

Designing Cross-Platform Software for Seamless Drug and Alcohol Compliance Reporting

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ABSTRACT

In this paper, the design and development of cross platform drug and alcohol compliance reporting software is explored. This integration of mHealth technologies, using smartphones, wearables and machine learning, has arisen due to the demonstrated need for effective monitoring and intervention tools for managing substance use. It is software meant to provide real-time alcohol and drug consumption tracking and provide personalised feedback and timely interventions. The platform designs users' centric any user can engage the platform effectively using any device and stick to it in the long run. Predictive analytics, AI, and data security future advancements have the potential to revolutionise substance use treatment.

Keywords : Cross-platform software, Drug and alcohol compliance, mHealth technologies, Real-time tracking, Machine learning, Artificial intelligence (AI), Data security, Health technology innovation.

INTRODUCTION

This is an urgent public health issue around the world, substance use disorders including alcohol and drug addiction are major causes of morbidity, mortality, disability, and major societal cost. Traditional approaches for managing and monitoring treatment adherence, i.e., in-person cheque ins, or manual reporting, fall short at creating engagement and real time tracking.

This means patients will go off their recovery plans resulting in relapse and prolonged health issues. New technological tools, including cross platform mobile applications, bring great promise for seamless, continuous monitoring of drug and alcohol use.

These applications use the ubiquity of smartphones and wearable technologies to collect real time data, giving the patients and the healthcare providers the actionable insights to effect timely interventions. In this paper, explore the design, development, and deployment of cross platform software for drug and alcohol compliance reporting, incorporating machine learning, predictive analytics and user centred design principles to improve drug and alcohol treatment adherence and health outcomes.

LITERATURE REVIEW

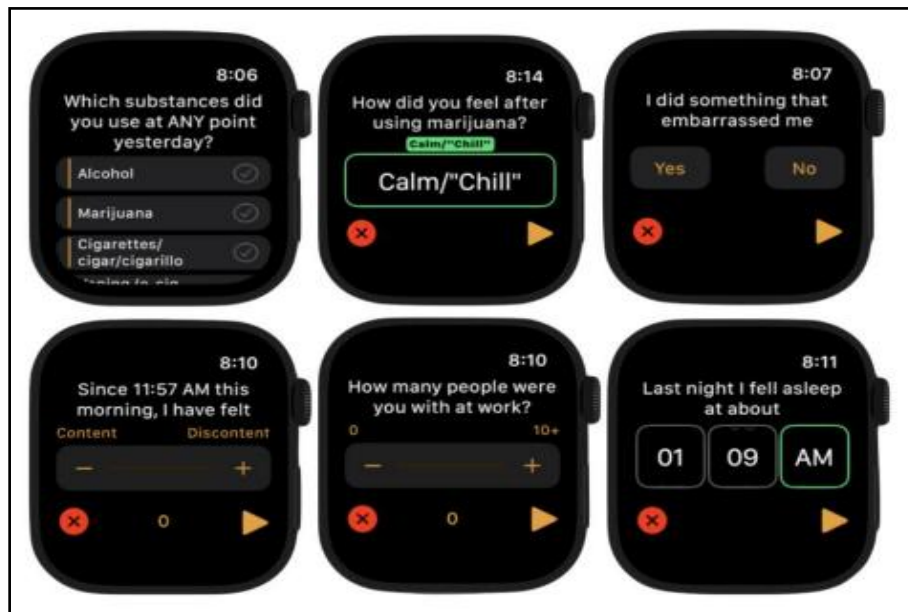
Designing User-Centered mHealth Solutions for Monitoring and Intervening in Alcohol Use Among Young Adults

According to Kunchay, S., 2016. The rapidly rising prevalence of alcohol and notably alcohol use among young adults has underscored the necessity for sufficient tools to observe and deal with alcohol consumption. Over the past few years, cross platform mobile health (mHealth) solutions have emerged as an extremely promising approach for enabling and reducing alcohol related harms.

The strength of these tools rests in harnessing frequent use of smartphones and wearable devices like smartwatches to collect data, and to provide interventions through pushes.

A mounting body of research consistently shows that rates of alcohol use among young adults, between the ages of 18 to 25, are some of the highest, and with huge long term physical, mental and social repercussions; mHealth solutions can boost engagement and compliance through leveraging technology that in users' everyday lives (Smith et al., 2017).

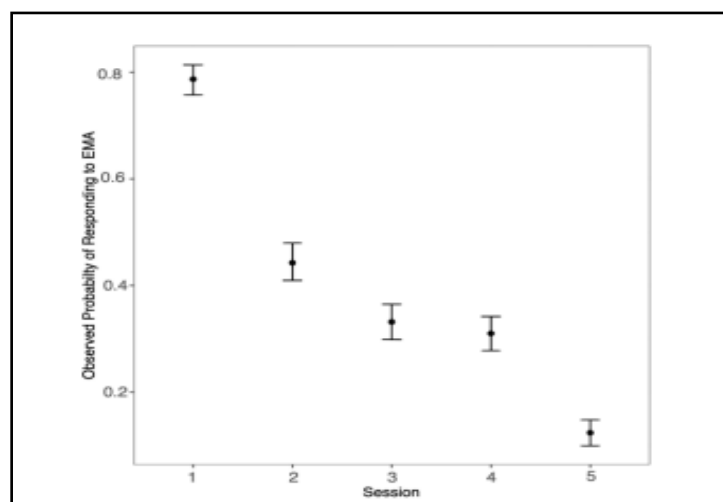
However, the effectiveness of mHealth tools is largely dependent on user centred design thought in relation to the preferences and needs of the target audience. Low adherence, low sustained engagement for intervention and many other factors pose a challenge to engaging young adults in data collection and intervention processes.



(Source: Kunchay, S., 2016)

Figure 1: A portion of EMAs designed and developed for the smartwatch application

However, the integration of sensor based data collection through wearables can substantially improve the accuracy of data and allow real time analysis of one's alcohol consumption patterns. These systems allow for personalised interventions, based on actual behaviour, which increases the likelihood of resonating with users versus traditional static approaches. Studies today show that young adults are more receptive to interventions that make the effects of drinking, such as calculating the impact on health metrics in their real time, tangible (Kunchay, 2016). Additionally, there is a need for seamless association of the content across the various platforms like Android and iOS to make accessibility and useable across a range of devices. The mobile app and wearable device are closely synchronized to track continuous monitoring, hopefully before harmful drinking behavior occurs and be promptly intervened. Behavioural data aligned with the ability to track actionable insights empowers us as not only a tool to reduce alcohol use, but also aid in the monitoring of compliance within vulnerable populations, specifically among young adults (Kiptoo, 2018). However, systems used to deliver alcohol-related health interventions are typically designed without consideration of usability or engagement, and as such can actually have a detrimental effect.

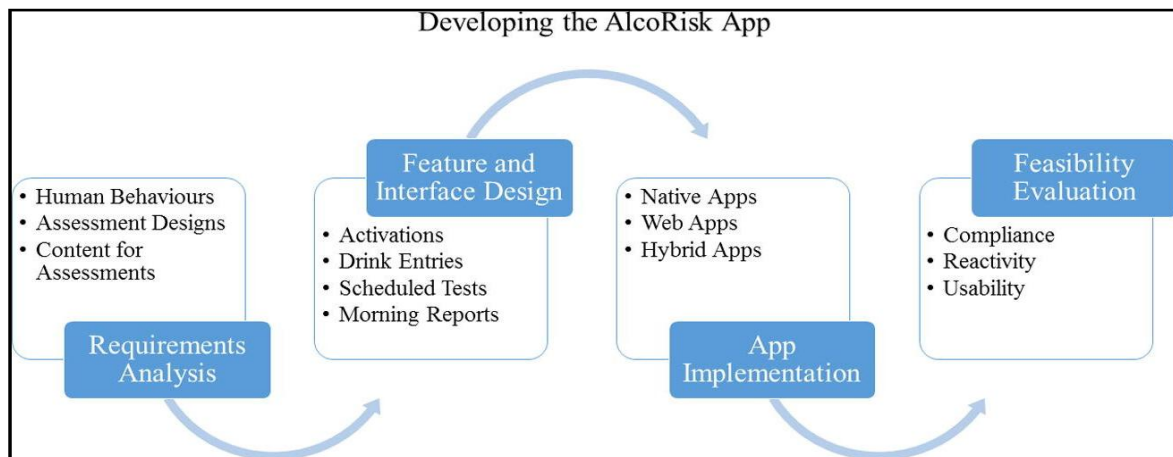


(Source: Kunchay, S., 2016)

Figure 2: Observed probability of participants responding to EMAs by session of day.

Design and Development of the AlcoRisk App for Monitoring Alcohol Consumption

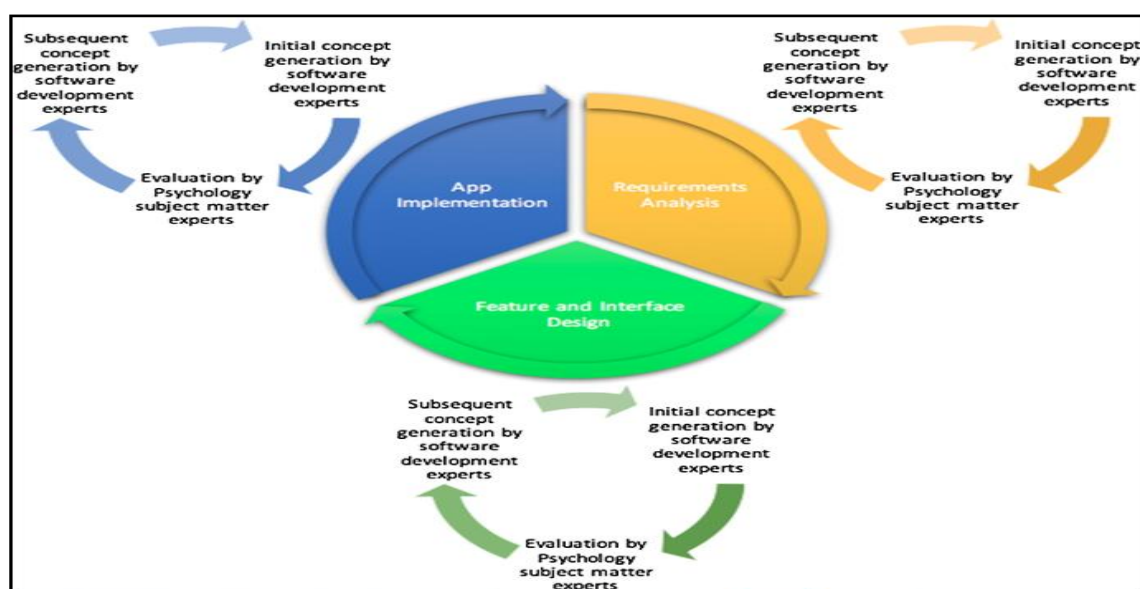
According to Smith et al., 2017. In behavioural research, smartphone apps have rapidly become essential tools to measure the behaviour of people in the wild, as demonstrated by the use of Ecological Momentary Assessment (EMA) to study real time behaviour of humans. EMA provides the opportunity for researchers to collect data regarding how, for example, people consume alcohol, smoke, and exercise in natural environments and learn about real world behaviours. Several studies have explained the use of smartphone apps to track behaviours but the development of these applications, especially when it comes to multidisciplinary fields like psychology, software engineering, and data analytics, has not been much explored. The integration of all these fields is what will eventually lead to creating effective apps, that will collect accurate, reliable and actionable data (Segerstahl, 2011). Design and implementation of apps for monitoring alcohol consumption are a very important area of interest.



(Source: Smith et al., 2017)

Figure 3: Developing the AlcoRisk App

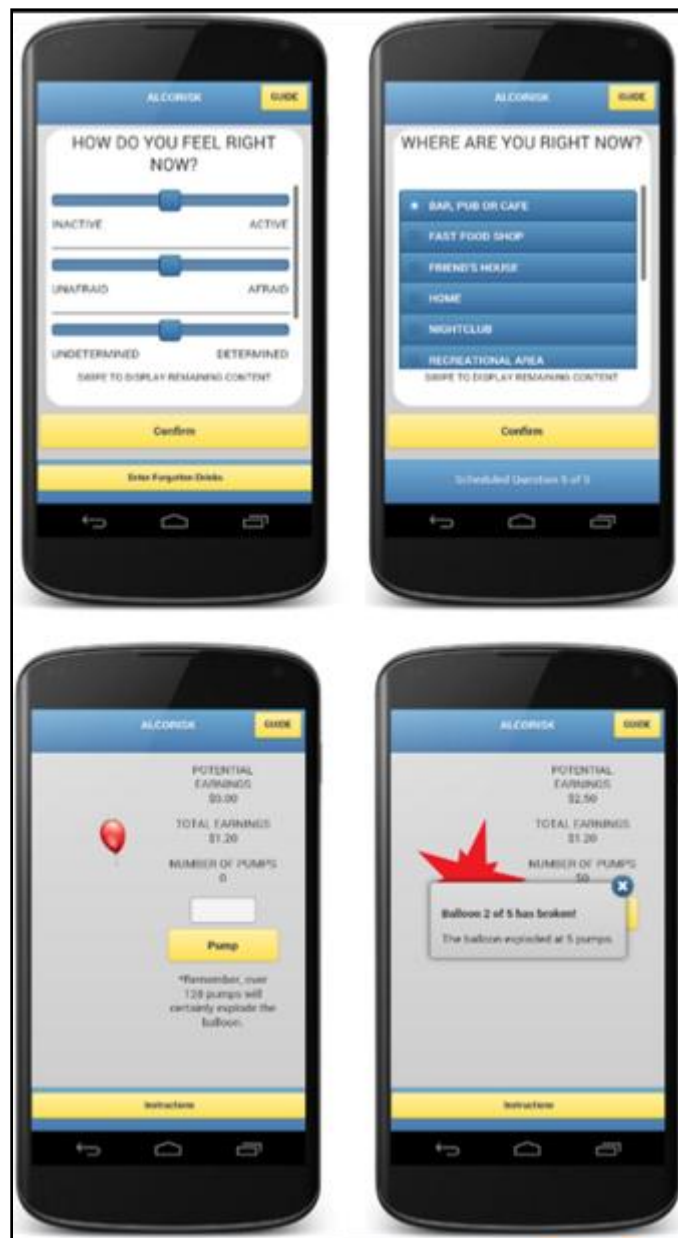
The AlcoRisk app developed for studying alcohol related behaviours illustrates the integration of app development with behavioural science. Researchers can submit their real-time data regarding alcohol consumption and risk-taking tendencies taken using the app. The design process of this app is performed in a structured manner that starts with requirements analysis, continues through feature and interface design to end with the app's implementation. It facilitates technical robustness and conforms with behavioural research goals (Amiribesheli and Bouchachia, 2018). While this AlcoRisk app represents a forward development of mobile health technologies, it also shows some of the challenges present, including getting precise data collection, good engagement with the user, and the smooth combination of behaviour and tech components.



(Source: Smith et al., 2017)

Figure 4: Software development methodology

Additionally, there is the issue of cross platform compatibility since the apps should work similar in all the different devices and all that more useful (Riliskis, 2011). Feasibility study of the AlcoRisk preliminary suggests that the mobile apps have the potential to greatly improve the understanding of patterns of alcohol use and generate valuable data for researchers. Such tools also open up a path to future innovation in digital health, in the areas of drug and alcohol compliance reporting, among other things.



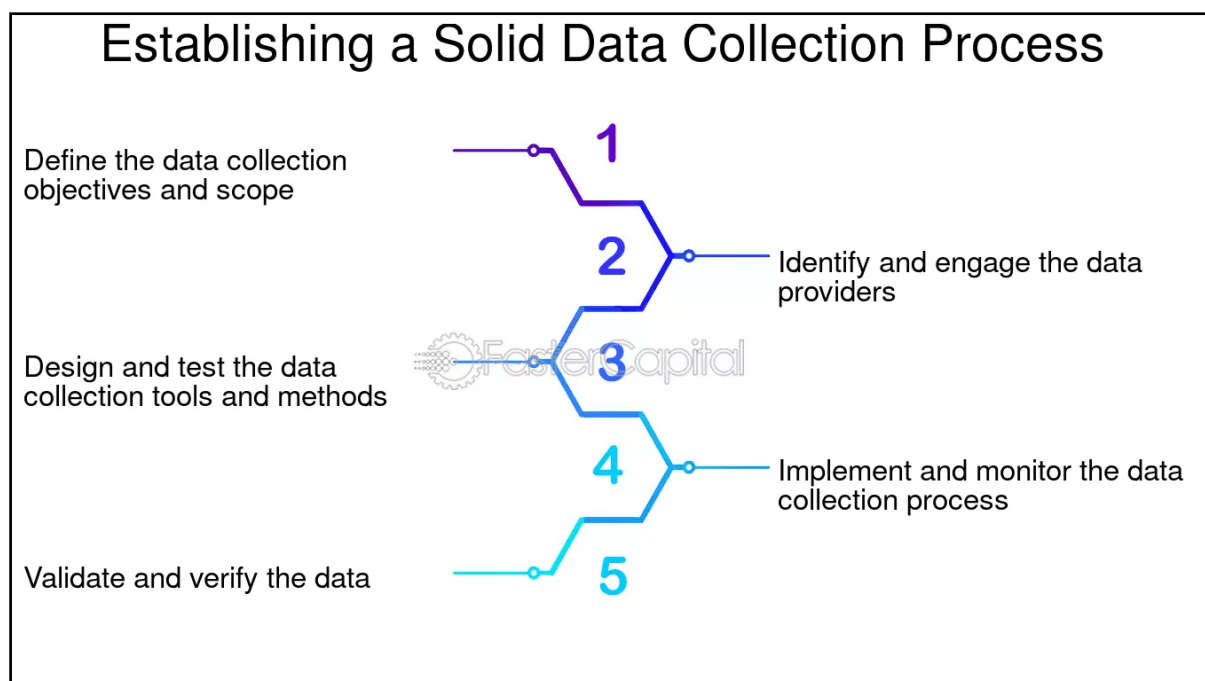
(Source: Smith et al., 2017)

Figure 5: monitored research participants

METHODS

Data collection and data processing

Collecting data for drug and alcohol compliance reports by simply getting the right accurate real time information from various sources such as wearable sensors, mobile application and collectors. It can include tracking physiologic data such as heart rate, or activity levels; or behavioral data such as alcohol consumption logs (Fisher, 2017). User feedback, through the self reporting or geolocation data of a patient, is also considered as need to have a complete picture of a patient's behaviour during the process. It stores data securely, is compliant with privacy, does pre processing on data for inconsistencies or missing values. Finally, this clean, structured dataset becomes the basis upon which further data analysis and predictive modelling can be leaned upon.

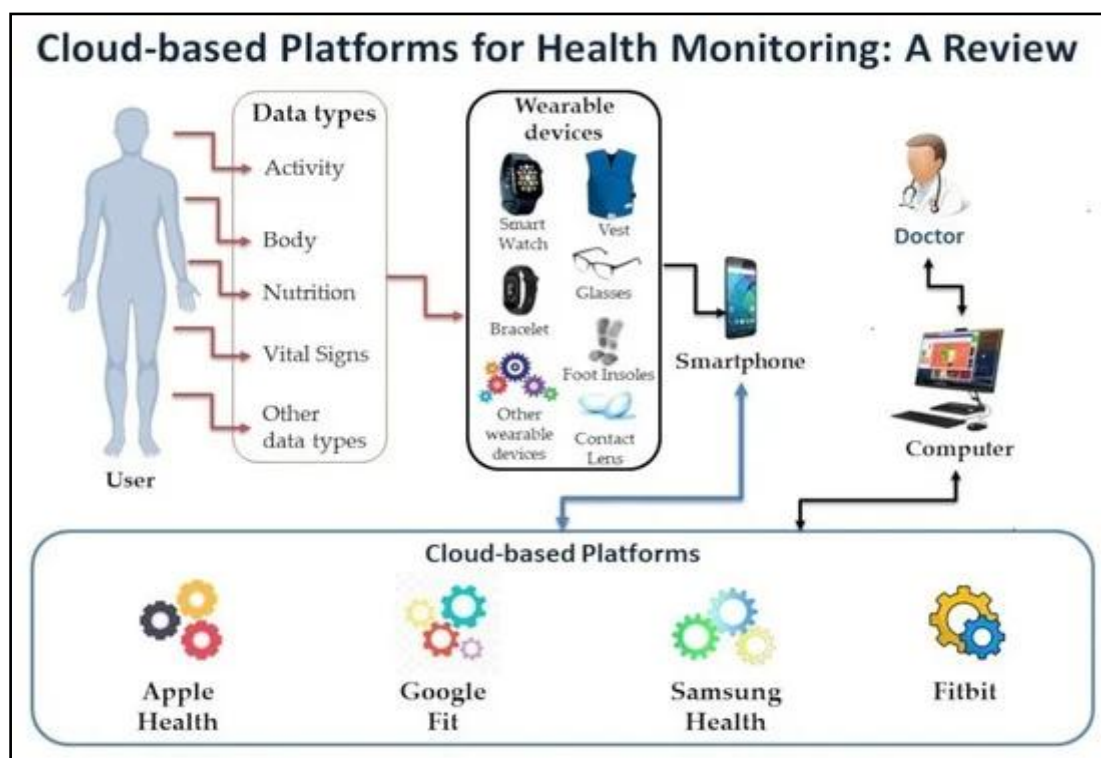


(Source: <https://fastercapital.com>)

Figure 6: Data collection and data processing

Designing of Machine Learning Models

In order to analyse the collected data and identify patterns in the drug or alcohol use and to predict relapse, potential non compliance based on machine learning models. Use supervised learning techniques like classification or regression to build models which can classify compliant and non compliant behaviours. Input variables such as time of day, physiological data and user behaviour have to be carefully selected in order to obtain best models through feature engineering. The models are modelled on historical data using cross validation techniques to ensure robustness and prevent over fitting, then updated continuously based on gathered data.



(Source: <https://pub.mdpi-res.com>)

Figure 7: Designing of Machine Learning Models

Implementation and Deployment

After creating the machine learning models, it is integrated into a cross platform software application. Among other things, the deployment process involves embedding the models into the mobile or web application with suitable frameworks to guarantee smooth flow of software on both Android and iOS devices (Zargaran et al., 2018). Used for online data processing, the application provides result instantly to its users, the status of their compliance (Amiribesheli and Bouchachia, 2016). Model performance needs to be continuous monitored, so the models need to be updated often and retrained using the new data trends so the accuracy of compliance reporting improves with time.

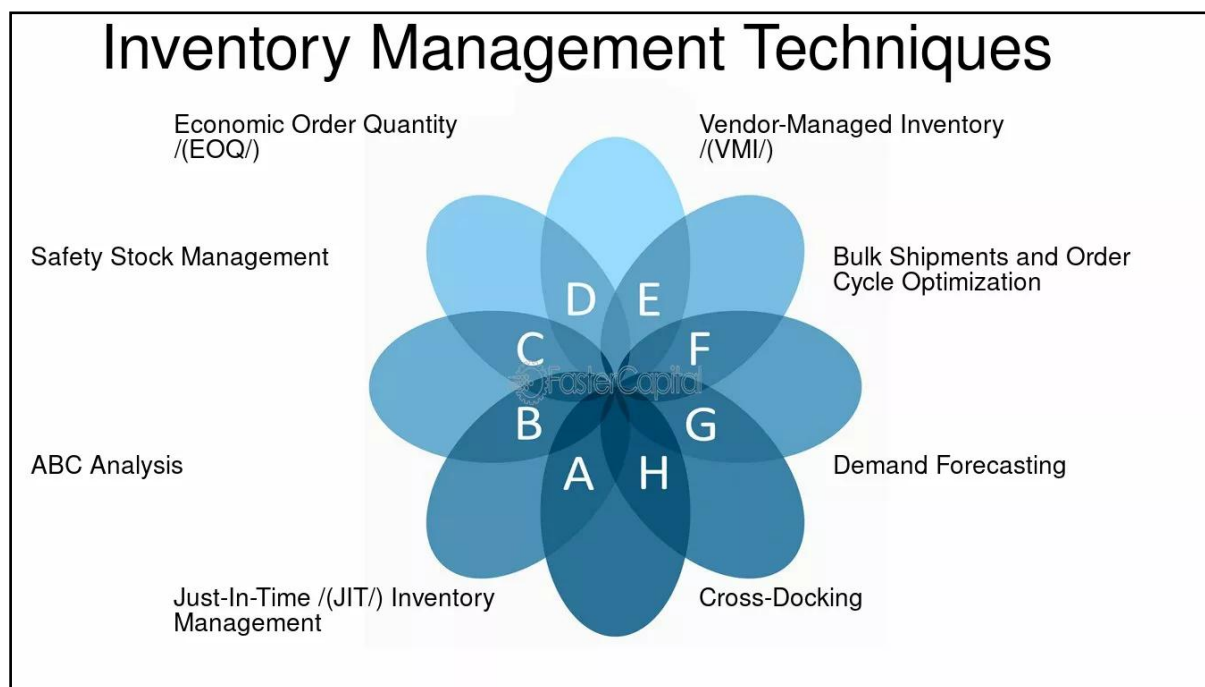
RESULT

Predictive Analytics in Sales and Demand

When considering drug and alcohol compliance reporting, predictive analytics can be applied at forecasting at-risk behaviour or pinpointing key times of risk. Machine learning models can use historical data about users' compliance patterns (e.g. medication adherence or alcohol consumption trends), and predict when a user is likely deviate from his/her prescribed behaviour. It allows proactive intervention, e.g. reminders or alerts, preventing non compliance. In addition predictive analytics can optimise frequency of checkins and interventions to increase overall compliance and decrease the probability of relapse for continued long-term health outcomes.

Innovation Strategies for Inventory Management and Replenishment

Innovations in inventory management can act as a driver of strategy for cross platform drug and alcohol compliance software for timely delivery of medications or substances to be used in treatment programmes (Murphy, 2018). Inventory systems can be integrated with real time data tracking to automatically change stock levels according to predicted demand, user prescription data, and expected consumption. With all integration, this helps prevent shortages and having users continue to have access to needed medications or treatment resources. Also, the software could send notification to caregivers or providers for better coordination between patients, providers and pharmacies to achieve seamless compliance management.



(Source: <https://fastercapital.com>)

Figure 8: Inventory Management and Replenishment

Redesigning the Lines of Logistics and Supply

The redesign of logistics and supply chains in respect to drug and alcohol compliance reporting includes providing equipment for the sake of monitoring, medication distribution, and comprehensive consistency (Thumbi, 2017). This can be further improved with the help of cross platform software that will bring healthcare providers, patients, and pharmaceutical suppliers together in real time, track medication usage and fill, and also optimise delivery routes. The software can then trigger automatic reordering through cloud based systems when supplies are running low and it can send necessary reminders to patients about when need to take their medication. Enhancing logistical coordination

improves a patient's probability of retaining compliance and reduces disruptions and gaps in medication or treatment access.

DISCUSSION

Rapid growth in digital health technology lies in creating cross platform software for seamless drug and alcohol compliance reporting. For instance, such software using real-time data collection and harnessing the charm of predictive analytics while providing convenient user interfaces, can provide continuous monitoring alongside support for the individuals looking to manage their intercourse use. But issues still remain in satisfying the nuances between usability and functionality, while making sure the software is not exotic enough to befuddle a wide demographic of users but with calloused data processing power (Palalas, 2012). One other thing that is paramount is that sensitive health data is continuously captured and privacy and security concerns are an issue. In addition, must make sure the software can be gradually adapted to the types of health care systems, devices and regulatory environments. While these represent challenge, the promise of these platforms to dramatically transform compliance reporting, including with personalised interventions, reduced health costs, and improved patient outcomes, is considerable. These tools apply in the future as the field of AI and machine learning continues to advance to add to the already high level of accuracy and effectiveness.

Future Directions

The future for cross platform drug and alcohol compliance reporting software will be building out its predictive capability and integrating with other healthcare systems. Just more customizable, data based insights into patient behaviour and risk can be shod with artificial intelligence and machine learning (Zhan, 2018). As wearable technology improves, these apps can integrate more real time biometric data, including heart rate and stress levels, to refine intervention strategies. The other piece that is going to be important is interoperability with other healthcare platforms so that data can flow seamlessly between the healthcare providers, the patients and sometimes even the family members. Later, social support features for patients would involve access to peer groups or mental health services through the app as well as the adoption of the blockchain for data security and privacy that will increase user trust and drive adoption. These innovations in the end will lead to a more holistic and integrated approach in substance use management.

CONCLUSION

The potential to transform how Doctor's or Substance Users will be managed through drug and alcohol compliance reporting will be through the design of cross platform software has vast benefits for individual patient care as well as for larger healthcare systems. These platforms can empower users to take their recovery into their own hands while allowing healthcare professionals to see progress and act proactively, ideally in real time, with personalised interventions and data driven insights. Despite the difficulties, include user engagement, privacy concerns and integrating with existing systems, this new technology is looking at a bright future ahead. As machine learning and AI emphasise continues and wearable technology as well develops, there is hope that these platforms will become more accurate, more user friendly, and more accessible. At the end of the day, if the software can be seamlessly integrated in people's daily life, so that it naturally improves adherence to treatment plans, reduces relapse rates and supports long term recovery, it becomes a very useful tool in the battle against addiction.

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