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Case report

MedBrain® for making diagnosis of childhood illnesses: a case report

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Abstract: Diagnosing childhood diseases can be particularly challenging, especially in areas with limited access to specialists. This case report explored the application of MedBrain®, an artificial intelligence–powered Clinical Decision Support System (CDSS), in supporting diagnosis in paediatric practice. We presented two clinical cases from Nigeria: a 4-year-old girl diagnosed with urinary tract infection and a 3-year-old girl diagnosed with acute gastroenteritis. These cases were selected to demonstrate common but diagnostically challenging paediatric conditions with overlapping symptoms. For each case, MedBrain® was used prospectively to generate a ranked list of differential diagnoses with corresponding diagnostic confidence scores based on patient symptoms and clinical findings. The system utilized a hybrid algorithm combining rules-based logic and machine learning to assess input data and compute likelihood estimates. In both cases, MedBrain®'s top-ranked diagnoses— urinary tract infection (96%) and gastroenteritis (95%)—were confirmed by attending paediatricians, validating its clinical utility. Comparatively, the standard clinical diagnosis was initially uncertain in both scenarios due to nonspecific presentations. These findings emphasized the potential of MedBrain® to augment paediatric diagnostic accuracy, particularly in low-resource or non-specialized settings. Future studies should evaluate MedBrain® in larger prospective cohorts or randomized control trials and compare its diagnostic performance with established clinical guidelines.

Keywords: Artificial intelligence, Clinical Decision Support System (CDSS), Diagnostic accuracy, Gastroenteritis, Nigeria, Urinary tract infection

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Introduction

Diseases identification in children is frequently difficult, especially when different diseases present with similar symptoms, which can lead to delayed or incorrect treatment [1, 2]. Prompt and precise diagnosis is critical for appropriate clinical care and to avoid potential complications [3]. Despite the importance of diagnostics, nearly 47% of the world's population does not have access to vital diagnostic services, particularly in primary healthcare settings, as highlighted by The Lancet's Commission on Diagnostics [4]. This lack of access is most pronounced in underserved, rural and low-income populations, where trained healthcare professionals and diagnostic resources are often scarce [5, 6].

Clinical Decision Support Systems (CDSS) have emerged as promising digital tools to support healthcare providers in making more informed diagnostic decisions [7]. MedBrain® is an app-based CDSS designed to assist with clinical diagnosis by generating a ranked list of possible conditions based on clinical data inputted by the users, including symptoms, medical history and basic physical examination findings [8, 9]. The system uses a hybrid model combining rules-based logic and machine learning algorithms to generate diagnostic scores that reflect the likelihood of each condition [8, 9]. MedBrain® provides a full ranked list of possible conditions that can be reviewed and considered by the clinician in real time [8]. These tools can be particularly useful in resource-limited settings or in situations where specialist care is unavailable [8].

This case report presents two paediatric cases— a urinary tract infection in a 4-year-old girl and an acute gastroenteritis in a 3-year-old girl, which occurred in a Nigerian healthcare setting. Both conditions are common in paediatric primary care and can present with non-specific symptoms that mimic other illnesses, making diagnosis difficult without laboratory confirmation. These cases were selected to illustrate how MedBrain® can aid in narrowing differential diagnoses and support clinical decision making in real-world, low-resource contexts.

Although evidence on the performance of MedBrain® is still emerging, preliminary reports suggest its potential utility in paediatric diagnostics, particularly where human expertise may be limited [7-10]. This case report aims to demonstrate the practical application, diagnostic utility and potential impact of MedBrain® in supporting paediatric care practice in underserved settings.

Case presentation

Case 1: A 4-year-old Nigerian girl was brought to the hospital after suffering from fever, frequent urination, irritability and general malaise for three days. Her parents initially attempted home remedies before seeking medical attention. Upon physical examination, the only notable finding was suprapubic tenderness, otherwise no specific signs were observed.

MedBrain®'s differential diagnosis prioritized urinary tract infection and assigned it a diagnostic probability of 96%. Urethritis and vulvovaginitis followed with diagnostic scores of 3% and 2%, respectively. A paediatrician later confirmed the diagnosis of urinary tract infection, validating MedBrain®'s top diagnosis. The child fully recovered after receiving appropriate treatment.

Case 2: A 3-year-old Nigerian girl presented with watery, frequent stools, vomiting and a mild fever of 37.5°C. These symptoms had persisted for two days, during which the parents attempted to manage the vomiting with over-the-counter medication, but this only provided temporary relief. On physical examination, she was febrile and dehydrated, as indicated by decreased skin turgor and dry mucous membranes. Abdominal tenderness and tachycardia were also noted, probably due to dehydration.

MedBrain® identified acute gastroenteritis as the most probable diagnosis, with a diagnostic score of 95%, based on the combination of low-grade fever, vomiting and diarrhoea. Malaria was the second most likely diagnosis at 5%, based on overlapping symptoms, but was ruled out due to a negative malaria test. The third possibility, sepsis (4%), was also excluded as there was no persistent high fever. The attending paediatrician confirmed the diagnosis of acute gastroenteritis made by MedBrain. The child responded well to hospital care and made a full recovery within five days.

Discussion

Interpretation with current literature

Urinary tract infection and acute gastroenteritis are among the most frequently encountered illnesses in paediatric primary care, yet their presentations can often be nonspecific, especially in young children [11-13]. Urinary tract infection in children may present with subtle symptoms such as irritability or general malaise rather than classic signs, making diagnosis difficult without laboratory confirmation [12]. Similarly, acute gastroenteritis, a major cause of morbidity and mortality in children worldwide, especially in low-resource settings, can overlap symptomatically with other febrile or infectious illnesses [13].

In this case report, MedBrain® identified urinary tract infection and acute gastroenteritis as the most probable diagnoses with high diagnostic scores (96% and 95%, respectively) in two paediatric patients. These predictions were later confirmed by the attending paediatricians. The results suggest that MedBrain® can assist in identifying common childhood illnesses that are prone to misdiagnosis due to nonspecific symptom presentations.

MedBrain®'s diagnostic mechanism

MedBrain® is a mobile, application-based CDSS developed to support healthcare professionals in formulating differential diagnoses by integrating patient-reported symptoms, medical history and clinical observations [8, 9, 14, 15]. The system operates on a structured medical database that utilizes disease-specific likelihood ratios, which are informed by established clinical guidelines such as those from the Nigerian Ministry of Health and the WHO's protocols on Integrated Management of Childhood Illness [8, 9]. After entering the symptom data, MedBrain® conducts a customized, adaptive interview using a rule-based algorithm that progressively refines the potential diagnoses. Once a sufficient level of diagnostic certainty is achieved, it generates a prioritized list of probable diseases.

On average, it takes a healthcare provider approximately 5-7 minutes to complete a full diagnostic session using MedBrain®, depending on the complexity of the clinical presentation and the user's familiarity with the interface [8]. MedBrain® incorporates a Medical Library of Likelihood Ratios, diagnostic tools such as the Disease Rank and Tag Rank algorithms, and a Step-by-Step Guide, all aimed at enhancing diagnostic accuracy and simplifying clinical evaluations through evidence-based symptom assessment [8, 9]. In the two illustrative cases, MedBrain® effectively prioritized common but occasionally difficult-to-identify conditions, demonstrating its practical utility in routine paediatric care. However, while these illustrative cases show the app's potential, further studies—especially those involving diagnostically complex or ambiguous paediatric presentations—are needed to fully assess MedBrain®'s performance under real-world variability. The authors are actively working on a follow-up studies, including randomised controlled trial that incorporate such scenarios to rigorously evaluate the system's specificity, sensitivity, and diagnostic differentiation in challenging contexts.

Clinical implications

The diagnostic utility of MedBrain® lies in its ability to systematize clinical reasoning and support timely decision making. In low-resource settings or in primary care—where access to advanced diagnostic tools or paediatric subspecialists is often limited—tools such as MedBrain® can significantly improve diagnostic accuracy [8]. This is particularly important in the paediatric population, where clinical presentations are often atypical and diagnostic uncertainty is common [1, 2]. Furthermore, the app's ability to function offline enhances its usability in rural or underserved regions. Importantly, MedBrain® can also serve as a teaching and reinforcement tool for young or non-specialized healthcare workers by guiding them through logical diagnostic pathways [8, 9].

Implications for clinical research

Beyond its clinical use, MedBrain® also presents potential for research applications. The system's ability to collect, anonymize, and aggregate clinical data offers opportunities for real-time epidemiological tracking, assessment of diagnostic trends, and identification of knowledge gaps. Although this case report validated MedBrain®'s output using clinical diagnoses by Nigerian paediatricians rather than laboratory results, the consistency observed underscores its reliability in real-world settings. The platform can support future studies focused on diagnostic accuracy, health system performance and decision making in paediatric populations at various levels of care.

Strengths and limitations

One strategic strength of MedBrain® is its high diagnostic concordance with clinician-confirmed outcomes in these two cases [8, 9]. Its user interface is intuitive, and it provides structured diagnostic support, regardless of the physician's level of experience. The app's offline capability makes it particularly suitable for remote or underserved environments.

However, there are also limitations. The diagnostic suggestions generated are based on symptomatology and clinical input without inclusion of laboratory or radiologic data. In its current form, MedBrain® does not learn from previous cases (i.e., it is not machine-learning-enabled), which could limit its adaptability in rare or complex cases. Nevertheless, the development team is exploring the integration of supervised machine learning in future updates to enhance its predictive performance over time. MedBrain® is designed to assist—rather than replace—clinical judgment. As its database is continually being expanded and updated, misdiagnosis may occur, especially for cases with atypical or rare presentations. However, the system incorporates a rule-based algorithm designed to consider less common presentations when sufficient symptom overlap exists [8]. MedBrain® also modifies the approach to the physical examination by prompting clinicians to perform or confirm only relevant signs—streamlining the assessments but potentially reducing the breadth of the physical examination training for inexperienced physicians.

Conclusion

This case report demonstrated that MedBrain® can effectively assist in diagnosing common childhood illnesses such as urinary tract infection and acute gastroenteritis in primary care settings. Its structured, evidence-based approach supports timely, accurate

clinical decision making, particularly in low-resource settings where access to specialists is limited. While further validation—including prospective trials—is needed, MedBrain® proves to be a promising practical and scalable solution for improving paediatric diagnostics. Its further development and integration into healthcare systems could help reduce diagnostic delays and improve care outcomes for children globally. We believe MedBrain® holds promise for eventual integration into triage workflows, particularly in resource-limited or rural settings where diagnostic expertise may be limited. The system's structured approach to symptom collection and prioritization can support early risk stratification.

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Conflict of interest

The authors declare that there is no conflict of interest in this work.

Ethical consideration

Consent was obtained from the parents of the index patients to allow the reporting and displaying of pictures where necessary.

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Author's contributions

GUE and OCN conceived and supervised the study; CAN, CDN, DRS, OLI, JAU, EIN, and CGO analysed data; GUE, and CAN wrote the manuscript; GUE, ICU, CCN, PCD, JEM and NCE made manuscript revisions. All authors reviewed the results and approved of the final version of the manuscript.

Ethics approval and consent to participate

Not applicable

Consent for publication

Written informed consents were obtained from the parents of the index patients to publish this case report and any image which accompanied it.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analysed during this study.

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