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Dialysis Nurses' Experiences with Continuous Glucose Monitoring in Hemodialysis Patients Treated with Insulin

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Abstract. This study examines dialysis nurses' perspectives on the use of continuous glucose monitoring (CGM) in hemodialysis (HD) patients with insulin-treated diabetes. Through eight semi-structured interviews, nurses highlighted how CGM improved the patients' and nurses' ability to monitor patients' glucose levels, enhancing patient engagement and nursing practices. The nurses emphasized the value of real-time glucose data during dialysis sessions, allowing for timely adjustments and better glycemic control. Despite these advantages, they also noted challenges, including a lack of knowledge regarding CGM technology. Overall, the nurses viewed CGM as a beneficial tool, providing a clearer understanding of patients' glucose patterns. Furthermore, the findings reveal that CGM fosters better communication and awareness among healthcare professionals and patients, ultimately improving the care provided to insulin-treated HD patients.

Keywords. Continuous glucose monitoring, hemodialysis patients, nursing perspective, insulin-treated diabetes

1. Introduction

Effective diabetes management is a critical aspect of care for hemodialysis (HD) patients, particularly those treated with insulin [1]. Maintaining stable blood glucose levels in this population is often challenging due to the kidneys' central role in glucose and insulin metabolism and the glucose fluctuations caused by dialysis [1-2].

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In recent years, continuous glucose monitoring (CGM) has emerged as a valuable tool for providing real-time data, helping patients and healthcare professionals make informed decisions about diabetes management [3]. CGM technology has shown promise in various patient groups by improving glycemic control and reducing complications [4]. Given its potential benefits, CGM is increasingly being proposed for use in diabetes patients undergoing HD. Consequently, healthcare professionals in nephrology need to stay updated on the optimal use of the technology [5]. However, its implementation in the context of HD patients remains relatively new, particularly from the perspective of healthcare providers responsible for daily management [6]. Dialysis nurses, in particular, play a key role in managing the complex needs of these patients and are well-positioned to provide insight into the practical benefits and challenges of using CGM technology in this setting [7].

Despite the growing body of research on CGM's clinical impact, there is limited qualitative research exploring the experiences and perspectives of dialysis nurses. Understanding these experiences is crucial for optimizing the integration of CGM into routine care and improving outcomes for insulin-treated patients undergoing HD. This study aims to fill this gap by employing a qualitative approach to investigate dialysis nurses' experiences with CGM in HD patients with insulin-treated diabetes.

2. Methods

2.1. Study design

A hermeneutic-phenomenological approach was employed to gain in-depth insights into the experiences of dialysis nurses and capture their perceptions of the technology's impact on patient care. Semi-structured interviews were conducted to allow flexibility in exploring the participants' insights and reflections.

2.2. Participants and study setting

Eight HD nurses from two hospitals in the North Denmark Region, who had cared for patients wearing CGM devices for six weeks (as part of a crossover trial), were recruited for the interviews. The nurses were not involved in the design phase of the study but received training on how to use the CGM and interpret its readings. All nurses from the two dialysis sites were invited to participate, and all individuals who expressed interest in participating were included in the study.

2.3. Data collection

Data were collected through in-depth, face-to-face interviews with the eight participating nurses. The interviews, lasting between 25 and 40 minutes, were conducted in private rooms within the dialysis units between February 2022 and December 2023. A semi-structured interview guide was used, designed to explore the nurses' experiences with the implementation of CGM in the care of HD patients. The interview guide included both open- and closed-ended questions to encourage varied levels of reflection. All interviews were audio-recorded with participant consent and later transcribed verbatim for analysis.

2.4. Analysis

The interview data were analyzed using thematic analysis, as outlined by Braun and Clarke [8]. This allowed the researchers to systematically identify and analyze patterns and themes across the data, capturing the key perspectives of the dialysis nurses. The process involved familiarization with the data, generating initial codes, searching for themes, reviewing themes, and refining them. Reflexivity was maintained throughout to ensure credibility and trustworthiness in interpreting the data.

2.5. Ethical considerations

While formal ethical approval was not required under Danish legislation, the study adhered to ethical guidelines to protect the informants' rights. Informed consent was obtained from all participants, and confidentiality was ensured. Personal data were stored securely, and pseudonyms were used to maintain anonymity.

3. Results

3.1. Characteristics of the informants

The informants were all females and had a median age of 35.5 (26 to 51) years with three and five employed at the two study sites, respectively. The average (SD) duration of nursing experience among the informants was 13.0±8.7 years, with 8.4±8.5 years specifically in the field of dialysis.

3.2. Theme 1: Improvement of Diabetes Management among Dialysis Patients

Nurses reported that CGM enhances diabetes management among patients by providing ease of use and immediate feedback. This functionality motivates patients to monitor their glucose levels more frequently, leading to better insulin management. CGM also empowers patients to take a more active role in their health, increasing awareness of their dietary habits and activity levels: "*I think they have become much more aware of their diabetes and what they can do to adjust their blood sugar levels*". While wearing a sensor has been motivating for many patients, some nurses have observed that once the sensor is removed, it can be difficult for patients to maintain their motivation to focus on diabetes management: "*It was clearly more motivating for them when it was easy to just see what the measurement was*".

3.3. Theme 2: Improvement of Nursing Practice and Optimized Blood Sugar Control

Nurses reported that CGM significantly enhances their practices for managing diabetes in HD patients. By facilitating discussions about diabetes management, CGM increases awareness of related issues and improves proactive monitoring and timely interventions. The technology provides real-time glucose insights, enabling quicker assessments and decision-making during dialysis, which helps prevent significant fluctuations in blood sugar levels, particularly hypoglycemia: "*Then we can help them during dialysis. So,*

they don't experience those big fluctuations". Furthermore, CGM empowers patients to engage actively in their diabetes management, promoting self-sufficiency: "*The patients can be as self-sufficient as possible, so they may well check up on themselves*".

3.4. Theme 3: Barriers and Adaptation Issues

While nurses reported only minor issues using CGM in HD patients, such as discomfort from sensor placement and frustrations with nighttime alarms, the overall sentiment is positive. Concerns about sensor reliability and potential workflow disruptions were noted, yet many nurses expressed confidence in the technology's benefits: "*80% of the time I think I trust it*". According to several nurses, improved training and communication about CGM use could mitigate some concerns and enhance its implementation in clinical practice.

3.5. Theme 4: Target Groups for CGM Technology

Nurses emphasized the value of CGM for all dialysis patients, highlighting its role in improving blood sugar management and enhancing independence. However, some nurses indicated that CGM is particularly useful for those with fewer resources, as it simplifies glucose monitoring compared to traditional methods. Furthermore, they noted that it could benefit those with good appetites and new HD patients: "*For patients starting dialysis where you have to figure out how much their blood sugar is affected by the dialysis*".

4. Discussion

Nurses reported that CGM significantly improves diabetes management by empowering patients to participate more actively in monitoring their glucose levels. This increased engagement aligns with existing literature, which indicates that enhanced self-management capabilities correlate with improved glycemic control [9]. However, the concerns regarding a decline in motivation after CGM removal highlight the potential need for continuous CGM monitoring rather than periodic use, or the implementation of strategies to support the maintenance of good habits after the removal of CGM devices.

The findings demonstrate that CGM not only benefits patients but also enhances nursing practice by enabling timely interventions and facilitating improved communication with patients about diabetes management. This aligns with existing research, which suggests that sharing CGM data with others fosters active and collaborative decision-making based on the insights provided by the technology [10].

The overall positive sentiment toward CGM indicates a readiness to adapt to CGM technology and the potential for wider clinical implementation. However, as remarked by some nurses, training for patients and staff is essential for successful integration into routine care. Without sufficient insight into how CGM works, healthcare providers may struggle to interpret glucose data correctly or miss opportunities for timely interventions. Thus, optimal use of CGM technology requires a thorough understanding of its features, functionalities, and limitations. Similarly, patients need to be well-informed about how to use CGM effectively to engage in their self-management [11].

As only eight nurses agreed to participate, data saturation was not achieved, which could influence the depth and range of the insights gathered. Furthermore, since the

informants participated in a cross-over study involving CGM under evaluation, their responses might reflect heightened motivation to engage with the technology, potentially influencing their perspectives on its use. This may lead to a more favorable view of CGM, as informants may have been more inclined to recognize its benefits.

5. Conclusions

This study highlights the multifaceted benefits of CGM technology for diabetes management in HD. CGM facilitates more proactive and informed decision-making, both for healthcare professionals and their patients. The technology has the potential to foster better glycemic control through real-time monitoring and to increase patient engagement. Despite minor barriers such as sensor discomfort and alarms, the overall sentiment towards CGM is positive, with nurses expressing confidence in its benefits. However, to fully leverage CGM's potential, training for both healthcare professionals and patients is essential, ensuring that the technology is used effectively in routine care. Finally, while CGM appears beneficial for all HD patients with insulin-treated diabetes, its impact is particularly noted in those with fewer resources and new dialysis patients, emphasizing the importance of considering personalized care strategies.

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