APAMI2020 Poster Presentation Sessions | APAMI 2020 | Poster Presentation Sessions
Connected and Digital Health / Telehealth
Sun. Nov 22, 2020 1:20 PM - 2:10 PM Room E-2 (Congress center 5F - Conference Room 53)

[AP2-E2-2-01] Implementing eHealth to Complement and Support Achieving Adherence to Growth Hormone Therapy

*Ekaterina Koledova[1], David Dixon[2] (1. Global Medical Affairs, Merck KGaA, Germany, 2. Connected Health &Devices, Global Healthcare Operations, Ares Trading SA, Switzerland)

Keywords: Avatars, Connected Device, Gamification, Patient engagement

Despite the development of recombinant growth hormone (GH) treatment and the benefits in long-term clinical health outcomes, evidence has shown that many children with GH-treated growth disorders still fail to achieve their target adult height. Suboptimal outcomes have been largely attributed to treatment non-adherence. Adherence is routinely assessed at clinic visits; however, this provides little information about what is happening between visits, as reported data is frequently over- or underestimated by patients/caregivers. Connected eHealth devices, with automatic recording and transmission of adherence data, provide more accurate insights into individual patients' management. Our ongoing activities incorporate several patient empowerment tools to connect clinician/nurse and patient/ caregiver to provide a better system of care for GH therapy. These include mobile-based augmented reality (AR) combined with interactive avatars for patient education, and patient support programs with integrated behavior change techniques.

Implementing eHealth to Complement and Support Achieving Adherence to Growth Hormone Therapy

Ekaterina Koledova[a] and David Dixon[b]

[a] Global Medical Affairs, Merck KGaA, Germany
[b] Connected Health & Devices, Global Healthcare Operations, Ares Trading SA, Switzerland

Abstract

Despite the development of recombinant growth hormone (GH) treatment and the benefits in long-term clinical health outcomes, evidence has shown that many children with GH-treated growth disorders still fail to achieve their target adult height. Suboptimal outcomes have been largely attributed to treatment non-adherence. Adherence is routinely assessed at clinic visits; however, this provides little information about what is happening between visits, as reported data is frequently over- or underestimated by patients/caregivers. Our data show that eHealth already plays a major role in the support of patients undergoing GH treatment. In particular, connected injection devices, with automatic recording and transmission of adherence data, provide more accurate insights into individual patients' management. In this poster, we present ongoing pilots and implementations incorporating several patient empowerment tools to connect clinician/nurse and patient/ caregiver to improve care for GH therapy in different healthcare systems across several continents. These include a mobile-based augmented reality (AR) app with interactive avatars for patient education, and patient support programs with integrated behavior change techniques. We conclude that these developments will help to improve the future management of growth disorders, but careful planning, design and formative evaluation of effective patient engagement and clinical endpoints are needed to overcome implementation issues across healthcare systems.

Keywords:

Avatars, Connected Device, Gamification, Patient Engagement

Introduction

Medical injection devices have evolved from syringes to 'smart' connected autoinjectors that transmit data such as dose, date, and time to centralized cloud-based databases [1-2]. That digital medication monitoring infrastructure enables the creation of eHealth tools to better track and report adherence as a natural progression, both for patient/caregiver and healthcare professional (HCP). Such ecosystems already exist in asthma, diabetes and other therapeutic areas [3-4].

We present herein our experiences in developing and implementing an ecosystem of eHealth tools for supporting growth hormone (somatropin, GH) treatment in pediatric endocrinology. GH treatment poses challenges due to the low prevalence of growth disorders and heterogeneity of background and clinical responses in patient groups. The core element of the ecosystem is the easypod™, a connected eHealth device that provides insights into adherence and its effect on growth in patients receiving GH.

Research on implementation of eHealth solutions for chronic patient management shows that multiple cycles of piloting and deployment are needed to capture user and implementation needs. Further, this should be considered a continuous cycle rather than a sequential process [5]. For these reasons, we created the policy of piloting and testing the implementation of the different eHealth solutions across different countries presented in this poster. We hypothesize that this eHealth device and its related patient-centric eHealth technology will help to change the future management of growth disorders, addressing individual issues with adherence, providing e-learning between clinic visits and enabling patient-centric research based on accurate, reliable, aggregated data.

Methods

The full system described below has been developed using a mixed methods approach including retrospective analysis of anonymized data, surveillance studies, and qualitative and quantitative exploratory research. The easypod is the key component of this eHealth ecosystem that provides patients/caregivers and HCPs with tools for monitoring adherence to GH treatment (Figure 1).

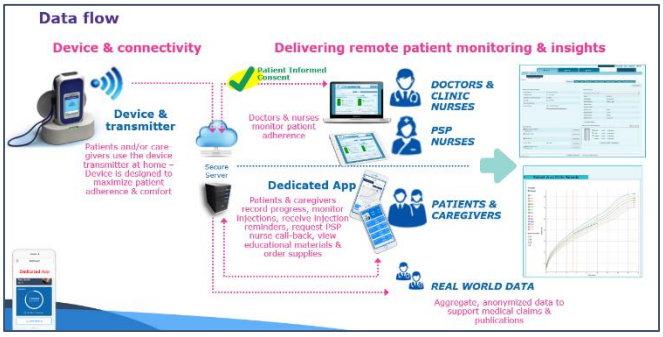

Figure 1- The easypod™ connect ecosystem

Tools for patients

- The easypod is a connected smart auto-injection device for Saizen® recombinant human GH. The device automatically delivers a pre-set dose of GH, with a dosage sensor, adjustment and tracking features, and provides on an LCD screen a history of injected (and missed) doses, including date, time, and dose delivered. The device can also transmit the injection history to a secure cloud via a transmitter. This device is commercialized in over 40 countries.
- An easypod-related mobile App, growlink™, provides additional patient support. It is currently deployed in France, Sweden, UK, Canada, Spain, and Germany, and undergoing testing and refinement in Asia. growlink supports monitoring patient's adherence behavior, offers the option to track height and weight, and provides medication reminders.
- The ecosystem also includes a mobile solution (easypod AR®) for educating children about injection techniques us-

ing AR technology and avatars. The AR App with nine interactive lessons shows users how to properly administer GH treatment with an e-device, and engages patients in quizzes and gamifications using an avatar. The App also helps HCPs to address any questions patients/caregivers may have after in-person training, and provides support between clinic visits.

Tools for HCPs

- Easypod connect is a web-based Adherence Decision Support System that enables HCPs to monitor individual patients' adherence based on information retrieved from their easypod. The system also has the ability to generate auxological (growth) curves for monitoring height and weight, provides alerts for low adherence, and can generate reports to support HCPs' management of individual patients.

Research tools

- The aggregated data are collated into a database for research purposes (after removing all identifiable information) e.g. prospective observational studies and implementation of an analytics platform aimed at evaluating effective engagement with the system.
- A nurse-based patient support program (PSP) called TuiTek™ with personalized motivational interviews and behavior coaching techniques is undergoing testing in Taiwan, but has already shown potential for increasing disease awareness and understanding, and reducing treatment-related anxiety. This PSP is integrated with the AR App to support the telehealth services for patients undergoing GH treatment.

Results

The platform is being used by thousands of patients worldwide, and data collected using the ecosystem have already contributed to the scientific literature several Real World Evidence publications based on large samples of patients [6]. These confirmed that easypod can help to maintain adherence over prolonged periods of up to 4 years, but have also revealed evidence gaps, such as limited knowledge of who gives the injections – patient or caregiver. The 5-year easypod connect observational study (ECOS) enrolled 2,420 patients aged 2–18 years in 24 countries [6]. There were statistically significant correlations between adherence and 1-year change in height and height velocity. Analyses of the anonymized database have also shown that most children treated with GH via easypod had high adherence (≥85%), but this can be affected by age, puberty, weight, and gender [7-8].

The mobile and digital solutions for patients described herein are still undergoing pilot studies to assess their feasibility and usability prior to large-scale deployment.

Discussion and Conclusions

This overview of novel developments that are changing the management of growth disorders summarizes the design and implementation of an eHealth ecosystem to support GH treatment. This shows the practical implementation of a large-scale ecosystem which enables the collection of patient-generated data while supporting patient empowerment.

Future work on the mobile eHealth tools of the ecosystem will include the addition of an App for patient engagement tools that address personalized behavior issues leading to non-adherence, with nurse-led coaching sessions that combine motivational interviewing and SMS text messaging alerts. Further research is required to assess the usefulness of growlink, TuiTek, and the AR App on patient-centric disease management, behavioral support and learning. We believe that these developments will ultimately enable data-driven personalized care in growth disorders and optimize long-term clinical outcomes. These patient tools will support the understanding of factors related to technology acceptance across different countries, which will enable further research on the role of cultural and healthcare system aspects in the implementation of integrated digital health technologies.

Acknowledgments

The authors thank all patients and their families and all HCPs who have participated in or contributed data to our research. They also thank David Candlish of inScience Communications, UK for providing editorial assistance funded by Merck KGaA, Darmstadt, Germany, in accordance with Good Publication Practice (GPP3) guidelines.

Compliance with Ethical Standards

EK and DD are employees of Merck and EK holds shares in the company.

Author contributions

EK contributed to data analysis for device, design and implementation of PSP and patient app. DD contributed to design of patient app, future development of the easypod connect system, educational content of growlink app and development of EHR linkage between PSP and growlink. Both contributed equally to the writing and development of this abstract.

References

[1] Dahlgren J, Veimo D, Johansson L, Bech I. Patient acceptance of a novel electronic auto-injector device to administer recombinant human growth hormone: results from an open-label, user survey of everyday use. *Curr Med Res Opin.* 2007; 23:1649–55.

[2] Lion F-X. Electronic recording of growth hormone dosing history: the easypod™ auto-injector. *Curr Drug Ther.* 2010; 5:271–6.

[3] Browne SH, Behzadi Y, Littlewort G. Let visuals tell the story: Medication adherence in patients with type II diabetes captured by a novel ingestion sensor platform. *JMIR mHealth uHealth.* 2015; 3(4):e108.

[4] Merchant R, Inamdar R, Henderson K, Barrett M, Su JG, Riley J, van Sickle D, Stemper D. Digital health intervention for asthma: patient-reported value and usability. *JMIR Mhealth Uhealth.* 2018; 6(6):e133.

[5] Wilson K, Bell C, Wilson L, Witteman H. Agile research to complement agile development: a proposal for an mHealth research lifecycle. *NPJ Digit Med.* 2018; 1:46.

[6] Koledova E, Stoyanov G, Ovbude L, Davies PSW. Adherence and long-term growth: the easypod™ connect observational study (ECOS) in children with growth disorders. *Endocr Conn.* 2018; 7:914–23.

[7] Cancela J, Guedes S, and Koledova E. Real-world data from electronic monitoring of adherence to GH treatment in children with growth disorders: a descriptive analysis. ENDO 2018. IL. USA.

[8] Koledova E, Tornincasa V, van Dommelen P. Real-world data from electronic monitoring of adherence to growth hormone treatment in children with growth disorders: A descriptive analysis. ESPE 2019. Vienna, Austria.

Address for correspondence:

Ekaterina Koledova
Global Medical Affairs, Merck KGaA, Frankfurter Strasse
Darmstadt, 64293, Germany
E-mail: ekaterina.koledova@merckgroup.com