Review Article

From diabetes care to prevention: review of prediabetes apps in the DACH region

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Abstract: The rapid proliferation of mobile health (mHealth) apps for diabetes and prediabetes care has surged, driven by the growing interest and research in digital health interventions. However, as the number of these apps continues to expand, both patients and clinicians are finding it increasingly challenging to identify the most suitable app for their specific needs. This review sought to explore the current landscape of mHealth apps tailored for prediabetes within the DACH region (Germany, Austria and Switzerland), assessing their value to both patients and clinicians while examining how effectively they integrate into the wider healthcare ecosystem. Mobile apps were identified through a search of Google Play, the App Store, and the German Digital Health Applications directory (DiGa), using the keywords "diabetes", "prediabetes", and "blood glucose". From an initial pool of 76 apps, 8 met the inclusion criteria. These criteria specified that the apps must be available in the DACH region, specifically target prediabetes or its risk factors (such as obesity), have been updated within the past three years, and hold relevant certifications. The analysis revealed that while many applications provide valuable features such as food diaries, blood glucose monitoring, and compatibility with fitness apps, they frequently fall short in addressing the specific needs of prediabetes patients and supporting their entire patient journey. Additionally, clinician-facing features require significant enhancement to ensure seamless integration into existing workflows. Moreover, very few applications are supported by evidence-based research to substantiate their efficacy claims, highlighting a critical gap in the validation of these digital tools.

Keywords: Mobile health (mHealth); prediabetes; prevention

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Introduction

Background

The global surge in prediabetes is rapidly escalating, posing a significant risk of advancing to type 2 diabetes mellitus (T2DM), which led to an alarming 6.7 million deaths in 2021 alone and threatens to trigger a worldwide health crisis (1). Projections indicate that by 2045, 8.3% of the global population will be affected by prediabetes (2). Despite a staggering 70% risk of progression to T2DM (3), awareness of prediabetes remains critically low, with only about half of individuals with diabetes being aware of the condition (4).

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Additionally, those who develop T2DM face up to 42% higher healthcare costs (5). Addressing this issue requires a strategic shift from managing diabetes to preventing it, which involves early diagnosis through assessments based on risk factors such as excess weight, high blood pressure, insufficient physical activity, smoking, dyslipidemia, cardiovascular disease, and family history of diabetes (3).

Type 2 diabetes can be both managed and prevented through lifestyle intervention programs. Clinical trial data has shown a significant decrease in the progression from prediabetes to T2DM in individuals who achieved even modest weight loss by adopting healthier dietary habits and increasing physical activity; these lifestyle changes have proven to be highly effective in reducing the risk of developing full-blown diabetes (6). Diabetes prevention programs (DPPs) have been broadly adopted and proven successful in helping individuals achieve weight loss and enhance health behaviors, including regular physical activity and maintaining a balanced diet (7,8). These programs play a critical role in empowering people to make sustainable lifestyle changes that significantly lower their risk of developing diabetes.

Rationale and knowledge

Patients frequently struggle to find essential information and maintain adherence to lifestyle intervention goals, while healthcare providers are often limited by time and resources, hindering their ability to offer comprehensive support; this creates a critical opportunity for technology to bridge the gap (9,10). Mobile applications, equipped with features such as personalized content delivery, reminders, and continuous support, can empower patients in their health journeys, integrating tools like smartwatches and chatbots can enhance user engagement and simplify app usage (11-14). Moreover, these technological solutions can overcome barriers of time and accessibility, offering 24/7 support from any location, thus providing a more comprehensive and accessible healthcare experience (15).

Previous research has demonstrated that mHealth solutions can play a pivotal role in preventing type 2 diabetes by significantly promoting weight loss and boosting physical activity levels (7). Furthermore, emerging evidence highlights the positive impact of digital health interventions on the self-reported quality of life for individuals with prediabetes and type 2 diabetes; these benefits are largely driven by enhanced access to educational resources and robust monitoring tools (16). However, as the number of these technologies continues to expand, both patients and clinicians are finding it increasingly challenging to identify the most suitable app for their specific needs (17). This is especially relevant given that only a limited number of the available apps have undergone systematic assessment or rigorous evaluation (18,19).

Objective

This review aimed to examine the current landscape of mHealth apps targeting prediabetes in the DACH region (Germany, Austria, and Switzerland). The focus was on evaluating their value for both patients and clinicians, as well as analyzing how seamlessly these apps integrate into the broader healthcare ecosystem.

Methods

We conducted a comprehensive analysis, comparing and evaluating the functionality of various mobile apps targeting diabetes and prediabetes within the DACH region.

Data sources and search strategy

To identify relevant mobile apps, we conducted a thorough search across the Swiss Google Play and App Store, and the German Digital Health Applications directory (DiGa), employing the targeted keywords “diabetes”, “prediabetes”, and “blood glucose”. The search was conducted over the course of June and July 2024.

Inclusion and exclusion criteria

Apps identified through our search were evaluated and filtered according to specific inclusion and exclusion criteria. We included apps that were accessible in the DACH region (Germany, Austria, Switzerland), targeting prediabetes and related risk factors like obesity, and not just diabetes. Apps also had to be updated within the last three years and possess relevant certifications such as Conformité Européene (CE mark), Food and Drug Administration (FDA) certified, International Organization for Standardization Quality Management System for Medical Device Manufacturing (ISO 13485), or DiGa certification. Conversely, we excluded apps that were unavailable in the DACH region, focused solely on diabetes management (e.g., only management of insulin pumps), had not been updated in over three years, lacked certifications, or offered only

general wellness and lifestyle content.

Analysis of selected apps

Our evaluation was informed by the sociotechnical framework for assessing patient-facing eHealth tools, validated by 57 experts from 18 countries and 9 stakeholder groups, which emphasizes the importance of considering context in the evaluation of healthcare technologies (20). This framework extends beyond assessing individual technologies, accounting for critical factors that impact eHealth adoption among both patients and clinicians, and examines how the technology integrates into the larger healthcare ecosystem (20-23). To minimise bias, the initial analysis of each included application was independently conducted by the first two authors, each spending 60–90 minutes testing and exploring every app. Their findings were then compared, followed by an in-depth discussion to critically refine and align the reviews of each application.

The evaluation was structured to examine three primary criteria clusters. First, it focused on the value created for patients, examining whether the app offers a broad range of features to demonstrate usefulness, supports the entire patient journey, provides comprehensive educational materials, and is backed by clinical evidence. Second, the evaluation considered the value for clinicians, assessing how the app impacts clinical workflows, offers adequate training and support materials, and presents valid evidence, such as cost-benefit analyses, to substantiate its efficiency claims. Lastly, the review addressed the app's integration into the broader healthcare ecosystem, evaluating its interoperability, data management capabilities, infrastructure requirements, and transparency of the business model.

Results

From an initial pool of 76 apps, eight met the inclusion criteria. The file (https://cdn.amegroups.cn/static/public/mhealth-24-57-1.xlsx) displays the list of apps identified from the search and illustrates the application of inclusion and exclusion criteria used to select the apps for the final analysis.

None of the eight applications that met the inclusion criteria fully satisfied all the assessment criteria. However, DiabTrend stood out for its "Value for Patients" and "Fit into Ecosystem", while Glooko excelled in both "Value for Patients" and "Value for Clinicians". Most of the apps primarily emphasize diary-like features for diabetes management, particularly logbook functionalities to monitor blood glucose levels. Additionally, all applications demonstrated compatibility with fitness apps like Google Fit and Apple Health, and many supported integration with glucometers for more efficient blood glucose tracking.

An interesting finding was that certain applications allowed users to specify their diabetes diagnosis during profile setup. While all of these apps included options for type 1 and type 2 diabetes, a few, like Diabetes:M, also offered the choice to select prediabetes or no diabetes at all. However, selecting a different diagnosis did not seem to alter the app's functionality. *Table 1* offers a high-level summary of the assessment results, where a (–) indicates that the app did not meet a specific criterion or lacked the necessary information, a (+) signifies partial fulfillment of the criterion, and (++) denotes full compliance with the criterion.

It is important to acknowledge that the inherent subjectivity of certain assessment criteria is a recognized challenge in prior research (20). The inclusion of subjective measures has been debated, as such criteria can introduce variability into assessment outcomes due to individual perspectives (18,24,25). Previous research confirms that specific characteristics of eHealth tools are particularly difficult to assess with consistency, and low inter-rater agreement, observed in widely recognized initiatives such as ORCHA, MindTools, and One Mind Psyber Guide, underscores this issue (25).

Despite these challenges, many experts support including subjective criteria due to their critical role as primary drivers of technology adoption (20,21,23,24,26). For example, integrating user experience evaluations into the review process can enhance adherence and lead to better health outcomes (27). To mitigate the effects of subjectivity, scholars and experts recommend providing assessors with clear, specific guidance to ensure a consistent approach to evaluating these criteria (20). Accordingly, the file (https://cdn.amegroups.cn/static/public/mhealth-24-57-2.pdf) offers a detailed analysis of each app based on the predefined assessment criteria, to enhance the transparency of the evaluation process.

The CONTOUR® DIABETES App by Ascensia Diabetes Care, based in Basel, Switzerland, is a smart blood glucose diary that has been available since 2016. It syncs glucose readings from compatible CONTOUR® glucometers and provides alerts for abnormal blood glucose levels. The app's value for patients was rated as limited, as it primarily focuses on tracking blood glucose and generating reports for healthcare providers, but lacks broader features.

Table 1 Summary of the assessment results for the reviewed apps

Assessment criteria/app	CONTOUR® DIABETES	VidaGesund	Diabetes:M	Diab Trend	Glooko	mySugr	OneTouch Reveal	SocialDiabetes
Value for patients								
Offers advantages for patients through a broad set of features (to demonstrate usefulness; e.g., allows users to track glucose levels, nutrition, weight, medication, physical activity, customizable reminders, goal-setting, connectivity to fitness trackers)	+	++	+	++	++	+	+	+
Encompasses the entire patient journey, including prediabetes stage (e.g., features for users suffering from obesity or insulin resistance, not only patients already diagnosed with diabetes)	+	+	+	++	++	–	+	+
Provides robust educational resources for patients (e.g., the material is present and comes from verified sources)	+	++	+	++	+	+	++	+
Offers credible clinical evidence (e.g., published results of clinical trials, user research, real world evidence)	++	+	–	+	++	++	+	–
Value for clinicians								
Delivers advantages for clinicians (e.g., information about benefits for clinicians or clinic/hospital management)	–	–	+	–	+	–	+	++
Addresses the potential effects on clinical workflow	–	–	++	–	++	–	+	++
Provides comprehensive training and support resources for clinicians	–	–	+	–	++	–	++	–
Presents evidence to substantiate claims of efficiency (e.g., a cost-benefit analysis to support efficiency claims)	–	–	–	–	++	–	+	–
Fit into the ecosystem								
Business model transparency (e.g., B2B, B2C, B2B2C. Transparent about how they get paid and by whom)	+	++	++	++	–	++	–	–
Offers clear information on data management and privacy policies	++	++	++	++	++	++	++	++
Addresses data sharing and interoperability	++	++	++	++	++	++	++	++
Requires no additional infrastructure to be functional	–	++	++	++	++	++	+	++

(–) the app did not meet the criterion or lacked the necessary information, (+) partial fulfillment of the criterion, (++) full compliance with the criterion.

Although it includes options for prediabetes and various diabetes types, the app is primarily centered on glucose monitoring, offering minimal patient education and support within the app itself. However, the app received a high rating for clinical evidence, as it references scientific studies. On the clinician side, the app offers no significant benefits or workflow integration. In terms of fitting into the broader healthcare ecosystem, the app's reliance on CONTOUR® NEXT glucometers limits its accessibility.

The Diabetes-App + Blutdruck-App (VidaGesund) by VidaWell GmbH, based in Baden-Württemberg, Germany, serves as an interactive health diary and integrated health record for self-management. The app allows users to track glucose levels, blood pressure, nutrition, weight, medication, and physical activity, with additional features like customizable reminders, goal-setting, and connectivity to devices such as Google Fit and Fitbit. While the app offers comprehensive functionality suitable for both diabetic and prediabetic patients, it does not specifically cater to prediabetes, focusing more on diagnosed cases. Patient education is provided through blog posts and articles, though the clinical evidence supporting these materials is limited. The app lacks specific features for clinicians, which was a significant drawback. However, the app integrates well into the broader healthcare ecosystem, offering transparent pricing, data management, and privacy policies, and functioning as a standalone solution without requiring additional infrastructure.

Diabetes:M by Sirma Medical Systems AD is a cloud-based diabetes management app from Sofia, Bulgaria, offering extensive features for logging glucose levels, insulin injections, carbs, weight, and other health metrics. It also includes a food database and remote monitoring for clinics. While the app provides valuable tools such as a bolus advisor and data visualization, its features primarily target diagnosed diabetes patients, with minimal adjustments for prediabetes users. The app offers some blog-based training resources, but lacks strong evidence of effectiveness. For clinicians, the app provides patient monitoring and report generation, but lacks direct interaction features such as appointment scheduling. The app integrates well into the healthcare ecosystem, with transparent business practices, strong data management, and interoperability.

DiabTrend by DiabTrend AI Analytics Kft. is an artificial intelligence (AI)-driven diabetes management app headquartered in Hungary that offers a range of advanced features, including AI-based food recognition with portion estimation, blood glucose prediction, and a comprehensive logbook for various health metrics. It received high ratings for creating value for patients, thanks to its extensive features, including integration with other apps, a recipe database, educational resources, and gamification elements. The app supports the entire patient journey, including prediabetes management, and offers strong data management and privacy practices. However, it falls short in providing clinical value, as it only offers report generation without addressing workflow impact, training, or evidence-based claims.

Glooko, based in California, USA, offers a comprehensive diabetes management app designed to improve patient outcomes by tracking blood sugar, hemoglobin A1c (HbA1c), weight, physical activity, nutrition, and medication. The app facilitates patient-clinician communication through data sharing, report generation, and connectivity with various diabetes-tracking devices. It received high ratings for creating patient value, addressing the entire patient journey, and providing substantial clinical evidence. However, the app's educational content is limited, accessible only through its website, and lacks direct scientific references. Clinician benefits include remote patient data access and workflow efficiency improvements, supported by training resources. Despite these strengths, the app's ecosystem fit was rated lower due to non-transparent pricing and the need for additional assumptions regarding clinician costs. However, its robust data management, privacy policies, and flexibility in device integration were positively rated.

MySugr, a diabetes diary app by mySugr GmbH in Vienna, Austria, focuses primarily on tracking blood glucose levels throughout the day and in response to various factors like meals and exercise. The app includes features such as a logbook for blood glucose, a bolus calculator, HbA1c, and connectivity with Google Fit, Apple Health, and compatible glucometers. It primarily serves diagnosed diabetes patients with limited scope beyond blood glucose monitoring. Training and support materials are available on the website, but the app itself lacks these resources. MySugr does provide valid clinical evidence, which improved its rating in that area. However, it offers little value for clinicians, resulting in a low rating for clinician support. The app's integration into the broader ecosystem was rated highly due to its transparent subscription model, detailed data management, and privacy policies, and its ability to function as a standalone tool while offering connectivity with various health apps and devices.

The OneTouch Reveal app by LifeScan, based in Pennsylvania, USA, is a diabetes management tool focused on tracking blood glucose, insulin, physical activity, and

nutrition to support patients. Despite being unavailable for direct analysis in Switzerland, the app was evaluated using its website. The app offers a holistic approach with features like data tracking, personalized goals, reminders, and report generation, but was rated average for value creation due to several limitations, including restricted device compatibility (only OneTouch glucometers) and language barriers. While it provides robust educational content through blog posts, the app lacks in-app education features. The value for clinicians was rated average, offering basic data-sharing and remote monitoring functions, but lacking direct clinical evidence and transparency in its business model. The app's integration into the broader ecosystem was rated average, with concerns over limited device compatibility and unclear pricing for clinicians, though it received high ratings for its data management and privacy policies.

SocialDiabetes, based in Barcelona, Spain, offers a diabetes management app designed to optimize patient outcomes by centralizing relevant data for patients and healthcare professionals. The app provides holistic tracking features such as glucose, blood pressure, HbA1C, and physical activity, along with report generation and device connectivity. However, it received an overall average rating for patient value due to language issues (mixed German, English, and Spanish), lack of clinician connectivity, and a food database that excludes DACH region products. The patient journey is also rated average, as the app focuses on diagnosed patients and lacks sufficient education and evidence support, with blog posts that are not available in German and lack credible sources. Clinician value was rated average despite some highly rated features like remote monitoring, appointment scheduling, and direct patient communication, due to the absence of training materials and evidence. The app's integration into the ecosystem also received an average rating, driven by unclear business model transparency and conflicting information about its certification. Nonetheless, the app was positively rated for its extensive data management, privacy policies, and compatibility with various devices.

Discussion

Value for patients

Most applications demonstrated strengths in consistently tracking dietary and lifestyle data, such as blood glucose levels, weight, physical activity, nutrition, medication, blood pressure, and insulin levels. Many applications also included features for generating reports and sharing patient data with clinicians. Additionally, several apps offered device and application connectivity, though compatibility varied, with some apps not supporting devices from other brands (e.g., OneTouch). Noteworthy features included comprehensive patient support, gamification elements, and AI-enhancements.

Regarding patient education, most applications provided user guides or educational content, typically in the form of blog posts or videos. However, a significant weakness identified was the often-limited scope of the patient journey. Although some apps allowed users to select their diabetes status (e.g., prediabetes), the functionality remained largely focused on patients with diagnosed type 1 or type 2 diabetes, with no meaningful adjustments for prediabetes. Another drawback was language accessibility, particularly in U.S.-based applications, which frequently offered only English or Spanish as language options, often limited to the application's webpage.

The educational content varied widely; while some applications covered a broad spectrum of the diabetes journey, others were narrowly focused on specific aspects such as nutrition, exercise, or the technical use of the app. Moreover, educational resources were often accessible only via the application's webpage rather than within the app itself, and the content frequently lacked evidence-based information or properly cited sources.

To enhance value for patients, it is recommended that apps expand device and application compatibility, offer personalized data insights based on collected data, enable real-time data sharing, and provide personalized patient reports. Personalization is particularly crucial, as several studies have highlighted that the inability to customize an app to meet individual needs such as specific diagnoses, symptoms, medications, or treatment stages, can significantly reduce adoption rates and may even lead to the abandonment of the tool (21,28-30). Ensuring that the app can adapt to individual patient needs is key to fostering engagement and long-term use (31).

Additional suggestions include incorporating gamification features, improving language accessibility to ensure user-friendliness across the DACH region, and delivering comprehensive, evidence-based health education that accounts for the entire prediabetes customer journey. Research indicates that interactive design features can influence the decision to adopt digital health tools (21,32,33). Additionally, prior studies have highlighted that language barriers, such as limited language options, can

impede adoption and negatively impact user experience, particularly for patients with low literacy levels (21,34-36). Ensuring that tools are both engaging and accessible in multiple languages is crucial to broadening their appeal and effectiveness. Furthermore, the integration of AI features for user support and the provision of information and education is encouraged, as only a few of the analyzed applications currently offer such capabilities.

Value for clinicians

The value provided to clinicians by the reviewed apps was generally consistent, with certain strengths emerging when such features were included. Positive impacts on clinical workflows included remote monitoring of patient data and the generation of patient data reports. Some apps also integrated with external ecosystems for patient data management. Additionally, a few apps offered training materials for clinicians, available as blogs, user manuals, or instructional videos. Noteworthy features included the ability to schedule patient visits remotely and direct communication with patients through the app.

However, significant weaknesses were also identified on the clinician-facing side. Several applications either neglected clinician needs entirely or offered only limited functionality, such as basic patient data report generation. While some apps claimed to improve efficiency, they often lacked clinician-oriented training, and only one app, Glooko, provided evidence to support its efficiency claims. In one instance, access to more detailed information was restricted behind clinician registration, limiting the ability to fully evaluate the app.

The benefits for clinicians are significant, even for applications primarily designed with patient-focused features. This is underscored by a systematic review encompassing 147 studies, which found that patients are more inclined to adopt mHealth tools that are recommended by their care team (21). To enhance value for clinicians, apps should incorporate features such as real-time patient interaction, direct communication, and appointment scheduling. These functionalities can help streamline clinician workflows, lessen administrative burdens, and boost clinician adoption of these tools (22,23).

Seamless integration into existing clinical workflows is essential, as studies have shown that an app's alignment with clinical practice and compatibility with current workflows are key factors for successful adoption (23,37-39). In this regard, a management tool like a clinician dashboard could provide substantial added value. Additionally, offering comprehensive training and detailed guides for app usage is crucial, as research indicates that inadequate or insufficient training can significantly hinder clinician acceptance and adoption of new technologies (23,37,40,41).

Furthermore, the strength and quality of clinical evidence supporting an app's claims are vital, as studies have shown that a perceived lack of robust evidence and proof of clinical benefit from mHealth use is a significant barrier to adoption (22,23,37,42-44). Lastly, providing a demo version of the app could be instrumental in encouraging clinician adoption. Research has highlighted that the ability to trial an app before full implementation, referred to as "trialability", can significantly influence decision-making (37,45). Offering a demo or a pilot phase allows clinicians to evaluate the app's effectiveness and usability in a controlled setting, reducing the risk associated with a broader rollout and increasing the likelihood of successful adoption.

Fit into the ecosystem

The fit of the reviewed apps into the broader healthcare ecosystem was generally consistent, with ratings ranging from partially to fully meeting the assessment criteria. Strengths included robust data management and privacy policies, as well as clear information on data sharing and interoperability, which were often comprehensive and well-communicated. Additionally, most apps were effective as standalone solutions, minimizing the need for additional infrastructure, with only a few exceptions like the CONTOUR® DIABETES App, which requires specific devices such as glucometers.

However, a significant weakness was observed in three of the eight apps analyzed, where there was a notable lack of transparency regarding their business models, leaving little to no information available on how these companies were funded.

To enhance ecosystem integration, it is recommended that apps can function without needing additional infrastructure while being compatible with multiple devices and applications for data collection. Studies have shown that clinicians favor tools that seamlessly integrate with the other systems they use daily, reflecting a positive attitude toward such integrated solutions (23,37,46,47).

Data management, privacy policies, data sharing, and adherence to interoperability standards should be prioritized as essential components. Previous studies have demonstrated that these factors are critical not only for

ensuring patient trust but also for clinician confidence in adopting new health technologies. Both patients and clinicians view these aspects as fundamental to the safe and effective use of mHealth tools (20-23). Additionally, greater transparency regarding the app's background, including its financing and business model, should be provided to build trust and credibility (17,20).

Limitations and future research

This study faced several limitations. Given the rapid pace of technological advancements, it is likely that the mobile apps we assessed may have received updates since the research was conducted, potentially altering their features. Additionally, some apps were inaccessible to us reviewers due to stringent verification requirements, such as restricted access only for certain user groups. While we assessed whether the apps made any statements about data security, we were unable to confirm if the apps indeed handled data securely. Furthermore, although we carefully selected search terms to include as many relevant apps as possible, there is still a chance that some pertinent apps were overlooked.

Lastly, it is important to note that our quality assessment was conducted as a high-level review focused on app features and information provided by the developers. This approach did not include verification of real-world implementation success, the quality of certain claimed services (e.g., direct communication with the care team), or an assessment of the apps' functionality over the long term in specific healthcare settings. A comprehensive evaluation of these apps under real-world conditions would therefore offer valuable, complementary insights to our initial assessment, enabling, for example, an in-depth comparison of the quality and performance of individual apps over an extended trial period.

Conclusions

In summary, there is significant potential for apps specifically tailored to the needs of individuals affected by prediabetes. Most of the analyzed apps are primarily designed for patients diagnosed with type 1 or type 2 diabetes, and while some offer the option to select prediabetes as a patient status, they do not adapt their functionalities accordingly. Although these existing apps can be utilized by prediabetic patients, dedicated apps that fully address the entire patient journey, provide education and tools grounded in clinical evidence, and transparently communicate their foundations and objectives could better serve this population.

Furthermore, several areas where current apps fall short or could be improved include enhanced connectivity with a wide range of external devices and applications, AI-supported features like food recognition, clear and transparent communication about pricing policies, and more comprehensive clinician-oriented information. Additionally, ensuring that these apps use appropriate language for the DACH region is crucial to maximize value generation for prediabetic patients and other users. By addressing these gaps, such apps could more effectively meet the needs of this growing patient population.

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Footnote

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