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Digital Support for Family Health Protection by Health Visitors: The "Health Visitors for a Healthy Generation and Nation" Project

A védőnők családi egészség-gondozásban betöltött feladatainak digitális támogatása: "Védőnők az egészséges generációért, nemzetért" projekt

Abstract

Aim: To test whether a photoplethysmography based automated pulsewave analysis system designed for remote patient monitoring can be used (attitudes, technical usability, integration into daily routine) in the work of the Hungarian health visitors during their duties of monitoring pregnant mothers and their relatives. This way, we are taking the first step towards an increased level of safety during pregnancy and creating space for timely prevention measures for society.

Materials and methods: A novel telemedicine tool was distributed amongst volunteering home visitors (n=28), who started to use the system in their daily routines and distributed 115 smart pulse oximeters, taught their patients how to use the app and how to make measurements on a regular basis.

Results: During the project, 644 subjects used the system 6097 times. Out of the 28 home visitors 17 answered the questionnaire at the end of the project, expressing an increased sense of connectedness to their patients and motivation to continue the project.

Conclusion: The project proved that the health visitors are open to trying new possibilities to support the everyday work of family care, they could learn easily how to use the telemedicine system used in the project. Moreover, they successfully trained their patients to use the system at home. The next step of the project is to evaluate the health-economic risks and benefits of using the system in family care and upon favorable results the system might become part of the everyday routine of the health visitors.

Keywords: *telemedicine; Plethysmography; Pulse Wave Analysis; Feasibility Studies*

Absztrakt

Cél: Annak vizsgálata, hogy egy telemedicina célra tervezett, automatizált pulzushullám-elemző rendszer használható-e (attitűdök, technikai használhatóság, napi rutinba való integráció) a magyar védőnők munkájában a várandós anyák és hozzátartozóik egészségmegőrzésével kapcsolatos feladataik során. Projektünk az első lépés egy olyan új rendszer bevezetésében, amelynek elterjedése a várandósságok biztonságának növelését és a társadalom számára az időben történő, szív-érrendszeri prevenciós intézkedések megvalósulását jelentheti.

Anyag és módszer: Egy új telemedicina rendszert kaptak meg önkéntes védőnők (n=28), akik elkezdték használni a napi rutinjukban, valamint kiosztottak 115 okos pulzoximétert, megtanították a magaskockázatú várandósokat és családtagjaikat az alkalmazás használatára és a rendszeres mérések elvégzésére.

Eredmények: A projekt során 644 alany 6097 alkalommal használta a rendszert. A 28 védőnő közül 17-en válaszoltak a kérdőívre a projekt végén, és kifejezték, hogy megnőtt a betegekhez való kötődés érzése, valamint hogy szívesen folytatják a projektet.

Következtetés: A projekt bebizonyította, hogy a védőnők nyitottak a családgondozás mindennapi munkájának támogatására szolgáló új lehetőségek kipróbálására, könnyen megtanulták, hogyan kell használni a projektben használt telemedicinális rendszert. Sőt, sikeresen betanították a várandós anyákat a rendszer otthoni használatára. A projekt következő lépése a rendszer családgondozásban való használatának egészségügyi-gazdasági kockázatainak és előnyeinek értékelése, és kedvező eredmények esetén a rendszer a védőnők mindennapi rutinjának részévé válhat.

Kulcsszavak: *telemedicine; Plethysmography; Pulse Wave Analysis; Feasibility Studies*

Introduction

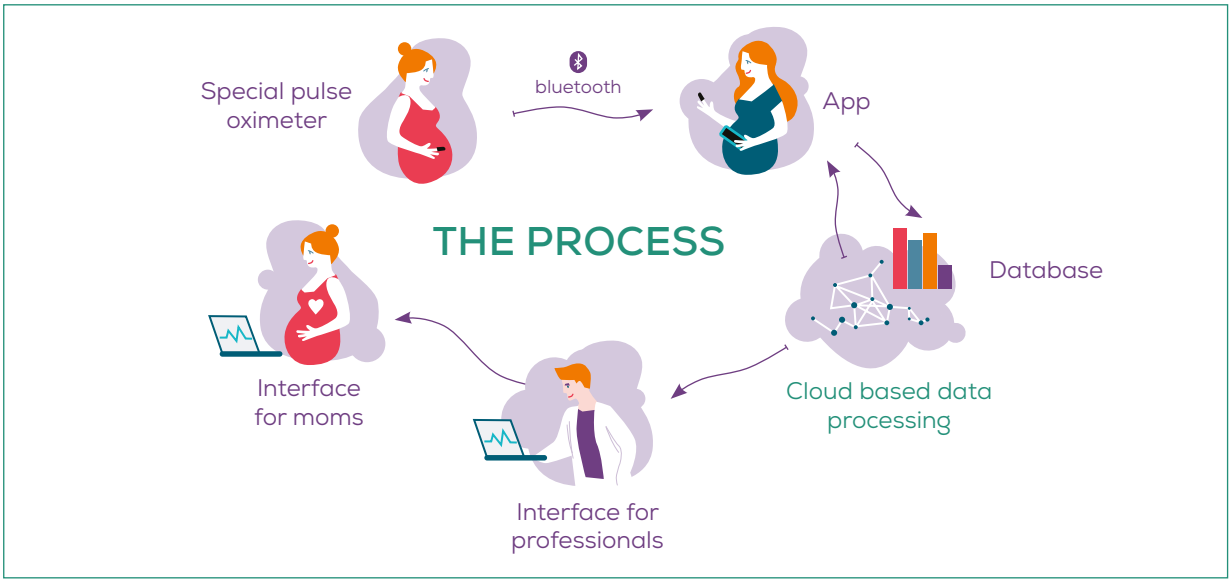
The healthcare system continually evolves, but cardiovascular diseases still rank as leading causes of death, both globally and in Hungary (WHO, 2023; KSH, 2023). This paradigm emphasizes the importance of early detection, especially for conditions that may still be reversible or stabilized through appropriate interventions. Many of these conditions, unfortunately, do not manifest clear symptoms until they've advanced.

Amidst this, the vital role of the worldwide unique profession of the Hungarian health visitors, who specialized for the pregnancy care in family health protection has gained increased attention, especially with the introduction of digital tools and software that can assist in cardiovascular health assessment. One such Hungarian innovation is the SCN4ALL (Scan-For-All) system (Figure 1), which is a photoplethysmography-based pulse wave analysis. Not only does it monitor general health aspects, especially cardiovascular conditions, but it also provides a foundation for remote care, analyzing over 30 parameters related to cardiovascular and autonomic nervous systems from just a two-minute measurement (Kulin et al, 2020).

The "Health visitors for a Healthy Generation and Nation" project provided a real-life opportunity for piloting this technology. Running from July 2021 to February 2022, the aim was to understand the system's feasibility in the project setting and the attitude of participants toward the system. This way laying down the foundations for later projects targeting pregnant women and their families for cardiovascular risks assessment.

It might not be widely known, but the cardiovascular adaptation, more exactly the average increase of the left ventricular muscle mass of pregnant women during the 9 months of pregnancy is more robust than the adaptation of elite athletes during a 1-year training program: a 35% vs 25% increase, respectively (Melchiorre et al, 2016).
Moreover, hypertensive disorders during pregnancy increases the risk by 12-25 times (!) of developing hypertension in the upcoming year after delivery (Behrens, 2017).
The project found its roots in a 2019 initiative called "PregnaScan," sponsored by the Vodafone Hungary Foundation, where health visitors first tested this system. Their positive results showcased the potential applications of such technology in maternity care.

Figure 1: the measurement process with SCN4ALL (own editing)



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Methods

In the "Health visitors for a Healthy Generation and Nation" project, where 27 health visitors, working together with the Professional Association of Hungarian Health Visitors, with the support from the

Prime Minister's Office and the Bethlen Gábor Fund, actively utilized the SCN4ALL systems during consultations and home visits. The emphasis was clear – this was not a scientific endeavor but a real-world feasibility test.

Results

By the project's end, the results were promising (active project period: July, 2021- February, 2022)

- 27 health visitors have completed the project (1 dropout was registered)
- 115 SCN4ALL smart pulse oximeters were distributed and used
- Total of 644 patients engaged (pregnant women (n=242) mean age: 30.2±5.68 years, female relatives (n=307): mean age: 47.16±16.00 years, male relatives (n=95): mean age: 43.22±18.02 years.
- 6097 measurements taken
- successful adaptation throughout bigger cities and smaller villages. (Figure 2)

Figure 2: Local distribution of districts participating in the project with measurement numbers (n). Numbers divided by comma are meaning different measurement numbers from different health visitors living in the same location. (own editing)

Feedback from the 17 participating health visitors who completed a survey was overwhelmingly positive. They felt empowered, more connected with their patients, and were eager to integrate this system into their daily routines. There were suggestions, of course, including optimizing the documentation process to make it less time-consuming. (Figures 3-5)

Figure 3: Testimonials from participating health visitors (own editing)

„I find it beneficial. Compared to previous methods, it brings a different kind of knowledge into the care process."

„It's an excellent screening and prevention opportunity. Those who received the device were very grateful, saying we looked after them. I hope we can continue, and I would like it if a small manual could be produced, maybe occasional training too. I think the initially trained health visitors could be trained to assist if this method becomes widespread. Thank you for the opportunity. I hope we'll work together for a long time."

„Thank you very much for the opportunity. I'm delighted to have been a part of it, and I hope it continues. I will miss the Zoom sessions; I enjoyed participating in them."

Thank you for the opportunity and the support! It's important that this easily usable, pain-free tele-diagnostic system, which supports the health protection of families, becomes widespread nationally."

„Thank you so much for allowing me to participate for „Thank you so much for allowing me to participate for the second time and supporting your work with great joy and enthusiasm. I've been working for 37 years and can now say I'm a,second-generation' health visitor. If we provide extra care, monitoring, and attention with medical support and analysis, it can only be good. The motto: „WE'RE LOOKING OUT FOR YOU!" is essential and appealing because everyone likes to be taken care of a bit more for the sake of preserving their health. I learned and experienced a lot during consultations and case discussions. It was good to see the enthusiasm of my fellow nurses."

Figure 4: Increased sense of connectedness during the project (own editing)

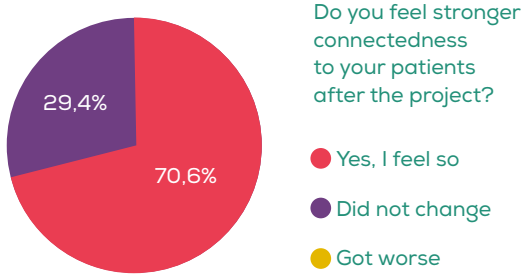
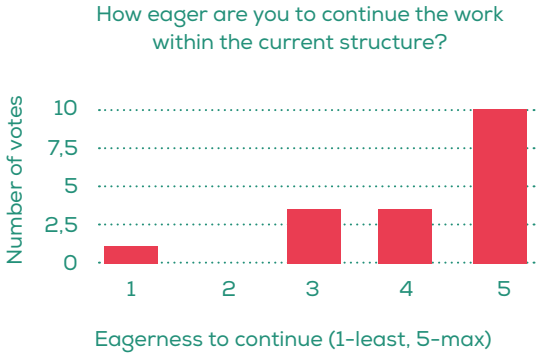


Figure 5: Eagerness to continue the project (own editing)



Since the project's official conclusion in February 2022, its effects have persisted. As of April 2023, measurements ballooned to 17,491 from 1,468 individuals since the participating health visitors were eager to continue. This also indicates the system's acceptance and its potential to revolutionize how health visitors engage with family health protection.

Discussion

Our assumption is that a 2-minute measurement yields more health insights about a patient than a 2-minute discussion with a skilled healthcare professional or a 2-minute questionnaire. Nonetheless, even if the insights derived were on par with a simple query about a patient's wellbeing, it's evident that reaching out to a patient eight times over six months would incur higher time, effort, and financial costs compared to the expenditures of this project. The data underscores the program's immense potential: in six months, participants on average underwent more than eight measurements, surpassing the typical amount of information the healthcare system usually gathers about a patient. Ensuring the right volume and caliber of information, especially when largely collected autonomously by

the patient, paves the way for a transformation in individualized and data-driven healthcare.

Given this success, the future of the project looks promising with recommendations including:

1. Increasing the number of participating health visitors and patients to ensure a more representative sample.
2. Collaborating with general practitioners operating within the same regions as participating health visitors.
3. Allocating funds to compensate health visitors and physicians for their additional efforts.
4. Examining the cost-effectiveness of this technology from a health economics perspective.
5. Launching sub-projects to further delve into the diagnostic capabilities of pulse wave analysis.

Conclusion

We conclude that the integration of innovative telemedicine systems like SCN4ALL in health visitors' routines has little or no technical obstacles. After further studies will be done on proving the hypo-thesized health, and health-economic benefits of the usage of the system – which is anticipated by the supportive data and results found in the medical literature – it might be reshaped how we approach cardiovascular screening and health monitoring. It is not only a testament to Hungarian innovation but also a call to action for the broader healthcare community to embrace such technological advances for the betterment of patient care.

Authorial division of labor
Dr. Dániel Kulin: data precessing, editing
Marianna Várfalvi: consultation, recruiting, project management
Dr. Sándor Kulin Sándor: conceptualization, medical supervision

The manuscript was read and approved by all authors.
The authors have no conflict of interests.

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