Advancing the Management of Paediatric Growth Hormone Deficiency

The 4 W's and the Role of Digital Health and Patient Support

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Abstract - Optimizing care for children with Growth Hormone Deficiency (GHD) is a priority in paediatric endocrinology. This article summarizes insights from an expert advisory board that explored the "4 W's" of GHD management: who needs the most support, what issues are critical, when to intervene, and why it matters. Key recommendations included early intervention, personalized support programs, and the use of digital tools to enhance adherence and outcomes. The board also highlighted the need for further research on long-term impacts, Artificial Intelligence (AI)-driven analytics, and remote monitoring, including psychosocial considerations.

Keywords - adherence monitoring; digital health; growth hormone treatment; patient engagement; paediatric endocrinology; patient support programs. Abel López-Bermejo Pediatric Endocrinology Research Group Dr. Josep Trueta Hospital Girona, Spain e-mail: alopezbermejo@idibgi.org

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I. INTRODUCTION

Paediatric Growth Hormone Deficiency (GHD) is a condition characterized by inadequate secretion of Growth Hormone (GH) from the pituitary gland, leading to impaired growth and development in children. It affects approximately 1 in 4,000 to 1 in 10,000 children worldwide [1]. GHD results from congenital or acquired causes, including genetic mutations, brain injuries, or tumours [2]. Left untreated, GHD can lead to significant health issues, including short stature, delayed puberty, and metabolic abnormalities [1][3].

Early diagnosis and intervention are crucial in managing GHD to ensure optimal growth, development and metabolic outcomes [4]. Treatment typically involves regular administration of recombinant human Growth Hormone (rhGH) injections starting in childhood, continuing to adolescence and in some cases into adulthood [5][6].

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This multi-year treatment journey of a paediatric patient involves daily, or more recently - for a small number of patients, weekly, recombinant human GH (rhGH) injections [5]. The patient journey is fraught with challenges as each child and his/her caregivers adapt to this new reality, initiate treatment, and learn how to administer injections [5][7]. Challenges such as poor adherence to treatment regimens, needle phobia, and limited access to specialized care can impede effective management [5][8]–[11].

Along the way, the clinic nurse and/or Patient Support Programs (PSPs), in collaboration with the clinician, offer training and support [10]. Patients make regular visits to the clinic to monitor growth, assess metabolic parameters and make dose adjustments, as necessary. As children grow and develop during this journey of growth hormone therapy, there may also be emotional and behavioural challenges that need to be addressed. These issues may become particularly challenging during teenage years, as young people approach their move to adult endocrine care (transition). Staying informed, remaining adherent to therapy, and addressing challenges that occur along the way, are essential elements of ensuring optimal outcomes. This requires a multidisciplinary team involving physicians, clinic nurses, patient support team, and the child as well as his/her caregivers [10].

Over the last decade, digital health solutions have supported patients, caregivers, and their HealthCare Professionals (HCPs). They offer tools to monitor, engage and, in some cases, treat patients and their symptoms [12][13]. They enable HCPs to track and treat patients remotely more regularly, offering valuable real-world evidence and insights that help personalize and optimize treatment outcomes [14]. For paediatric GHD, digital health solutions, to primarily improve patient adherence, have been developed and made available to patients, caregivers and HCPs to support them along their journey [14][15]. These tools have been used by tens of thousands of patients and their HCPs across 40+ countries [14][15]. Real world evidence tracking millions of daily injections have enabled greater insights into the optimization of adherence and better growth outcomes.

Given this context we convened a meeting of ten expert physicians in paediatric endocrinology from both public and private healthcare institutions from across Europe, Middle East, Asia and Latin America selected based on their experience in using digital health technologies and patientcentric support, to look at "4 W's" in advancing GHD care. Specifically, we wanted to consider 'who' amongst our patients needs more support, 'what' issues need to be addressed, 'when' and how to intervene, and 'why' such interventions make a difference. These questions were intended to support HCPs in understanding and addressing key concerns during the patient journey – thereby developing bespoke and targeted management and care and ensuring optimal outcomes.

In this article, we summarize our discussions and offer a roadmap for further enhancing patient support using digital health technologies to address these "4 W's" in the management of GHD.

II. OUR APPROACH

This paper is based on discussions from a meeting of ten expert physicians in paediatric endocrinology from across Europe, the Middle East, Asia, and Latin America. These experts were selected based on their extensive experience in using digital health technologies and patient-centric support in the management of paediatric GHD. The advisory board aimed to define a roadmap for enhancing patient support by addressing the "4 W's" in GHD care. The discussions focused on:

- Who Needs the Most Support? Identifying patient subgroups with the greatest need for additional support.
- What Are the Most Pressing Issues? Determining the key challenges in GHD management that need to be addressed.
- When & How Should We Intervene? Exploring optimal timing and methods for interventions.
- Why Do Such Interventions Make a Difference? Evaluating the impact and benefits of these interventions.

The experts explored how digital health solutions and patient support programs can address these questions to improve the patient journey and treatment outcomes.

III. RESULTS

The advisory board's discussions yielded several key findings:

- Who Needs the Most Support: The experts identified several patient subgroups with heightened support needs. These include newly diagnosed children (struggling with treatment initiation), adolescents (facing challenges with self-injection, behavioural changes, and financial barriers), children from separated families (requiring coordination of injections), patients with multiple hormone deficiencies, and those transitioning to adult care (at risk of treatment discontinuation).
- What Are the Most Pressing Issues: The most pressing issues revolve around treatment adherence. This includes optimizing rhGH dosage, educating patients and caregivers, addressing psychosocial aspects, and managing potential side effects. The effective integration of digital tools into clinical workflows, without overburdening HCPs or patients, was also identified as a key challenge.
- When & How Should We Intervene: The advisory board emphasized that early and personalized interventions are critical. This includes timely growth tracking, IGF1 monitoring, and psychosocial assessments. Digital tools can facilitate early habit formation, provide personalized feedback, and enhance communication between families and support services. The first months of treatment are crucial for establishing long-term adherence.

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• Why Do Such Interventions Make a Difference: The experts highlighted the importance of measuring the impact of interventions. AI and real-world data can be leveraged to optimize treatment, predict non-adherence, and personalize patient care [16]. Factors such as consistent injection timing, tailored digital support, and addressing patient and caregiver needs, beliefs, and cultural values can significantly improve outcomes.

The 4 W's and the role of digital health technologies and patient support are summarized in Figure 1.

IV. DISCUSSION

The advisory board emphasized that certain patient groups require more support, including newly diagnosed children, adolescents, children from separated families, patients with multiple hormone deficiencies and those transitioning to adult care.

The most pressing issue in managing paediatric GHD is ensuring treatment adherence. Non-adherence can stem from various factors, including injection fear, treatment fatigue, lack of family engagement, and difficulties integrating digital health solutions into care. Digital tools offer a promising avenue for supporting adherence, but they must be implemented strategically to avoid overburdening patients, caregivers, and HCPs. Educating patients and caregivers about the benefits of treatment and addressing psychosocial factors are also crucial for improving adherence.

Early and personalized interventions can significantly improve outcomes. Regular growth tracking, IGF-1 monitoring, and the use of digital reminders can help improve adherence. Digital tools can also provide personalized feedback, encourage early habit formation, and facilitate caregiver engagement. In particular, the first few months of treatment are critical for establishing long-term adherence.

Digital health tools, when combined with PSPs, can enhance patient support and engagement. AI and real-world data can be used to optimize treatment, predict nonadherence, and personalize patient care. Studies have shown that factors such as consistent injection timing, adjusting injection techniques, and providing tailored digital support can improve both adherence and growth outcomes. Personalized patient support programs, which use digital tools to target patients at risk of low adherence, have also demonstrated success.

V. CONCLUSION AND FUTURE DIRECTIONS

The advisory board concluded that a patient-centric approach, integrating digital health tools with personalized support, is essential for improving adherence and health outcomes in paediatric GHD patients. Early intervention, targeted support for high-risk groups, and leveraging AI and real-world data can enhance the effectiveness of GHD management. The advisory board identified several key areas for future research and development:

- Further research is needed to evaluate the long-term impact of digital health interventions on growth outcomes and quality of life.
- There is a need for more personalized and integrated digital health solutions tailored to the specific needs of individual patients and their families.
- The role of AI in optimizing treatment decisions and predicting individual responses to therapy should be explored.
- Strategies to ensure equitable access to digital health technologies for all patients with GHD are needed.
- Further consideration of remote health monitoring tools, including assessments of psychosocial aspects of patient lives is needed as part of advancing care in GHD.

DISCLAIMER

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CONFLICTS OF INTERST

EK is an employee of Merck KGaA, Darmstadt, Germany and holds shares in the company. All other authors declare that their participation in the advisory board was sponsored through funding from Merck (CrossRef Funder ID: 10.13039/100009945).

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Figure 1. The 4 W's and the role of digital health technologies and patient support.