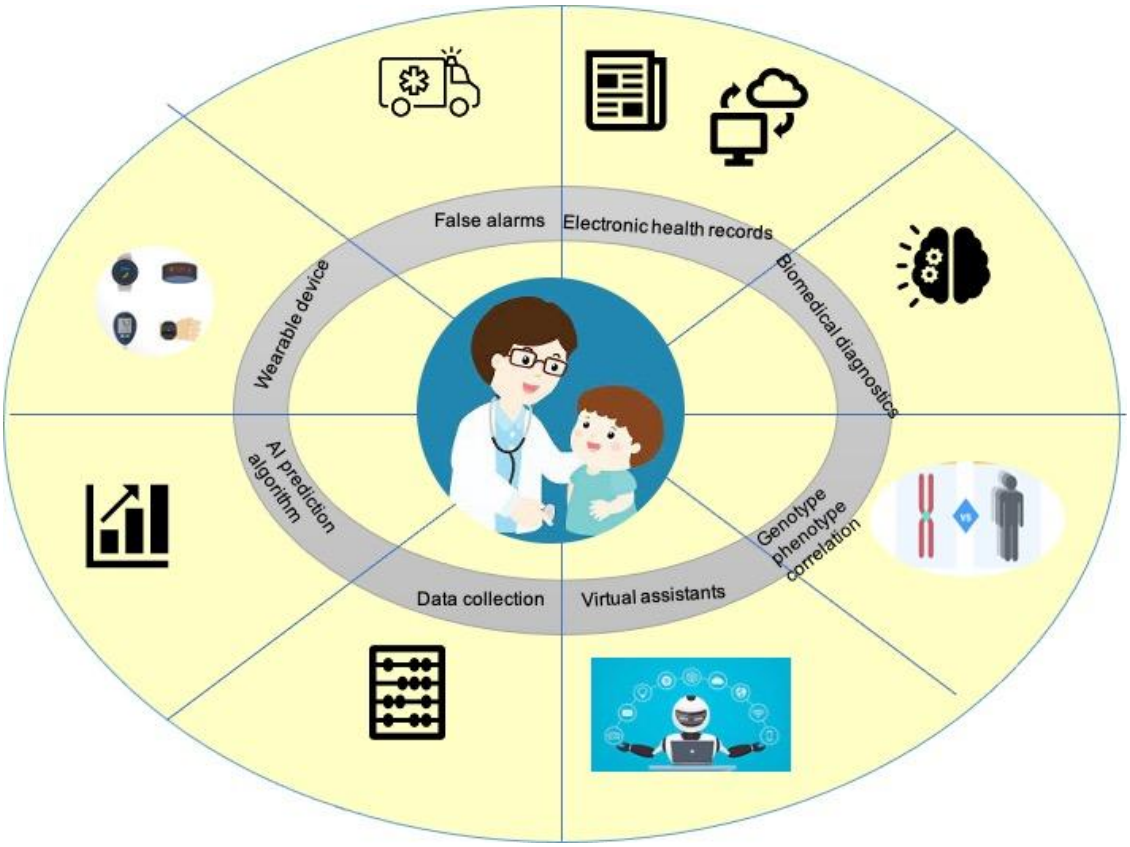

Figure 1: Application of AI in Paediatric Healthcare System

1. **Research:** AI has shown promising applications in medical research, especially in secondary research and evidence synthesis. AI-based tools and software such as Rayyan QRCI and Nested Knowledge help in intelligent and automated literature search, screening, data tagging, compilation, and evidence synthesis[17,18]. AI has a widespread scope of application in primary research in neonates and children, such as interpretation of investigations, clinical diagnosis of medical conditions, assessment of pediatric airways, mortality prediction, morbidity, inotrope requirement, length of hospital stay and other long-term outcomes[19,20].

2. **Diagnostic Dilemma:** In certain neurodevelopmental disorders, particularly autism spectrum disorder (ASD), AI has emerged as a promising diagnostic aid. Early diagnosis and intervention are crucial for optimal outcomes but are often complex in clinical practice. It requires subtle longitudinal observations by caregivers. AI has the potential to streamline this process by analyzing large amounts of observational data, such as speech patterns, facial expressions and body movements, to identify patterns and markers associated with ASD[21]. Childhood cancer is another arena of high-impact AI-mediated diagnostic capabilities. For instance, AI can decipher a child's genetic constitution and reference it with known cancer-related mutations to generate a customized treatment plan based on their unique susceptibility. This facilitates informed decision plans regarding the best possible outcomes[22].

3. **Predictive Modelling:** It also aids in predicting mortality rate, length of hospitalization and survival in life-threatening diseases requiring critical care support. The scope of these

models was highlighted during the COVID-19 pandemic, where these tools helped predict the spread of infection, identify containment zones and predict mortality[23,24].

4. **AI-Driven Virtual Assistants:** Can provide children and adolescents with personalized wellness and mental health support. Parents and caregivers use them to access health information, which offers recommendations based on a child's age, medical history, and symptoms, assisting caregivers in making informed decisions[25]. In conditions such as autism, it can help with daily routine activities and delivering therapy to the children as they are more receptive to interactive robots than human beings.

5. **Intelligent Health Data Analytics:** Involves exploiting healthcare-related data to optimize resources and improve the quality of care and clinical outcomes. This is increasingly used for precision medicine, disease prediction and outcomes, Point of care (POC) diagnostic devices and AI-based clinical decision systems[26]. Moreover, AI can help reduce the load on healthcare providers (HCPs) by automating routine tasks, such as data entry and appointment schedules, enabling them to prioritize patient care rather than administrative tasks.

6. **Operational Management:** Includes forecasting demand, managing supplies, reporting bed utilization, inter-facility transfer, care progression, and discharge planning. Hospitals use this information to pre-empt resource allocation requirements, streamline patient workflow and allow clinicians to focus on delivering the best care for the patient[27].

By harnessing the power of AI, paediatricians can make more accurate diagnoses, provide personalized treatment plans, and ultimately improve the quality of life for children and their families. Though the real purpose of AI in health care is to co-exist with the process of clinical decision-making by supporting and enhancing physician's decision-making, there are concerns with patient safety, algorithmic transparency, lack of proper regulation, liability & accountability, impact on patient-physician relationship and governance of AI-empowered healthcare.

III. B-BIOMARKERS

Biomarker research in health sciences has witnessed a significant impetus in recent years. Biomarkers are crucial in the diagnosis, progression, regression and treatment response. Bedside (POC) devices using novel biomarkers have improved our diagnostic ability and reduced laboratory turnaround time, thus enabling timely decision-making. Adult biomarkers cannot be applied to children without due consideration of the impact of ontogeny on physiological functions. This has fuelled the development of novel biomarkers such as NGAL and KIM-1 for clinical use to assess acute kidney injury in neonates and children[28,29].

Sepsis is the leading cause of mortality in critically sick children and, thus, a vital research arena for biomarker development. A recent study," The Pediatric Sepsis Biomarker Risk Model" (PERSEVERE), evaluated a panel of serum biomarkers for early diagnosis of sepsis and its association with mortality risk. Authors used complementary bioinformatics and ML to derive a list of candidate predictor genes for 28-day mortality[30]. Some of the evolving biomarkers in pediatric diseases are listed in **Table 1.**

Table 1: Novel Biomarkers in Paediatrics

S No.	Biomarker	Indications	Disease
1.	Mass Spectroscopy-based newborn screen	Disease screening	Inborn errors of metabolism Hematological conditions
2.	Urinary NGAL	Several Disease prognostication	Acute renal failure
3.	ADAMTS-13	Disease stratification	TTP
4.	Inhibin B	Assessment of treatment adverse effects	Chemotherapy-induced infertility
5.	TGF-b1	Assessment of treatment response	Marfan syndrome
6.	Anti-islet cell antibodies	Disease risk	Type 1 diabetes
7.	Factor VIII	Stratification	Hemophilia
8.	Presepsin	Disease diagnosis	Pediatric sepsis

IV. C- COMPUTER AND MOBILE HEALTH APPLICATIONS

Health information can be accessed using mobile health apps through handhelds, headgear, garments and smartphones. With wireless connectivity and mobile devices, paediatricians receive critical child health data updates, enabling quicker diagnoses and eliminating errors. Technologies such as picture archiving and communication systems (PACS) have replaced conventional radiological film imaging. They also have provisions for remote access, transfer and integration with the hospital information system[31].

Apps also offer learning simulations through real-life scenarios that promote positive decision-making and active learning in pediatric residents. Peer support-mediated interventions using social media networking apps have benefited Insulin-dependent Diabetes mellitus, nephrotic syndrome and bronchial asthma[32]. Patient home records can be digitized with the help of specialized asthma diary or insulin diary apps, thus helping to titrate therapeutic decisions effectively. A UK-based Neotree app regulates clinical workflows and guides HCPs when babies are admitted or discharged from neonatal wards[33]. **Table 2** depicts some of the commonly available AI-based health applications in paediatrics.

Table 2: The Top AI Applications in Paediatrics

S. No	Name	Developer	Features
1.	Little angel medical	Canada	Child health monitoring
2.	ATMAN	TCAIR, DRDO	COVID-19 patients to test positive predictive value and accuracy of X-rays in disease classification.
3.	Medicine from the sky	India	Drone-based deliveries of blood, vaccines, medical samples and organs.
4.	Chexnet	US	An algorithm created to diagnose pneumonia

5.	Cardio DL	US	AI-assisted cardiac imaging in the cloud
6.	Healthray	India	AI-enabled healthcare practice platform that integrates consultations, patient management, online doctor appointments, e-prescription, and EHR.
7.	Ensofia	US-based	Its natural language conversational AI handles everyday tasks such as appointment management and prescription refills.
8.	Pediametrix	US-based	AI and computer vision for reliable and accurate anthropometric measurement and monitoring through image processing and ML
9.	Zoala	Singapore	It identifies mental stressors and helps in building mental resilience.
10.	Curiedx	US-based	Image-based screening for common pediatric diagnoses such as fever, rash and sore throat.
11.	Safer	Artificial Intelligence Company Thorn	This AI-powered tool detects child abuse images with around 99% accuracy
12.	Griffeye	US Federal agency	It uses facial and image recognition tools to scan nude or inappropriate pictures to prevent child sexual abuse.
13.	Child Safe	US	It assists organizations in mitigating the risk of online child abuse.
14.	Elsa Health Assistant	US	Health providers input patient demographics, vitals, symptoms, and test results and receive insights and next-step recommendations about their patients' health. Elsa supports common pediatric illnesses (rash, gastroenteritis, etc.), nutrition-related illnesses, high-mortality illnesses such as malaria, and sexual and reproductive conditions (including HIV/AIDS). It supports healthcare providers in identifying early childhood development milestones.
15.	SAHELI	India	Restless Multiarmed Bandit (RMAB) framework to identify beneficiaries for outreach

iNICU intelligence is a cloud-based EHR platform that integrates bedside clinical observations and laboratory results and then analyses the data in comprehensive medical reports leveraging ML. It reduces manual errors and automatically generates discharge summaries and disease predictions.

Tele-ICU is a 'Hub and Spoke' model concept that gained popularity in the pandemic era. It aims to provide virtual access to the ICU expertise for critically sick children in remote areas, thus bridging the gap between rural and urban healthcare resources.

V. D- DEVICES

Pediatric critical care medicine has achieved significant milestones with advanced ICU ventilators, monitors and devices driven by patient needs. Some of these are discussed below.

1. **Near-Infrared Spectroscopy (NIRS):** NIRS is a novel technology based on non-pulsatile oximetry to determine regional tissue oxygenation[34]. Oxyprem is a Swiss-based device with a non-invasive reusable tissue oximeter that uses headgear to optimize oxygen use in premature babies[35]. It is being evaluated in pediatric acute kidney injury (AKI) and neurocritical care.

2. **(POC) Devices:** These enable rapid diagnosis, are either non-invasive or minimally invasive and assist in real-time dynamic management of several critical conditions[36]. Examples include point-of-care hemoglobinometers, lactate and ammonia meters, blood gas analyzers, troponin card tests, bilirubinometers and biochemistry analyzers.

3. **Intelligent Ventilators:** Using newer ventilation modes like neurally adjusted ventilatory assist (NAVA), closed-loop inspired oxygen (CLIO), adaptive support ventilation, High-Frequency Oscillatory ventilation (HFOV), and other hybrid modes enable better synchronization and breath-to-breath control[37]. The recent shift of focus to non-invasive ventilation using better nasal interfaces has also improved clinical outcomes.

4. **Prone Ventilation Beds:** In the wake of the COVID-19 pandemic, prone ventilation has emerged as one of the effective ways of managing Acute Respiratory Distress Syndrome (ARDS)[38]. Special kinetic beds are now available for facilitating proning of paralyzed ARDS patients on high ventilatory support.

VI. E-EVIDENCE-BASED MEDICINE

Many concepts in pediatric critical care medicine have radically changed our understanding of the disease process compared to a decade ago. The change in the demographic profile of the patients, the impact of lifestyle and environmental factors, emerging antimicrobial and drug resistance patterns, and the ever-growing technological advances have made it mandatory for healthcare providers to keep abreast of these changes and apply evidence-based medicine to deliver high-quality care to the sickest children[39].

VII. F-FAMILY CENTRIC CARE (FCC) MODEL

FCC has replaced the conventional approach of separating a sick child in the ICU with limited parental access. The FCC model is a partnership approach to care involving the parents in caring for their child. It aims to provide child-friendly, holistic, empathetic health care with more communication between families and clinicians. The parents are involved in child care and the clinical decision-making process. Even though it is considered the gold

standard of modern-day PICU care, there are some practical dilemmas. It might cause anxiety or exacerbate parental fears, especially if the child is unstable or has an unpredictable condition. It may also become a source of medicolegal issues for treating clinicians due to ignorance or misinterpreting standard ICU procedures. Thus, there needs to be an active effort by treating paediatricians to establish the trust and rapport of the caregivers and then strike a balance between confidentiality and engagement in care.

VIII. G-GENOMICS AND PRECISION MEDICINE

Nearly seven million children are born with genetic disorders annually. For these children, life typically begins in intensive care. Various NICUs are heading towards a standardized protocol for screening genetic disorders by sequencing the human genome. In pregnancies with a higher risk of genetic diseases, antenatal genetic evaluations help in pre-emptive diagnosis and timely intervention.

Soon, "Gene Patri" will likely replace "Janam Patri". Couples opting for marriage would probably like to match their gene patri as genomics has come a long way in India. It is no longer cost-prohibitive to get entire genomic profiling done to anticipate genetic susceptibility or estimate the risk of genetic disorders in the progeny. With the availability of DNA microarrays, Array comparative genomic hybridization (ACGH), and Next-generation sequencing (NGS), it is possible to generate a complete imprint of genetic susceptibilities and integrate it with AI technology to predict the likelihood of cancers, drug responsiveness, rare syndromes and many neurometabolic disorders. These principles are embedded in precision medicine from the bench to the bedside.

IX. CONCLUSION

The world of paediatrics is witnessing a sea change with the emergence of newer technologies, gadgets and aids. However, with every opportunity comes the responsibility of using it appropriately and ethically. The involvement of healthcare providers and local community support is essential for developing and implementing AI-based solutions to make them relevant, accessible, and aligned with the local context, thereby maximizing their positive impact.

REFERENCES

[1] Ollivier C, Mulugeta Y, Ruggieri L, Saint-Raymond A, Yao L. Paediatric extrapolation: a necessary paradigm shift. Br J Clin Pharmacol. 2019;85(4):675–9.
[2] Mesman GR, Kuo DZ, Carroll JL, Ward WL. The impact of technology dependence on children and their families. J Pediatr Health Care. 2013;27(6):451–9.
[3] Kaushal R, Barker KN, Bates DW. How can information technology improve patient safety and reduce medication errors in children's health care? Arch Pediatr Adolesc Med. 2001;155(9):1002–7.
[4] Kruizinga MD, Heide N van der, Moll A, Zhuparris A, Yavuz Y, Kam M de, et al. Towards remote monitoring in pediatric care and clinical trials—Tolerability, repeatability and reference values of candidate digital endpoints derived from physical activity, heart rate and sleep in healthy children. PloS One. 2021;16(1):e0244877.
[5] Ellenby MS, Marcin JP. The role of telemedicine in pediatric critical care. Crit Care Clin. 2015;31(2):275–90.
[6] Khera D, Toteja N, Singh S, Didel S, Singh K, Chugh A, et al. The Role of Presepsin as a Biomarker of Sepsis in Children: A Systemic Review and Meta-Analysis. J Pediatr Intensive Care. 2022;

[7] Lal CV, Bhandari V, Ambalavanan N. Genomics, microbiomics, proteomics, and metabolomics in bronchopulmonary dysplasia. In: Seminars in perinatology. Elsevier; 2018. p. 425–31.
[8] Fernandez-Luque L, Al Herbish A, Al Shammari R, Argente J, Bin-Abbas B, Deeb A, et al. Digital health for supporting precision medicine in pediatric endocrine disorders: opportunities for improved patient care. Front Pediatr. 2021;9:715705.
[9] Paul Y, Hickok E, Sinha A, Tiwari U, Mohandas S, Ray S, et al. Artificial intelligence in the healthcare industry in India. Cent Internet Soc India. 2018;
[10] Konwar AN, Borse V. Current status of point-of-care diagnostic devices in the Indian healthcare system with an update on COVID-19 pandemic. Sens Int. 2020;1:100015.
[11] Morley J, Machado CC, Burr C, Cowls J, Joshi I, Taddeo M, et al. The ethics of AI in health care: a mapping review. Soc Sci Med. 2020;260:113172.
[12] Shu LQ, Sun YK, Tan LH, Shu Q, Chang AC. Application of artificial intelligence in pediatrics: past, present and future. World J Pediatr. 2019;15:105–8.
[13] Shu LQ, Sun YK, Tan LH, Shu Q, Chang AC. Application of artificial intelligence in pediatrics: past, present and future. World J Pediatr. 2019;15:105–8.
[14] Sloane EB, Silva RJ. Artificial intelligence in medical devices and clinical decision support systems. In: Clinical engineering handbook. Elsevier; 2020. p. 556–68.
[15] Corsello A, Santangelo A. May Artificial Intelligence Influence Future Pediatric Research?—The Case of ChatGPT. Children. 2023;10(4):757.
[16] Xiao D, Meyers P, Upperman JS, Robinson JR. Revolutionizing Healthcare with ChatGPT: An Early Exploration of an AI Language Model's Impact on Medicine at Large and its Role in Pediatric Surgery. J Pediatr Surg. 2023;
[17] Rayyan - AI Powered Tool for Systematic Literature Reviews [Internet]. 2021 [cited 2023 Sep 1]. Available from: https://www.rayyan.ai/
[18] Adusumilli G, Pederson JM, Hardy N, Kallmes KM, Hutchison K, Kobeissi H, et al. Mechanical thrombectomy with and without intravenous tissue plasminogen activator for acute ischemic stroke: a systematic review and meta-analysis using nested knowledge. Front Neurol. 2021;12:759759.
[19] Adegboro CO, Choudhury A, Asan O, Kelly MM. Artificial intelligence to improve health outcomes in the NICU and PICU: a systematic review. Hosp Pediatr. 2022;12(1):93–110.
[20] Chioma R, Sbordone A, Patti ML, Perri A, Vento G, Nobile S. Applications of Artificial Intelligence in Neonatology. Appl Sci. 2023;13(5):3211.
[21] Song DY, Kim SY, Bong G, Kim JM, Yoo HJ. The Use of Artificial Intelligence in Screening and Diagnosis of Autism Spectrum Disorder: A Literature Review. J Korean Acad Child Adolesc Psychiatry [Internet]. 2019 Oct 1 [cited 2023 Sep 1];30(4):145–52. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7298904/
[22] Ramesh S, Chokkara S, Shen T, Major A, Volchenboum SL, Mayampurath A, et al. Applications of Artificial Intelligence in Pediatric Oncology: A Systematic Review. JCO Clin Cancer Inform [Internet]. 2021 Dec 15 [cited 2023 Sep 1]; Available from: https://ascopubs.org/doi/pdf/10.1200/CCI.21.00102?role=tab
[23] Payedimarri AB, Concina D, Portinale L, Canonico M, Seys D, Vanhaecht K, et al. Prediction Models for Public Health Containment Measures on COVID-19 Using Artificial Intelligence and Machine Learning: A Systematic Review. Int J Environ Res Public Health [Internet]. 2021 Jan [cited 2023 Sep 1];18(9):4499. Available from: https://www.mdpi.com/1660-4601/18/9/4499
[24] Santosh KC. COVID-19 Prediction Models and Unexploited Data. J Med Syst [Internet]. 2020 Aug 13 [cited 2023 Sep 1];44(9):170. Available from: https://doi.org/10.1007/s10916-020-01645-z
[25] Lee D, Yoon SN. Application of Artificial Intelligence-Based Technologies in the Healthcare Industry: Opportunities and Challenges. Int J Environ Res Public Health [Internet]. 2021 Jan [cited 2023 Sep 1];18(1):271. Available from: https://www.mdpi.com/1660-4601/18/1/271
[26] Abidi SSR, Abidi SR. Intelligent health data analytics: A convergence of artificial intelligence and big data. Healthc Manage Forum [Internet]. 2019 Jul [cited 2023 Sep 1];32(4):178–82. Available from: http://journals.sagepub.com/doi/10.1177/0840470419846134
[27] Dogru AK, Keskin BB. AI in operations management: applications, challenges and opportunities. J Data Inf Manag [Internet]. 2020 Jun [cited 2023 Sep 1];2(2):67–74. Available from: http://link.springer.com/10.1007/s42488-020-00023-1
[28] Koyner JL, Zarbock A, Basu RK, Ronco C. The impact of biomarkers of acute kidney injury on individual patient care. Nephrol Dial Transplant. 2020;35(8):1295–305.

[29] MediЋ#135; B, Rovcanin B, Savic Vujovic K, Obradovic D, Duric D, Prostran M. Evaluation of Novel Biomarkers of Acute Kidney Injury: The Possibilities and Limitations. Curr Med Chem. 2016 Jun 1;23(19):1981–97.
[30] Jacobs L, Berrens Z, Stenson EK, Zackoff MW, Danziger LA, Lahni P, et al. The Pediatric Sepsis Biomarker Risk Model (PERSEVERE) Biomarkers Predict Clinical Deterioration and Mortality in Immunocompromised Children Evaluated for Infection. Sci Rep [Internet]. 2019 [cited 2023 Sep 1];9. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6344559/
[31] Marques IC, Ferreira JJ. Digital transformation in the area of health: systematic review of 45 years of evolution. Health Technol. 2020;10(3):575–86.
[32] Gavrila V, Garrity A, Hirschfeld E, Edwards B, Lee JM. Peer support through a diabetes social media community. J Diabetes Sci Technol. 2019;13(3):493–7.
[33] Gannon H, Chimhuya S, Chimhini G, Neal SR, Shaw LP, Crehan C, et al. Electronic application to improve management of infections in low-income neonatal units: pilot implementation of the NeoTree beta app in a public sector hospital in Zimbabwe. BMJ Open Qual. 2021;10(1):e001043.
[34] Mittnacht AJ. Near infrared spectroscopy in children at high risk of low perfusion. Curr Opin Anesthesiol. 2010;23(3):342–7.
[35] Kleiser S. Cerebral oxygenation monitoring in neonates: improving and validating instrumentation [PhD Thesis]. ETH Zurich; 2017.
[36] Drain PK, Hyle EP, Noubary F, Freedberg KA, Wilson D, Bishai WR, et al. Diagnostic point-of-care tests in resource-limited settings. Lancet Infect Dis. 2014;14(3):239–49.
[37] Miller AG, Bartle RM, Feldman A, Mallory P, Reyes E, Scott B, et al. A narrative review of advanced ventilator modes in the pediatric intensive care unit. Transl Pediatr. 2021;10(10):2700.
[38] Petrone P, Brathwaite CE, Joseph DK. Prone ventilation as treatment of acute respiratory distress syndrome related to COVID-19. Eur J Trauma Emerg Surg. 2021;47:1017–22.
[39] Kianifar HR, Akhondian J, Najafi-Sani M, Sadeghi R. Evidence Based Medicine in Pediatric Practice: Brief Review. Iran J Pediatr [Internet]. 2010 Sep [cited 2023 Sep 2];20(3):261–8. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3446038/

