

Comp2147 Group Project: ABC clinic

Group Number: Group 47

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Deadline: Tuesday December 2, 2025 (11:59 PM)

ABC Walk-in Clinic – System Service Request

Requested by: Abid Rana

Department: Clinic Management

Location: Greater Toronto Area, Ontario

Contact: arana@abcclinic.ca | (416) 415-5000

Date: December 1, 2025

Type of Request [X] New System

Urgency [X] Problem exist, but can be worked around

Problem Statement

Patient volume at ABC Clinic has increased, creating additional administrative workload for reception, nursing, and billing staff. Manual scheduling, paper-based charting, and disconnected systems have caused appointment delays, duplicate data entry, and billing errors. Staff spend excessive time reconciling records from labs, pharmacies, and insurance portals, leading to longer wait times and reduced patient satisfaction. The current manual process is not scalable for the expected 1,500–2,000 patients per week.

Service Request

We request an analysis and design of a Clinical Management System (CMS) to automate and integrate all clinic operations: appointments, check-ins, queue management, triage, clinical documentation, prescriptions, lab and referral handling, billing, AR/AP for non-covered services, reporting, and staff scheduling. The system must comply with Ontario privacy and confidentiality regulations and provide secure access for physicians, nurses, receptionists, and management.

IS Liaison: Charis Luk, IT Consultant (cluk@abcclinic.ca | 416-415-6000)

Sponsor: Abid Rana, Clinic Manager (arana@abcclinic.ca) | 416-415-5000)

Project Charter

Project Name: Clinical Management System (CMS)

Project Manager: Dr. Michael Park (mpark@abcclinic.ca)

Customer: ABC family medicine and walk in clinic

Project Sponsor: Abid Rana, Clinic Manager(arana@abcclinic.ca)

Projected Start/End: 12/01/2025-08/31/2026

Project Overview

This project will design and implement a Clinical Management System (CMS) for ABC Walk-in Clinic to automate patient registration, scheduling, and billing processes. The CMS will replace paper-based workflows with an integrated, role-based digital platform that enhances patient throughput, improves accuracy, and ensures compliance with healthcare privacy regulations.

Objectives

- Eliminate redundant manual data entry across registration, triage, and billing.
- Provide accurate, timely access to patient and appointment data.
- Improve billing accuracy and turnaround time for government and private claims.
- Enable staff scheduling, reporting, and analytics for operational efficiency.

Key Assumptions

- The CMS will be developed using in-house + contracted IT resources.
- The interface will be web-based and accessible via secure login.
- Integration with external systems (MOH, labs, pharmacies, insurers) will be achieved through APIs or file exchange.
- All data will be stored in a secure, encrypted cloud database hosted in Canada.

Stakeholders and Responsibilities

Stakeholder	Role	Responsibility	Signature
Prof. Abid Rana	Clinic Manager	Sponsor, Project Vision, Resource Allocation	AR
Dr. Michael Park	Project Manager	Planning, Monitoring, Execution	MP
Dr. Sabrina Huda	Assistant Manager	Functional Requirements & Testing	SH
Janet Lee	Reception Lead	Workflow Design & Training	JL
Patti Visser	Head of Finance	Billing /AR-AP Integration	PV
Charis Luk	IT Consultant	Technical Architecture / Consultant Integration	CL

Feasibility Analysis

Project: ABC Walk-in Clinic – Clinical Management System (CMS)

Prepared by: COMP 2147 Group (Student ID: 101573055 & 101566625)

Date: November 16, 2025

Project Budget: CAD \$1,000,000

1. Introduction

ABC Walk-in Clinic provides family medicine and walk-in services to approximately 1,500 to 2,000 patients each week. The clinic still relies heavily on paper files, manual appointment logs, and scattered spreadsheets, which has resulted in longer patient wait times, duplicated or inaccurate information, delays and errors in billing, limited access to management reports, and increased compliance risks related to Personal Health Information Protection Act (PHIPA).

To address these challenges, the clinic proposes the implementation of a Clinical Management System (CMS). The system is expected to significantly improve operational performance and service quality.

2. Tangible and Intangible Benefits

Economic feasibility involves evaluating both measurable financial benefits and those improvements that contribute indirectly to operational effectiveness.

2.1 Tangible Benefits (Years 1–5)

The CMS is expected to reduce costs associated with paper, printing, overtime, and manual filing. It will also decrease Ontario Health Insurance Plan (OHIP) billing rejections and reduce data-entry errors. By improving how the clinic handles growing patient volumes, the system will help the clinic operate more flexibly without requiring additional staff. Faster patient check-in and shorter administrative cycle times will further improve efficiency. Management will gain more control through accurate reporting and analytics dashboards. Privacy compliance and enhanced patient trust will also provide added value. Altogether, these tangible benefits amount to approximately \$350,000 per year.

2.2 Intangible Benefits

The project also provides several important intangible benefits. The CMS is expected to significantly improve patient satisfaction by reducing wait times and modernizing service

delivery. Staff morale is likely to improve as paperwork decreases and processes become more organized. The clinic's reputation and professionalism will be strengthened through a more integrated and responsive workflow. The system will also help ensure better compliance with PHIPA, reducing the risk of legal issues. Although these intangible benefits do not directly influence the NPV calculations, they play a critical role in building a strong business case.

3. Economic Feasibility

3.1 Cost–Benefit Analysis

The project's total budget is \$1,000,000, which covers development and initial operational costs. The total present value of benefits is estimated at \$1,261,350, while the present value of costs is approximately \$1,150,020. This produces a net present value (NPV) of \$111,330, which is positive but modest. The corresponding ROI is approximately 9.7%, which confirms that the project offers a low but acceptable level of financial return. Overall, the system is expected to reach payback in roughly four years, which is considered reasonable for a healthcare information system.

Comp2147 Group Project: ABC clinic							
ABC family medicine and walk in clinic							
Clinical Management System							
Benefits							
Year	0	1	2	3	4	5	TOTAL
Net Economic Benefit	0	350000	350000	350000	350000	350000	
Discount Rate 12% (0.12)	0.12	0.12	0.12	0.12	0.12	0.12	
1/(1+rate)**i	1	0.892857	0.797194	0.71178	0.63551808	0.567427	
PV of Benefits	0	312500	278950	248850	222431	198599	
NPV Benefits(Accumulative PVs)	0	312500	591450	840300	1062731	1261330	1261330
Costs							
Year	0	1	2	3	4	5	TOTAL
One Time Costs	1000000	60000	40000	40000	30000	30000	
Discount Rate 12% (0.12)	0.12	0.12	0.12	0.12	0.12	0.12	
1/(1+rate)**i	1	0.892857	0.797194	0.71178	0.63551808	0.567427	
PV of Costs	1000000	53571	31888	28471	19066	17023	
NPV Costs(Accumulative PVs)	1000000	1053571	1085459	1113930	1132996	1150019	1150019
Overall NPV							111311
Overall ROI (Overall NPV/NPV of all Costs)							0.09679

4. Break-even Analysis

A break-even review was performed to determine when cumulative discounted cash flows become positive. The results show that although the first three years continue to operate at a cumulative loss, the system begins approaching break-even during Year 4. Full break-even occurs between Year 4 and Year 5, which aligns with the expectation for a moderate-return healthcare project.

Breakeven Analysis						
Year	0	1	2	3	4	5
Yearly NPV Cash Flow	-1000000	-741071	-494009	-273630	-70264	111312
Overall NPV Cash Flow	-1000000	258929	247062	220379	203366	181576
Breakeven occurs between Year 4 and 5						
Use First Year of Positive Cash flow to calculate Break-even Fraction $70264 - 181576 / 70264 = 0.387$						
Actual Break-even occurred at 4.4 Years						

5. Technical Feasibility

The technical evaluation indicates that the proposed CMS can be successfully developed and sustained by the clinic. The system will use a secure web-based architecture built on PHP or Node.js with a MySQL database. It will be hosted on a Canadian cloud provider to ensure that all data remains within Canadian legal boundaries. The platform will support HL7/FHIR standards to allow interoperability with laboratories and pharmacies and will include PHIPA-compliant authentication and audit logging. The clinic's existing IT consultant can support the system, and overall technical risks are considered manageable.

6. Operational Feasibility

Operationally, the CMS is well positioned to resolve the clinic's current workflow challenges. By eliminating paper-based processes, it will streamline patient check-in, reduce administrative delays, and improve the accuracy of clinical records. Physicians will experience smoother access to lab results and digital notes, and management will benefit from improved scheduling and billing insights. Although staff will require approximately two weeks of training, user adoption is expected to be strong because the system directly addresses long-standing pain points.

7. Schedule Feasibility

The project schedule fits within the required nine-month timeframe. One month is planned for requirements gathering and initial planning, followed by two months of system design, including the creation of ERDs, DFDs, wireframes, and overall architecture. Development will take place over the next three months, with two additional months dedicated to testing, UAT, and staff training. The final month will be reserved for deployment and post-go-live support.

8. Legal and Contractual Feasibility

The CMS complies with all relevant legal requirements. It adheres to PHIPA for patient privacy and ensures Canadian data residency in accordance with PIPEDA. All electronic billing features are designed to follow OHIP standards. Vendor agreements will explicitly address data ownership, system uptime, and security expectations, ensuring the clinic retains full control of its information.

9. Political Feasibility

Within the clinic, there is strong stakeholder support for the project. Management sees the CMS as a necessary modernization effort. Physicians appreciate the potential for faster lab result access and more efficient digital documentation. Reception staff welcome the idea of automated scheduling and reduced repetitive work. Resistance is expected to be minimal, especially with a proper training and rollout plan.

10. Conclusion and Recommendation

The Clinical Management System is feasible from every required perspective. Economically, the project demonstrates a low but positive NPV and ROI, with a reasonable four-year payback. Technically, it can be implemented using the clinic's existing infrastructure and expertise. Operationally, it addresses clear business problems and supports significant workflow improvements. The nine-month schedule is realistic, and the project meets all legal and regulatory requirements. Politically, it is supported by all major stakeholders.

Final Recommendation

The project should proceed. While the CMS is not intended to generate high financial returns, it offers substantial operational value by improving patient service, reducing errors, enhancing compliance, and stabilizing long-term clinic operations. These outcomes align with the strategic goals of healthcare information systems and fully support the clinic's commitment to better service delivery.

2.2 Intangible Benefits

The project also provides several important intangible benefits. The Clinical Management System (CMS) is expected to significantly improve patient satisfaction by reducing wait times and modernizing service delivery. As paper-based processes are reduced and digital workflows are introduced, staff morale is likely to improve because tasks become easier, faster, and more organized. A better workflow means fewer frustrations for receptionists, nurses, and physicians, leading to a more positive work environment.

The clinic's reputation and professionalism will also be strengthened. A modern, integrated, and responsive digital system enhances the public image of ABC Walk-in Clinic, positioning it as a reliable, efficient, and technologically advanced health provider. Faster service, fewer lost files, and more accurate patient records contribute to stronger patient trust and improved community perception.

The CMS will further help ensure better compliance with Personal Health Information Protection (PHIPA) and Personal Information Protection and Electronic Documents Act (PIPEDA), reducing the risk of privacy breaches and legal issues. More accurate record-keeping, improved audit trails, and standardized documentation practices support safer long-term data handling and regulatory adherence.

In addition to these direct advantages, the system also delivers broader intangible benefits commonly associated with information system development, such as:

- Improved decision-making, supported by more accurate and timelier clinical and administrative data.
- Enhanced accuracy of information, reducing transcription or duplication errors common in paper systems.
- Better service to the community, through reliable patient follow-up, chronic disease tracking, and continuity of care.

- Improved communication within the clinic, enabling smoother coordination between reception, nursing, physicians, and external partners such as labs and pharmacies.
- Greater organizational learning, as staff gain familiarity with standardized digital processes that improve training and long-term operational maturity.

Intangible benefits play a critical role in building a strong business case for adopting the CMS. Together, they support higher-quality service delivery, long-term organizational stability, and stronger patient trust, outcomes essential for a modern healthcare practice.

General Project Information

Project Name:	Clinical Management System (CMS)
Sponsor:	Abid Rana, Clinic Manager(arana@abcclinic.ca)
Project Manager:	Dr. Michael Park

Problem / Opportunity Statement

Rapid patient growth has outpaced ABC Clinic's existing manual processes. Paper files and spreadsheets make it difficult to track appointments, billing, and medical records efficiently. A new digital solution is needed to support the clinic's expanding operations and enhance patient experience.

Project Objectives

Develop and implement an integrated Clinic Management System (CMS) that manages all patient and appointment records electronically, streamlines check-in, check-out, and walk-in queue management, automates government and private billing workflows, provides comprehensive reports for management and compliance, and ensures data security in adherence to Ontario's privacy standards.

Project Description

The CMS will centralize all patient-related data and automate clinical workflows by supporting appointment scheduling and walk-in queue management with triage priority, electronic documentation of visits, vitals, prescriptions, and lab requisitions, automatic billing generation for government and non-covered services, integration with third-party systems such as labs, pharmacies, and accounting, and a reporting dashboard that provides daily, weekly, and monthly summaries.

Business Benefits

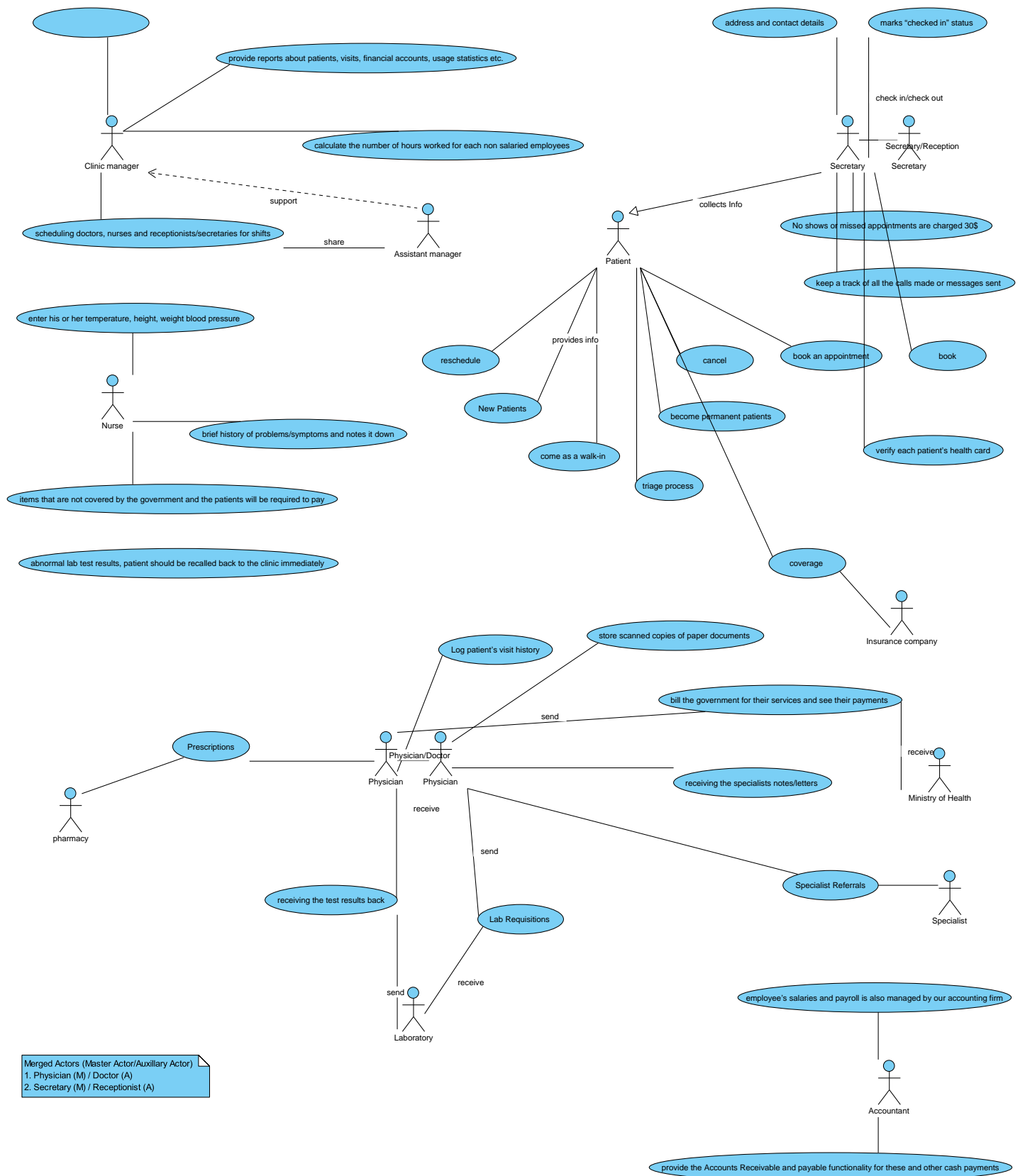
1. Reduced patient wait times and administrative workload.
 2. Improved data accuracy, billing turnaround, and financial reporting.
 3. Enhanced compliance with PHI privacy laws.
 4. Scalable digital foundation for future clinic expansion.
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Project Deliverables

1. CMS Requirements Analysis and System Design Documents.
 2. CMS Application (Web Interface + Database).
 3. User Training Manual and Implementation Guide.
 4. Test Plan and Pilot Deployment Report.
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Estimated Duration

9 months (December 01, 2025 – August 31, 2026)



Merged Actors (Master Actor/Auxiliary Actor)
 1. Physician (M) / Doctor (A)
 2. Secretary (M) / Receptionist (A)



B

eight receptionists and two Assistant managers to help me in running the day to day affairs of the clinic. Our clinic will be open

No.	Candidate Class	Extracted Text	Type	Description	Occurrence	Highlight
1	Assistant manager	Assistant managers	Generated M...	supports the manager, shares permissions for scheduling and administration	1	
2	Clinic manager	clinic manager	Generated M...	staff scheduling, payroll hours, reporting	1	
3	Patient	patient	Generated M...	register, book/cancel/reschedule, walk-in, pay, receive results	12	
4	Nurse	nurses	Generated M...	record vitals and medical history & symptoms	2	
5	Laboratory	Laboratory	Generated M...	receive requisition, send results	1	
6	Specialist	Specialist	Generated M...	receive referral, send notes	1	
7	Accountant	accountant	Generated M...	receive payroll report, process credit cards	1	
8	pharmacy	pharmacy	Generated M...	receive electronic prescription	1	
9	Physician	physician	Generated M...	iagnose, prescribe, order labs, referrals, billing	2	
10	Ministry of Health	Ministry of Health	Generated M...	health card check, billing payment	1	
11	Insurance company	insurance company	Generated M...	external insurance system for claims, approvals, and patient billing	1	
12	Doctor	doctors	Generated M...	diagnose, prescribe, order labs, referrals, billing	4	
13	Secretary	secretary	Generated M...	check-in, queue management, verify health card, payment handling check-	2	
14	Receptionist	receptionists	Generated M...	in, queue management, verify health card, payment handling walk-in	2	
15	come as a walk-in	come as a walk-in	Generated M...	patient is checked in, added to a queue, and assigned to doctor verify	1	
16	verify each patient's health card	verify each patient's health card	Generated M...	health card and mark the patient as arrived for their appointment	1	
17	marks "checked in" status	marks "checked in" status	Generated M...	verifies the patient's health card in real-time with the Ministry of Health system, confirms contact details, and marks the appointment	1	
18	store scanned copies of paper documents	store scanned copies of paper docu	Generated M...	upload paper-based results or letters into the system	1	
19	calculate the number of hours worked for each non salaried employ	calculate the number of hours work	Generated M...	track hours worked for payroll processing	1	
20	bill the government for their services and see their payments	bill the government for their servic	Generated M...	send physician claims to the Ministry of Health electronically	1	



c. Lab Requisitions (print out given to the patient or sent to the laboratory electronically and receiving the test results back)

No.	Candidate Class	Extracted Text	Type	Description	Occurrence	Highlight
21	book an appointment	book an appointment	Generated M...	schedule a visit with a physician	1	
22	Log patient's visit history	Log patient's visit history	Generated M...	schedule a patient visit with a selected doctor at an available time	1	
23	reschedule	reschedule	Generated M...	reschedule Appointment	1	
24	brief history of problems/symptoms and notes it down	brief history of problems/symptom	Generated M...	records symptoms	1	
25	keep a track of all the calls made or messages sent	keep a track of all the calls made o	Generated M...	record all commnication with the patient	1	
26	enter his or her temperature, height, weight blood pressure	enter his or her temperature, heigh	Generated M...	record Vitals	1	
27	receiving the specialists notes/letters	receiving the specialists notes/lette	Generated M...	receive referrals electronically from specialist offices	1	
28	accept payments in cash or via a major credit card	accept payments in cash or via a m	Use Case	payment processing	1	
29	abnormal lab test results, patient should be recalled back to the clinic	abnormal lab test results, patient s	Generated M...	notify and document follow-up communication with patients.	1	
30	No shows or missed appointments are charged 30\$	No shows or missed appointments	Generated M...	no show/missed appointments	1	
31	managing medical clinics	managing medical clinics	Generated M...	manager generates reports on patient visits, revenue, physician activity, usage statistics, and operational performance	1	
32	employee's salaries and payroll is also managed by our accounting	employee's salaries and payroll is a	Generated M...	manage payroll and salaries	1	
33	book	book	Generated M...	make appointment	2	
34	items that are not covered by the government and the patients will pay for them	items that are not covered by the g	Generated M...	handles payments for uninsured patients or services not covered by the government., accepts cash or credit card and issues receipts	1	
35	provide the Accounts Receivable and payable functionality for these	provide the Accounts Receivable ar	Generated M...	handle Accounts Payable, handle Accounts Receivable (Insurance/Cash)	1	
36	coverage	coverage	Generated M...	goverment health coverage	2	
37	provide reports about patients, visits, financial accounts, usage statistics	provide reports about patients, visi	Generated M...	generates reports on patient visits, revenue, physician activity, usage statistics, and operational performance	1	
38	Prescriptions	Prescriptions	Generated M...	generate and print/send medication prescriptions electronically	1	



B

change the status accordingly: booked canceled arrived Checked IN Checked OUT I W/T(left without treatment) No show

No.	Candidate Class	Extracted Text	Type	Description	Occurrence	Highlight
29	abnormal lab test results, patient should be recalled back to the clinic	abnormal lab test results, patient s	Generated M...	notify and document follow-up communication with patients.	1	
30	No shows or missed appointments are charged 30\$	No shows or missed appointments	Generated M...	no show/missed appointments	1	
31	managing medical clinics	managing medical clinics	Generated M...	manager generates reports on patient visits, revenue, physician activity, usage statistics, and operational performance	1	
32	employee's salaries and payroll is also managed by our accounting	employee's salaries and payroll is a	Generated M...	manage payroll and salaries	1	
33	book	book	Generated M...	make appointment	2	
34	items that are not covered by the government and the patients will	items that are not covered by the g	Generated M...	handles payments for uninsured patients or services not covered by the government., accepts cash or credit card and issues receipts	1	
35	provide the Accounts Receivable and payable functionality for these	provide the Accounts Receivable ar	Generated M...	handle Accounts Payable, handle Accounts Receivable (Insurance/Cash)	1	
36	coverage	coverage	Generated M...	government health coverage	2	
37	provide reports about patients, visits, financial accounts, usage stat	provide reports about patients, visi	Generated M...	generates reports on patient visits, revenue, physician activity, usage statistics, and operational performance	1	
38	Prescriptions	Prescriptions	Generated M...	generate and print/send medication prescriptions electronically	1	
39	receiving the test results back	receiving the test results back	Generated M...	electronic lab report	1	
40	address and contact details	address and contact details	Generated M...	edit patient contact or personal details	1	
41	scheduling doctors, nurses and receptionists/secretaries for shifts	scheduling doctors, nurses and rec	Generated M...	create work schedules for doctors, nurses, and receptionists	1	
42	Specialist Referrals	Specialist Referrals	Generated M...	create referrals and send electronically to specialist offices	1	
43	Lab Requisitions	Lab Requisitions	Generated M...	create lab test orders and send or print them for the patient	1	
44	New Patients	New Patients	Generated M...	create a new patient profile with personal and health card information	1	
45	cancel	cancel	Generated M...	cancel or change an appointment up to 24 hours before	1	
46	become permanent patients	become permanent patients	Generated M...	cancel a previously booked appointment	2	
47	triage process	triage process	Generated M...	chest pain, wound treatment	1	

8. Written Use Case – KITE Level

Use Case Title	Manage Patient Appointment
Primary Actor	
Level	Kite (summary)
Stakeholders	Patient, Receptionist, Physician, OHIP Billing System
Precondition	Patient accesses the clinic website or contacts the clinic. Clinic CMS is online and operational
Minimal Guarantee	Any incomplete appointment request is rolled back with no partial data stored
Success Guarantee	Appointment is successfully booked, stored in CMS, and confirmation is issued to the patient
Trigger	Patient requests to book an appointment (online, phone, or in-person).
Main Success Scenario	1. Patient accesses the ABC Clinic CMS (web portal or phones reception)
	2. Patient searches for available appointment slots with preferred doctor or service
	3. Patient selects an available date and time.
	4. CMS retrieves patient record or creates a new record for first-time users
	5. CMS verifies patient eligibility (OHIP validation or payment method)
	6. CMS holds the appointment slot temporarily
	7. Patient submits final confirmation
	8. CMS stores the appointment in the database and marks the time slot as unavailable
	9. CMS sends confirmation (email/SMS/portal)
Extensions	1a. Appointment search function unavailable
	1a1. Patient notified that the system is temporarily unavailable
	1a2. Patient quits or retries later
	1b. No appointments available for selected physician/service
	1b1. Patient offered next available staff/clinic location
	1b2. Patient selects alternative OR quits the process
	2a. CMS cannot retrieve patient profile
	2a1. System prompts patient to re-enter required details
	2a2. Patient retries OR cancels request (transaction rolled back)
	5a. OHIP eligibility cannot be verified
	5a1. Patient notified of issue.
	5a2. Patient chooses to provide alternate payment method OR
	5a3. Patient quits (transaction rolled back)
	7a. Confirmation transaction interrupted
	7a1. Patient notified and offered alternate confirmation method
	7a2. Patient quits (transaction rolled back)

