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FACULTY OF COMPUTING, UTM

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PROJECT: PHASE 1

SECD2523 : DATABASE

SECTION 08

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TABLE OF CONTENTS

1.0 Introduction

In the dynamic landscape of healthcare, the effective management of clinics and appointments plays a pivotal role in delivering quality patient care. The coordination of healthcare services, patient interactions, and appointment scheduling forms the backbone of a well-functioning medical facility. As we know, technological advancements have benefited the medical field in many ways namely the way doctors diagnose and treat patients, precision and efficiency in medical treatments, greater availability of information and the convenience of a patient to get treatment.

Here in this report, we are focusing on the importance of ensuring an efficient way a patient can get treated in a medical healthcare. This includes having a proper patient appointment and medical booking management system which eases both the patient and the healthcare's staff. Our project aims to develop an appointment booking system for a dialysis centre, Pusat Dialisis FN, located in Johor Bahru. Traditionally, managing appointments and medical bookings has been a labor-intensive process as it is prone to errors and inefficiencies. Phone-based scheduling, paper based record keeping and manually rescheduling and cancellations of appointments are a few traditional and challenging approaches that have been used before the integration of technology. Almost all these challenges are still being applied by Pusat Dialisis FN.

The new system that we are planning to install here aims to benefit both patients and staff to book and also handle appointments or medical bookings. We believe having an effective way to manage all these important arrangements is vital for a place that provides medical treatment. Patients can easily make online appointments from their home without the need to call or walk into the centre. Other than that, the staff can manage and refer to the appointments booked easier compared to the traditional or manual approach. This system will surely enhance the experience of both users to do their parts as it brings a more positive outcome.

2.0 Background Study

In response to the rising prevalence of chronic kidney diseases in Johor, Malaysia, the establishment of a dialysis center becomes imperative. Over the past decade, the state has witnessed an increase in renal health challenges, attributed to lifestyle changes, an aging population, and a surge in non-communicable diseases. This background study explores the historical, social, and theoretical dimensions surrounding the dialysis center's inception. Johor's dynamic economy and diverse population underscore the need for specialized medical facilities, aligning with the cultural importance placed on communal well-being. The center operates within a theoretical framework rooted in evidence-based nephrology practices, integrating global standards while catering to the unique healthcare requirements of the local community. Key terms such as hemodialysis and peritoneal dialysis form the foundation of the center's services, ensuring a patient-centered approach. This study illuminates the contextual factors driving the center's establishment and its role in addressing renal care challenges in Johor, setting the stage for a detailed examination of its infrastructure, services, and impact on the local healthcare landscape.

3.0 Problem Statement

According to Pusat Dialisis FN, the current registration system relies on an outdated paper-based process, which results in operational difficulties and reduces efficiency. Patients are required to manually fill out paper forms during each visit, leading to time-consuming registration procedures and an increased risk of errors in patient information. This outdated system not only consumes valuable staff time but also jeopardizes the accuracy and security of patient records. Furthermore, the manual nature of the process makes it difficult to track and analyze patient data for improved healthcare management.

Next, the PDFN currently relies on a calendar-based appointment system combined with manual call and text notifications for patient scheduling and communication. This approach poses several challenges, including inefficiencies in appointment management and increased risk of errors in the notification process. The reliance on a static calendar limits the flexibility to accommodate urgent or changing patient needs, leading to potential disruptions in the treatment schedule. Moreover, the manual nature of call and text notifications may result in missed or delayed communications, impacting patient attendance at appointments and be inconvenient.

Lastly, the current payment system at PDFN is characterized by a lot of methods such as cash transactions, sponsorship, government claims and debt invoicing. This approach introduces complexities in financial management, making it challenging to track and reconcile payments effectively. The use of cash poses security risks, and the reliance on sponsorships and government claims may lead to delays in reimbursement, affecting the center's cash flow. Additionally, managing debt invoices adds another layer of intricacy, potentially resulting in inaccuracies and difficulties in debt recovery.

4.0 Proposed Solution

To address the difficulties with the outdated paper-based process at Pusat Dialisis FN, we propose a plan to update and improve things. Our main ideas are to make an automated appointment scheduling system with a digital database for managing patient information efficiently. The goal is to replace the old paper way, making appointment management easier and reducing operational problems. Also, we want to get rid of patients filling out paper forms each time they visit, saving time and reducing the risk of errors in their information.

At the same time, the database will store patient information in one place, reducing mistakes and reducing data redundancy from doing it on paper. This not only makes routine tasks automatic but also makes sure patient records are accurate. The new system will make registering simpler and set the foundation for a safer, more accurate, and efficient healthcare management at Klinik Dialysis FN.

As part of this proposed system, we'll add advanced communication features, like sending SMS notifications through an integrated API. This will help the staff communicate better with patients. Also, we'll set up a task scheduling system to send email and SMS reminders to patients a day before their appointments, making sure they don't forget and improving the overall patient experience.

Lastly, in addition to these proposed systems, we'll introduce a straightforward financial management system. This system will keep track of various financial transactions, like payments and government claims. Integrating this will help Pusat Dialisis FN manage its financial tracking better, making the financial side of things clearer and more efficient. These updates will not only fix issues with patient data but also improve financial processes, making Pusat Dialisis FN more efficient overall.

4.1 Technical Feasibility Study

For the end user, the booking system requires a device with SMS capability and an internet connection to access the website. This is essential as, a day before the scheduled appointment, patients receive a reminder email and on their phone message. Additionally, patients can conveniently access their booking details through the web system using a browser. The login process involves entering personal information, such as the IC number. The web system places a strong emphasis on user experience, recognizing that many patients may be older individuals.

Moreover, the system needs IT support to address potential challenges, including bugs, system glitches, and performance issues. Having IT support ensures a proactive approach to system maintenance, prompt issue resolution, and ongoing improvement. A dedicated server is required for hosting the database and web-based applications. Serving as the central hub, the server facilitates data storage, retrieval, and communication between applications and the database. This critical infrastructure guarantees the availability and accessibility of crucial information for the web system. The server's role is pivotal in maintaining a centralized and secure environment, enabling efficient data management.

4.2 Operational Feasibility Study

The booking system is designed to align seamlessly with the operational procedures of the staff at Pusat Dialisis FN. The aim is to integrate with existing appointment management processes, facilitating a smooth transition for administrative staff. We acknowledge the significance of assessing the potential impact on daily operations, including any required staff training for system utilization. This evaluation also encompasses the identification and management of potential changes in roles or responsibilities resulting from the system's introduction. In a nutshell, we prioritize adaptability and strive to integrate seamlessly without causing disruptions to the current operations.

4.3 Economic Feasibility Study

Estimated Cost	
Software	50000
Consultant	10000
Training	10000
Linux Hosting	1800 per year
IT Support	12000 per year
Maintanance	2500 per year

Table 4.3.1 Estimated Cost

Estimated Benefits	
Time Savings	2000 per month
improved efficiency	3000 per month
Enhanced Patient Satisfaction	2000 per month
Inventory Saving	2500 per month

Table 4.3.2 Estimated Benefits

Assumption	
Discount Rate	10%
Sensitivity Factor (Cost)	1.1
Sensitivity Factor (Benefits	0.9
Annual Change in Producti	7%
Annual Change in Benefits	5%

Table 4.3.3
Assumption Table

Cost	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost						
Software	50000					
Consultant	10000					
Training	10000					
Total	70000					
Production Cost						
IT Support		13200	14124	15113	16171	17303
Maintanance		2750	2943	3149	3370	3606
Linux Hosting		1980	2119	2268	2428	2598
Annual Production Cost		17930	19186	20530	21969	23507
(Present Value)		16300	15856	15424	15005	14596
Accumulated Cost		86300	102156	117580	132585	147181

Benefits	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Time Savings		21600	22680	23814	24905	26150
improved efficiency		32400	34020	35721	37507	39382
Enhanced Patient Satisfaction		21600	22680	23814	24905	26150
Inventory Saving		27000	28350	29768	31256	32819
Annual Inventory Cost		102600	107730	113117	118573	124501
(Present Value)		93273	89033	84986	80987	77305
Accumulated Benefits		93273	182306	267292	348279	425584
(Present Value)						
Gain or Loss		6973	80150	149712	215694	278403
Profitibality Index		3.97				

Figure 4.3 CBA Cost & Benefits

From the figure 4.3 above the, the Profitability Index is 3.97, which means that the system is profitable. This is due to the index being greater than 1. From the figure above, we also know that we will gain profit of RM 6973 in the first year and will gain more for the next 5 years.In a nutshell, the system is highly profitable and will generate a huge revenue and also increase in operational productivity for Pusat Dialisis FN.

5.0 Proposed Project Objectives

- To develop an automated appointment scheduling system for PDFN
- To provide a system that able to record data of the patient
- To increase efficiency and reduce data redundancy of PDFN operation by implementing a modernized system.
- To simplify financial management and improve tracking and reconciliation of payments.

6.0 Scope

The purpose of this appointment and medical booking system is to improve the service that patients receive while reducing the workload of staff members who need to handle patient data. This system also aims to make it easy for both the PDFN staff and patients to schedule a dialysis or any medical appointment in a matter of minutes, without patients having to physically visit the clinic and manually fill up papers, therefore avoiding lines and cutting down on waiting times. In order to help users keep track of their appointments and lower the amount of missed appointments, this system is also made to be coupled with a proper and a more digitalized calendar system. Three groups of people are involved in this system and that is the patients, the PDFN staff, and the administrator. Every stakeholder will have distinct uses and functions.

Patients:

In the new Pusat Dialisis FN appointment and medical booking system, online scheduling, rescheduling, and cancellation procedures are easy to use and are beneficial for patients. This system also offers an interactive web-based booking system design that makes it easier for patients of all ages to schedule their medical appointments. Before login and make appointments, patients will first need to sign up and fill in their personal information such as contact number and IC number. They are then allowed to view the available time slots to make appointments and can reschedule or cancel it anytime upon what they desire. The patients then can check their upcoming appointment status and receive timely reminders from email, sms and

also in-app notifications. On the day of the appointment, they can just come and “check-in” through the PDFN staff to attend the selected appointment time without the need to wait or fill any forms.

Staff:

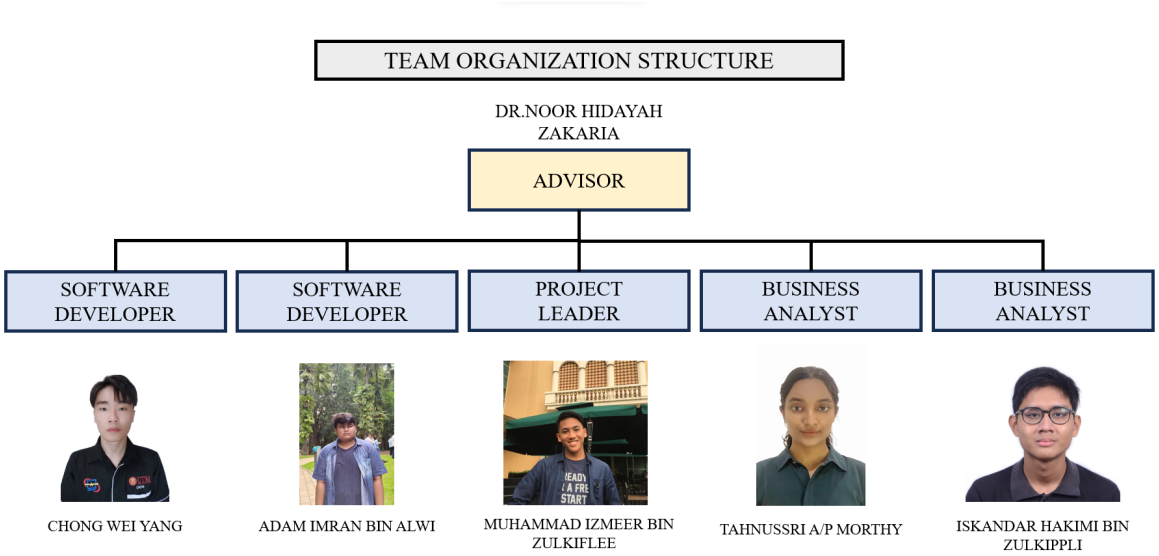
This system allows PDFN staff members to view and amend their personal data, including name, phone number and email address. Besides the patients themselves who can book their own appointments, the staff also have the ability where they can see and edit the patient's appointment and information details. This feature lets the staff to easily see the whole view of latest appointments made so that preparations can be made earlier. Proper planning and a more organized workflow is formed after the implementation of this new system as the coordination between patient, staff and the doctor is improved. PDFN staff can also efficiently sort and view appointments data for their reference to form a report. PDFN staff will no longer need to receive any calls or entertain walk-in patients who want to make any appointments. Other than that, they can track various financial transactions easier such as payments, sponsorships and government claims digitally with less usage of hardcopy documents.

Administrator:

Administrators have the same access and capabilities as PDFN staff on the system, including the ability to register patients and manage their appointments schedules. Administrators can also assist with registration, access, and modification of the PDFN staff members. Conversely, staff members are unable to view or change one another's personal data unless it is their very own personal data. Additionally, administrators have the ability to show the entire count of staff members and customers in the centre together with their current status as active members or customers. Since they are the most important user with the most authority to administer and run the system, administrators can typically do all operations on the system.

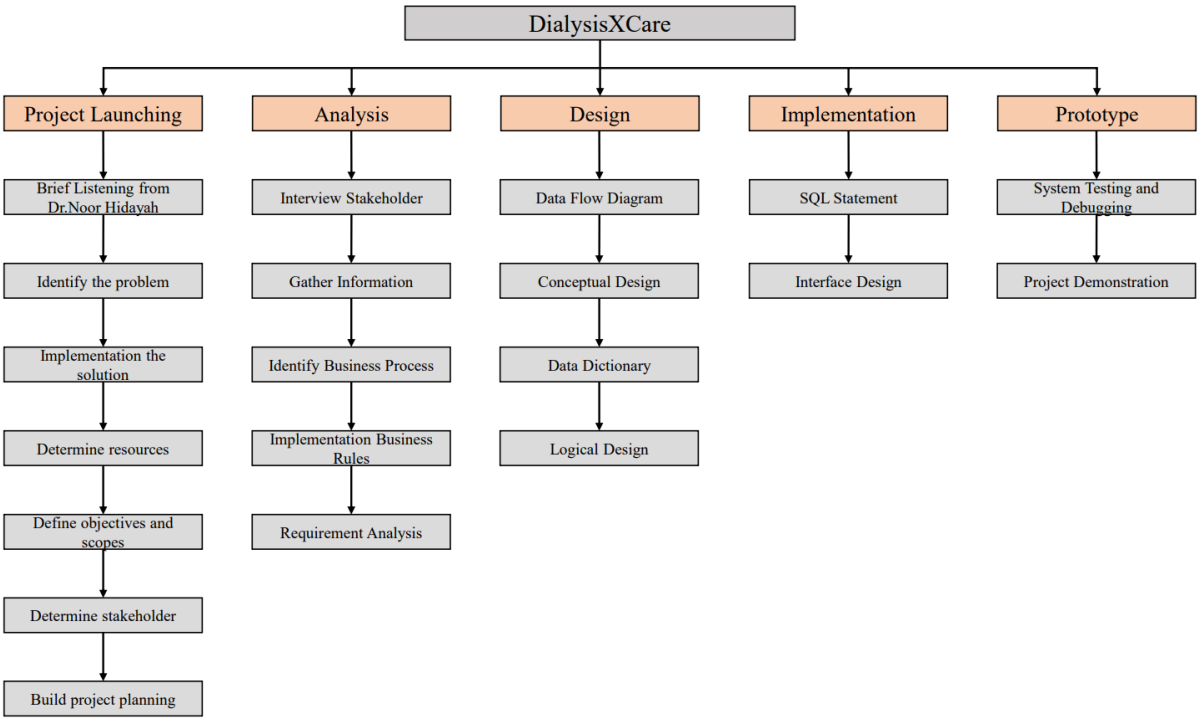
7.0 Project Planning

7.1 Human Resource



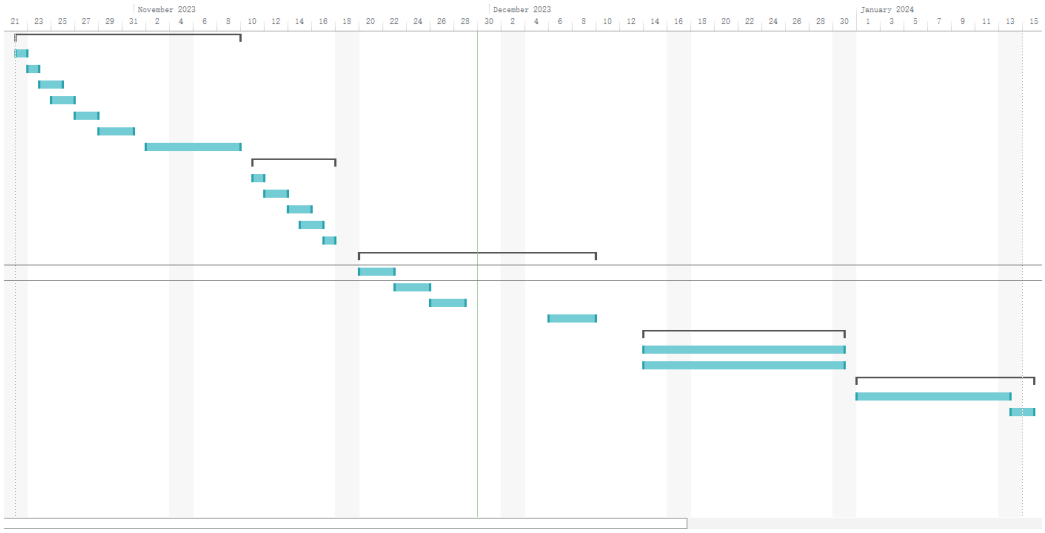
Role	Person In Charge	Responsibility
ADVISOR	DR. NOOR HIDAYAH ZAKARIA	1. Review the progress of the project 2. Provide feedback to improve the project
PROJECT LEADER	MUHAMMAD IZMEER BIN ZULKIFLEE	1. Create a detailed project plan 2. Define roles and responsibilites
SOFTWARE DEVELOPER	1. CHONG WEI YANG 2. ADAM IMRAN BIN ALWI	1. Develop the system 2. Test the system 3. Debug the system
BUSINESS ANALYST	1. TAHNUSSRI A/P MORTHY 2. ISKANDAR HAKIMI BIN ZULKIPPLI	1. Requirements gathering 2. Analyze data 3. Quality assurance

7.2 Work Breakdown Structure (WBS)



7.3 Gantt Chart

Task Name	Durati	Start Date	End Date
Project Launching	**19 days**	**Sun 10/22/23**	**Thu 11/9/23**
Brief listening from Dr.Noor Hidayah	1 day	Sun 10/22/23	Sun 10/22/23
Identify the problem	1 day	Mon 10/23/23	Mon 10/23/23
Implement the solution	2 days	Tue 10/24/23	Wed 10/25/23
Determine resources	2 days	Wed 10/25/23	Thu 10/26/23
Define objectives and scopes	2 days	Fri 10/27/23	Sat 10/28/23
Determine stakeholder	3 days	Sun 10/29/23	Tue 10/31/23
Build project planning	8 days	Thu 11/2/23	Thu 11/9/23
Requirement Analysis	**7 days**	**Sat 11/11/23**	**Fri 11/17/23**
Interview stakeholder	1 day	Sat 11/11/23	Sat 11/11/23
Gather information	2 days	Sun 11/12/23	Mon 11/13/23
Identify business process	2 days	Tue 11/14/23	Wed 11/15/23
Implement business rules	2 days	Wed 11/15/23	Thu 11/16/23
Requirement analysis	1 day	Fri 11/17/23	Fri 11/17/23
Design	**20 days**	**Mon 11/20/23**	**Sat 12/9/23**
Data flow diagram	3 days	Mon 11/20/23	Wed 11/22/23
Conceptual design	3 days	Thu 11/23/23	Sat 11/25/23
Data dictionary	3 days	Sun 11/26/23	Tue 11/28/23
Logical design	4 days	Wed 12/6/23	Sat 12/9/23
Implementation	**17 days**	**Thu 12/14/23**	**Sat 12/30/23**
SQL statement	17 days	Thu 12/14/23	Sat 12/30/23
Inferface design	17 days	Thu 12/14/23	Sat 12/30/23
Prototype	**15 days**	**Mon 1/1/24**	**Mon 1/15/24**
System testing and debugging	13 days	Mon 1/1/24	Sat 1/13/24
Project demostration	2 days	Sun 1/14/24	Mon 1/15/24

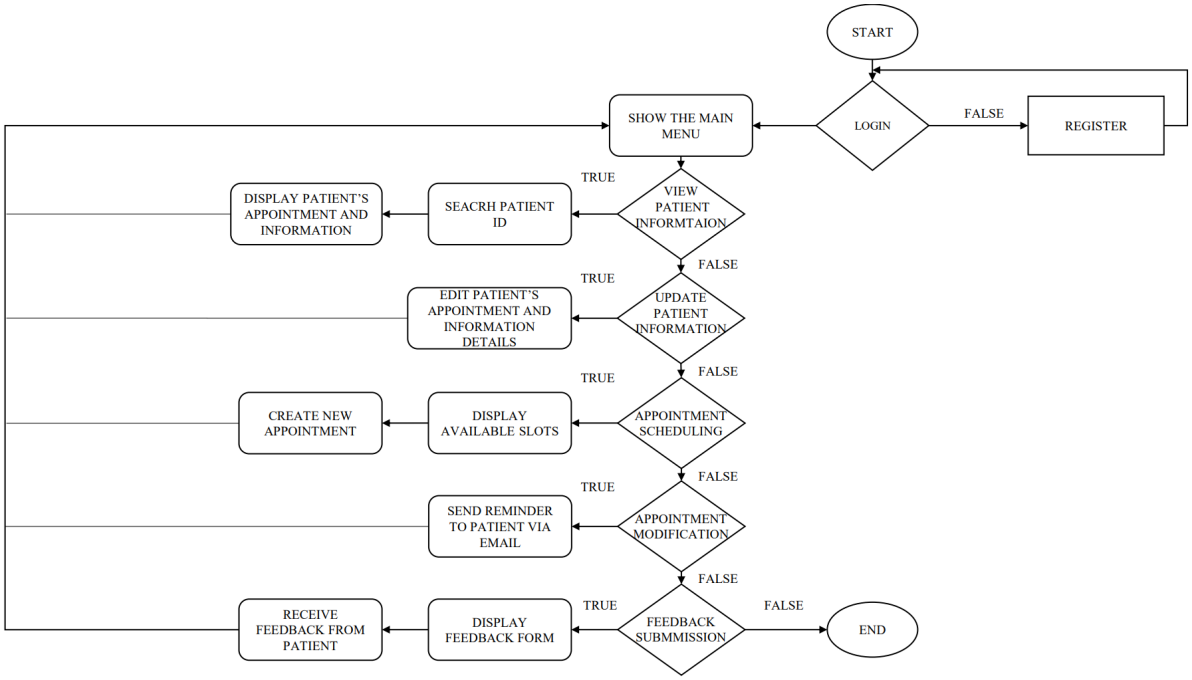


8.0 Requirement Analysis (Based from AS-IS analysis)

8.1 Current Business Process

Here are the scenarios and workflow:

1. User login to the system
2. Show the main menu
3. View patient information
    a. Search patient ID
    b. Display patient's appointment and information
4. Update patient information
    a. Edit patient's appointment and information details
5. Appointment scheduling
    a. Display available slots
    b. Create new appointment
6. Appointment modification
    a. Send reminder to patient via email
7. Feedback submission
    a. Display feedback form
    b. Receive the feedback from patient



8.2 General Requirement

1. Performance

   The system must exhibit swift responsiveness to user interactions and demonstrate substantial throughput to manage extensive workloads, all while sustaining minimal response times and averting data loss occurrences.

2. Reliability

   The system ought to uphold prolonged operational periods to ensure widespread availability and fault tolerance. Even in the event of server failure, the system should persist in its functionality.

3. Security

   Encryption should safeguard all user data, encompassing login details and patient information, during both data transmission and storage. Access to the system should be restricted, allowing only relevant sections to be accessible by authorized staff and patients.

9.0 Transaction Requirement

9.1 Data Entry

1. Enter essential patient information for new registrations.
2. Enter the preferred date and time for appointments.
3. Enter the information regarding the prescribed treatments.
4. Enter the referral doctor of the patient.
5. Enter the patient feedback response.

9.2 Data Update/Delete

1. Update/Delete the patient information.
2. Update/Delete the appointments.
3. Update/Delete the information of treatments.
4. Update/Delete the referral doctor of the patient.
5. Update/Delete the feedback.

9.3 Data Queries

1. Data list information of patients.
2. Data list scheduled appointments.
3. Data list patient appointment history.
4. Data list patient feedback details.
5. Data list patients' treatment history..

10.0 Benefit and Summary of Proposed System

Developing an appointment booking system for a dialysis center can offer several benefits, both for the healthcare providers and the patients. One of the advantages is it leads to efficient resource management. It helps in optimizing the allocation of dialysis machines and healthcare staff based on the scheduled appointments. Besides, it also reduces the likelihood of overbooking or underutilization of resources, leading to better operational efficiency. Next, the most important thing is the system maximizes the time efficiency by reducing the administrative burden. Automation of appointment scheduling and patient information management reduces the time and effort spent on manual administrative tasks, allowing staff to focus on patient care.

Furthermore, it minimizes data entry errors by standardizing data entry processes to ensure consistency and accuracy in patient information. Storing patient information in a digital format reduces the risk of errors associated with handwritten or paper-based records. Furthermore, the system sends automated reminders through SMS to the patients, reduce the likelihood of missing scheduled dialysis appointments and enhance overall patient compliance. Timely reminders contribute to better patient attendance, ensuring that appointments are honoured as planned. It increases patient's engagement with the staffs. SMS can be used for two-way communication, allowing patients to confirm, reschedule, or inquire about appointments, fostering increased engagement. Offering patients the ability to interact with the appointment system through SMS and email empowers them to actively manage their healthcare.

Introducing a straightforward financial management system in the appointment booking system for a dialysis centre will provide an accurate billing process. Integration of financial management ensures accurate and timely generation of bills based on scheduled appointments and provided services. Automation minimizes the risk of manual errors in billing, leading to more precise financial transactions. Integration with a straightforward financial system enables online payment options, improving the convenience for patients and ensuring faster payment processing. Last but not least, the appointment booking system helps in cost savings. It reduces the need for manual administrative tasks, leading to potential cost savings in terms of staff time

and resources.It also enhances overall operational efficiency, contributing to cost-effectiveness in the management of the dialysis center.

Developing an appointment booking system for a dialysis center provides numerous advantages for both healthcare providers and patients. The system enhances resource management by optimizing machine and staff allocation, improving operational efficiency. Patients benefit from a more convenient and flexible scheduling process, reducing wait times and enhancing their overall experience.The automated system streamlines operations, minimizing manual tasks and reducing administrative workload. Efficient communication channels are established, facilitating seamless information exchange between the healthcare team and patients. Enhanced patient care is achieved through better coordination and planning, ensuring the availability of resources for each dialysis session.

The system contributes to data management and analysis, allowing for the collection of valuable insights into trends, resource utilization, and patient outcomes. Reminders and notifications help reduce no-shows and cancellations, improving overall clinic efficiency and patient compliance.Cost savings are realized through reduced administrative tasks, contributing to operational efficiency..Scalability is a key feature, accommodating the center's growth and changing patient volumes. The integration of an appointment booking system ultimately results in a more organized, patient-centered, and well-managed healthcare environment for dialysis services.

11.0 Summary

Due to several outdated manual methods, Pusat Dialisis FN experiences some operational inefficiencies. These include the fact that the clinic's patients find it hard to set an appointment and that is by physically walking in and filling in a form or through making phone calls. Other than that, the dialysis centre workers or staff also think that it is hard to organize, manage and retrieve existing appointment data if it is done manually. The proposed project aims to develop an improved and modernized appointment and medical booking system Pusat Dialisis FN by implementing an integrated digital platform within it.

The importance of a proper appointment and medical booking system was underlined by our background research, which also highlighted the widespread problem with manual systems. These specific problems such as poorly structured patient data, inadequate , and appointment scheduling will be brought to light specifically by the study. The proposed solution suggests transitioning from manual process to a modern digital system. It addresses the appointment scheduling challenges through an online appointment system, providing real-time information and automated reminders. The goal of implementing a more digitalized outcome of an appointment booking system is to benefit both patients and staff to book and also handle appointments or medical bookings. A facility that offers medical care needs to have a reliable method for handling all these details.

Prior to commencing the project, we developed a Work Breakdown Structure (WBS) to delineate the tasks and subtasks necessary for implementing the appointment booking system at Pusat Dialisis FN. This preparatory step is essential for project launch, offering a clear overview of the project's scope and enabling effective resource allocation. Simultaneously, we created a Gantt Chart to visually represent the project timeline, providing a guide for task interdependencies and key milestones. Both the WBS and Gantt Chart function as vital planning tools, steering our project team in the sequential execution of tasks and ensuring efficient project management.