1 Literature Review

1.1 Web-based Clinic Management System

In most clinical settings the implementation of digital healthcare has become essential for addressing the challenges related to manual processes, inefficiencies and major complexities in data management. The study “Web based Clinic Management Systems” by Jibrin Muhammad and Salisy Favra explored the development of a system which helps streamline clinical operations at Sule Lamido University Clinic. This review talks about the contributions, advantages and limitations of this approach. Healthcare information systems (HIS) have been identified as something extremely critical for enhancing clinical workflows, decision making, resource optimization and so on. It can facilitate the management of patient records, appointment scheduling and diagnosis tracking, which improves both efficiency and patient outcomes. The CMS proposed aligns with the objectives by efficiently automating services which would rather require quiet a manpower to do such as appointment scheduling, online consultations, inventory management which can also minimize errors and reduce data storage. The CMS is structured as a modular framework, featuring several interconnected elements to improve functionality and data processing. Key modules include appointment scheduling, observation and diagnosis, pharmacy and inventory management alongside online consultations. A secure system was designed that allowed the patients to request and manage appointments while the medical individuals can confirm or modify the requests. As well as the observation and diagnosis module enable the doctors to record patient diagnoses and manage treatment and referrals of each individual. The tertiary study focuses on the technical approaches of the CMS that was designed and developed using PHP, JavaScript, HTML, CSS and SQL and run on the My-SQL database. This approach has the benefits of scalability, simplicity and integration with existing systems. The study shows that the CMS decreases the clerical burden, enhances record completeness and timeliness, and increases organizational efficiency of clinics. However, current scope of application involves only interactions between the patient, the physician and the pharmacist. The next releases might add laboratory sections and link extra databases to the system, if necessary. In conclusion, the proposed system serves as an example of how

a web-based clinic management system can revolutionize the clinics by automating and providing a reliable platform for data integration and accessibility, also sustaining the data for future purposes. (Jibrin Muhammad, 2019)

1.2 Investigating Patient Use and Experience of Online Appointment Booking in Primary Care: Mixed Methods Study

Specifically, the current work aims to explore the patient variables in the use of websites containing appointment booking applications and the experience of engaging with these applications in English primary care and these are achieved using mixed methods. The survey collected 1.3 million retrospect records besides the interviewing of 43 patients. Findings revealed that while 45.11% of patients claimed they were aware of online appointment booking services there were only 15.61 who avail of the services. Characteristics for use were also found to be linked to age, deprivation, ethnicity and health. Over the years, there was low awareness and low usage rate recorded among those over 75 years and those from the deprived areas. The results indicated that White patients had better engagement than Black and other minorities. A qualitative study of patient perspectives showed that people who have LTCs appreciated online booking for easy self-booking of well-person appointments, while those over 65 preferred phone booking because it was easier to use. Accessibility was one of the major factors that favoured the working-age population and the populace with caregiving roles. Online booking and organisation of the registration process differed from one general practice to the other, thus affecting the patients' uptake and satisfaction.The qualitative results pointed out that scheduling and registration affected patient experience positively, thanks to appointments offered. This was complemented by low digital literacy or awareness and/or a failure of some practices to actively seek engagement. Curiously, the online prescription systems themselves became the opportunities to turn patients to other digital services.Applying findings from this study to your clinic management system may foster patient interactions. Blending options that focus on making the registration process less complicated and increasing IT-support for digital literacy, as well as specific targeted action – increase the adoption of the e-

service. Providing opportunities for both would be convenient as this way users would not be limited by any form of accessibility. When done in your clinic, for instance, there are several ways it can meet the needs of different patients and enhance satisfaction. This study highlights the importance of simplifying registration, addressing low digital literacy, and offering hybrid booking (online and phone). Integrating guided tutorials and prescription management can boost accessibility. (Helen Atherton, 2024)

1.3 Developing public health surveillance dashboards: a scoping review on the design principles

This paper explores the essential components required for creating effective public health dashboards which can play a critical role for monitoring and predicting disease outbreaks, support in decision making and enabling real time data analysis. The study utilizes a scoping review methodology based on ARksy and O'Malleys framework which analyses 67 studies from an initial pool of 543 articles. In the evaluation, five major guidelines for development of optimal PHDs are outlined. First, they have to meet certain user requirements for content, presentation and interaction targeted at groups of users including policymakers, practitioners and citizens. User requirements define the KPIs to be implemented on the software and also determine the software's design. Second, structural and operational KPIs should be central and precise, content should be arranged in global-local hierarchy and be sex and class-stacked for specific analysis. Third, an easy-to-navigate map-based graphics interface for the end-users is mandatory as well as the 9659 extended functionalities such as zooming, drilling down, and all forms of view flexibility. Tools and instruments including heat maps, trending analysis, and interactive charts should follow the user view, and one should be capable of learning more from the data. Fourth, reliable analytical tools, especially the ones supporting online data analysis, search for trends and applying machine learning for statistical prediction are crucial for decision making at the right time. Last but not least a stable environment with effective data warehousing, safe data sharing, qualities, and standards guarantees proper data handling and analysis for immediate updating. These findings underscore the

potential to transform the Public Health Surveillance Dashboards in health sector, particularly during the crises like pandemic for eg COVID-19 pandemic, where real time monitoring and timely actions are essential for better results and effective attempts to come out with a possible solution for the cure of the disease.This study will help guide the clinic management system by focusing on the ease of users, continuous updates of data and also serve as key benefits of interactive dashboards. Protection of data and display technologies like data heat map or trends will improve operation effectiveness and beneficence of the clinical outcomes. (Reza Rabiei, 2024)

1.4 The application of data security management in healthcare organizations

Boström and Javidi Agheli's thesis digs into an important issue of how healthcare organizations handle data security, especially when it comes to stopping data leaks. As healthcare continues to become more digital, there's been a huge increase in the amount of sensitive patient data being shared and stored. That, of course, makes healthcare organizations more exposed to security risks. The authors argue that while things like encryption and firewalls are important, they're not a cure-all. You also need strong policies and solid management to really protect that data. The study, based on interviews with healthcare professionals in Sweden, looks at how organizations deal with security, raise awareness among staff, and follow regulations like GDPR. One big finding is that security threats don't just come from outside hackers; internal mistakes, usually from employees, are just as much of a risk. The research highlights that getting employees to understand and follow security rules is a major factor in keeping data safe. The authors also talk about strategies like role-based access and the CIA triad (confidentiality, integrity, and availability), which can really help cut down security risks. They stress that having clear and consistent policies is key, especially as more people work remotely or use cloud systems. The thesis suggests that creating a security-conscious culture with regular training and up-to-date policies is essential for keeping things secure. They also highlight how important it is to follow GDPR, which lays down strict rules about how patient data should be collected, stored, and shared. By combining the right tech with smart, human-focused strategies, the research offers a balanced and practical approach to data security in healthcare. The authors conclude that while

technology is crucial, it has to go hand-in-hand with solid organizational practices, like making sure employees are trained and policies are followed. They suggest there should be more research into ways to standardize these practices and look into new tech, like AI, that might help predict and prevent breaches. This thesis gives healthcare organizations some valuable insights into improving their data security as they become more digital. It shows that technology and good management need to work together to really protect patient data. (Amanda Javidi Agheli, 2021)

1.5 Managing Security of Healthcare Data for a Modern Healthcare System

The study established that the development of new technologies in the healthcare sector has been progressively fast, especially in Artificial Intelligence (AI) and The Internet of Things (IoT), to advance patient health, minimize cost and transform community health. Nonetheless, such enhancements raise issues about protection and privacy of health information, and thus require effective theoretical frameworks for ensuring safe storage of health information. IoT healthcare systems' applications focus on data combinability and analysis to give the best patient results. Deep learning and blockchain have been used as solutions to improve security in the past. Thilagam et al said that they developed a system for privacy preserving data analytics based on CNN. Even though it provides certain means to reduce the leakage of privacy, its limitations include very high costs in terms of computation and increased processing time. Likewise, blockchain technologies, just as revealed by Kumar and his colleagues' PBDL framework, improve data exchange and provenance based on the advanced cryptographic protocols. Nevertheless, such approaches often encounter one of the main challenges, which is limited scalability and increased time for solution completion. This work introduces the LRO-S method the improved optimization procedure that uses Lion and Remora algorithms to develop a reliable security key for Serpent encryption algorithm to protect data in the cloud for healthcare applications. To ensure secure storage of the patient information, the framework involves a technique of encryption of such data and using an asymmetric hash signature for the validation of the key. Even with applications based on

fundamental advancements such as blockchain and machine learning, healthcare security still presents challenges in scalability, cost, and time to execute, which the LRO-S method resolves. The applicability of the framework for responding to fundamental security concerns is affirmed through the examination of its results and directions for improvement, including the incorporation of deep learning for predictive solutions. Derivative of the proposed LRO-S framework, creating new possibilities for real-time monitoring, endowed with the capacity for early threat detection, enhancing intricate AI integration can also enhance the model's prognostic power especially in the context of healthcare threats and medical defence legal and institutional models for improved security and intelligence. (Abdulmohsen Almalawi, 2023)

2 Conclusion

These works are assembled to provide useful information about how to build a clinic management app that will be safe, easy to use, and efficient. Through implementing integrated systems like the LRO-S, the application offers the much-needed patient data protection as well as the right, efficient methods of sharing the information. Also, the efficient self-explanatory interface and immediate data incorporation contribute to the better clinic performance of decision-making and service provision.Before those features that enhance the accessibility are noted, the provided options of easy registration and the combination of online and offline booking are especially beneficial for the targeted users. Moreover, it makes use of Recommendation Decision Support and paying extra attention to colours and layouts of the interface, but keeps the interface as friendly, colourful, and simple for the users. The system being smart enough is backed by high tech tools like predictive analytics and machine learning together with real-time monitoring enables the system to prevent or to respond to any disaster docket with care, threats and resources' management. They engage in innovations that not only make the operations run smoothly but also seek to solve issues that may likely harm patients before they occur. Fitted to the complex and dynamic requirements

of modern healthcare, this successful approach fosters efficient and secure clinic management solutions that conform to the increasing standards.