

## **e\_Dialysis Clinical Systems**

### **QA Test Plan**

**Version: <3.0>**

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### 1 DOCUMENT ACCEPTANCE AND SIGN-OFF

By signing below, I acknowledge that I have read the entire contents of this document and accept the document in this form as reasonably fulfilling the goals described in the section titled Document Purpose. I further agree that this will constitute the document of record and cannot be changed without review and acknowledgement of the groups shown below:

Group / Role	Approver Name	Approver Signature	Date Approved
Test Manager	Krupa Patel	KP	04/22/2024
Dev manager	Shreyas Rai	SR	04/22/2024
QA Lead	Swetha Paturu	SP	04/22/2024
Test Analyst	Sraddha Pedda Gangireddy Gari	SP	04/22/2024
Test Analyst	Alankrutha Reddy	AR	04/22/2024

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### 2 REVISION HISTORY

Document/Department Editor:			
Date	Revision #	Editor	Description of Change
04/17/2024	1.0	QA	Initial creation of the document.
04/19/2024	2.0	QA	Added additional sections on requirements.
04/21/2024	3.0	QA	Updated test scenarios and added new test cases for additional functionality to include seamless entity registration.

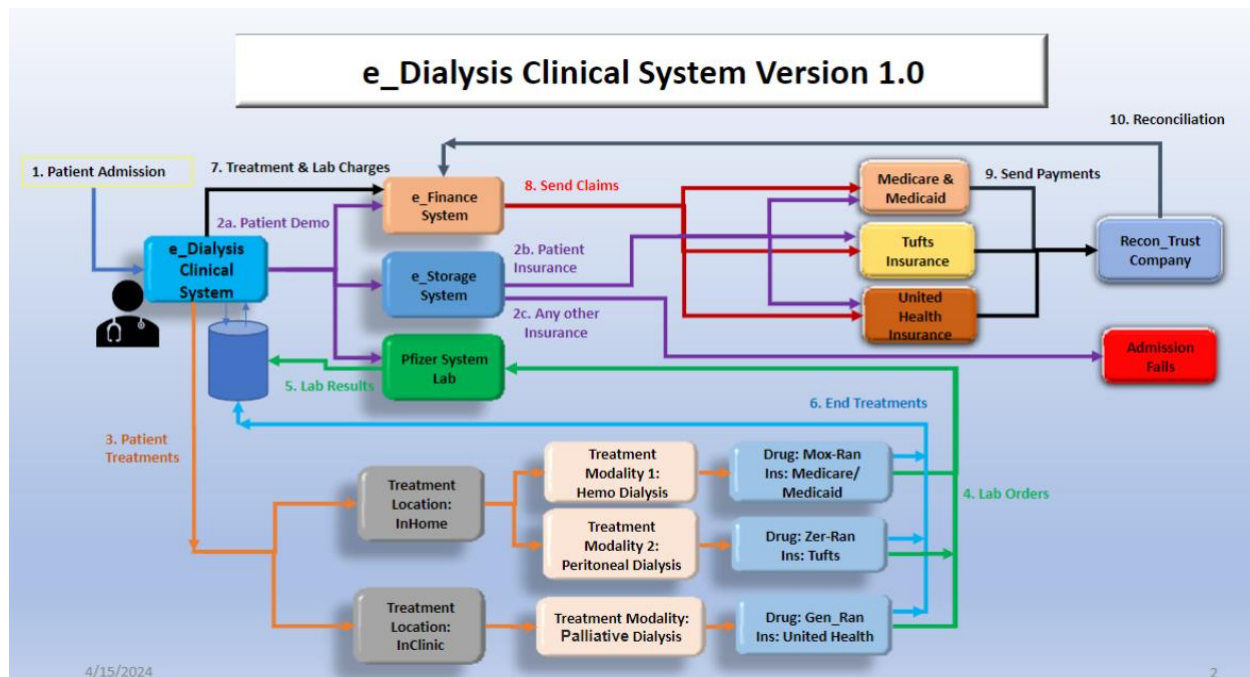
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## 3 Introduction

### 3.1 PURPOSE

The e\_Dialysis Clinical System project aims to modernize dialysis clinic management by replacing the outdated Treatment Sheet application. It promises comprehensive functionality to streamline patient admission, treatment, lab orders, lab results, and financial billing. The rigorous test strategy ensures thorough verification of critical functionalities, including patient admission processes, treatment protocols, and financial billing procedures. Testing is conducted in phases, including unit testing, integration testing, system testing, and acceptance testing, to validate system functionality and alignment with user requirements. Effective test management ensures timely resolution of effects and facilitates stakeholder collaboration throughout the testing process, ensuring the system's readiness for deployment and contributing to improved patient care and operational efficiency in dialysis clinics.



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### 3.2 PROJECT OVERVIEW

The e\_Dialysis Clinical System (V1.0) project consists of two core modules: Patient Admission and Treatment & Billing. The Patient Admission module manages the seamless admission of patients, ensuring compliance with financial clearance and insurance verification.

The Treatment & Billing module oversees patient treatments and associated financial processes. It records treatment data and lab orders, transmitting them to the Pfizer System Lab for processing. Lab results are promptly relayed back, and charges are forwarded to the e\_Finance system for billing.

Key capabilities of the e\_Dialysis Clinical System include:

1. Efficient patient admission management with financial clearance and insurance verification.
2. Secure transmission of patient demographic and insurance information to essential systems.
3. Accurate recording and management of patient treatments and lab orders.
4. Seamless transmission of lab orders to the Pfizer System Lab for processing.
5. Prompt relay of lab results back to the e\_Dialysis Clinical System.
6. Daily collection and forwarding of treatment and lab charges to the e\_Finance system for billing.
7. Compliance with Agile methodology for project development and testing, with sprint cycles managed through a defect tracker.

## 4 Scope

### 4.1 IN-SCOPE

The following core features and business flows will be included in scope for testing efforts:

- Admitting new and existing patients based on the FinAdmit\_Flag and sending their demographics and insurance information to specified systems.
- Administering treatments to patients based on Clinical Clearance and insurance types, including specific drugs and treatment modalities.
- Storing and sending treatment and lab charges to the e\_Finance system for billing purposes.
- Sending claims to insurance companies and processing payments accordingly.
- Conducting weekly reconciliation of claims and payments between Recon\_Trus Company and e\_Finance System.
- Testing interfaces, processes, workflows, and integrations with external vendors as outlined in *the business requirements*.

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Non-Functional Areas (In-Scope):

- Accessibility and compliance with mandated guidelines.
- Security measures such as data protection, encryption, and role-based access.
- Performance testing for load, volume, and peak capacity.
- Recovery and failover mechanisms.

#### 4.2 OUT-OF-SCOPE

Following areas are currently out of scope for this test plan

- Scalability testing beyond projected capacity.
- Testing hardware capacity and configurations.
- Testing external systems beyond integration points.
- Mobile and tablet-specific UI optimizations.
- Future capabilities and minor enhancements

The above items are excluded due to timing limitations and resource prioritization for core functionality testing. These may be considered in future releases. Additionally, minor enhancements like UI color scheme changes are deferred to future releases and not part of current testing.

## 5 Testing Strategy

### 5.1 TEST OBJECTIVES

Below are the objectives for e\_Dialysis Clinical System

- Validate all functionality outlined in the e\_Dialysis Clinical System's business requirements document.
- Ensure seamless integration between the e\_Dialysis Clinical System and external systems such as the Pfizer System Lab and e\_Finance system.
- Verify the system's ability to handle both valid and erroneous transaction data inputs effectively.
- Test end-to-end user workflows across different patient types and treatment modalities.
- Assess system performance under expected workload conditions to meet predefined benchmarks.
- Identify areas for usability improvement through informal user testing sessions.
- Achieve a minimal number of defects before User Acceptance Testing (UAT) and production deployment.

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Testing tasks carried by QA Team:

- Review business requirements and functional specifications to develop comprehensive test cases covering all controls and workflows.
- Prepare test data sets that encompass valid and invalid conditions to ensure thorough testing coverage.
- Coordinate with relevant teams to conduct end-to-end testing of integrated data flows between systems.
- Develop automated test scripts for regression testing of system components to ensure consistent performance across iterations.
- Analyze system logs and conduct volume spike testing to simulate peak usage scenarios and assess system scalability.

Testing timeframes:

- Sprint 1: Core patient admission functionality
- Sprint 2: Integration interfaces with external systems
- Sprint 3: Patient treatment workflows
- Sprint 4: Security and accessibility testing
- Sprint 5: Load testing to evaluate system performance at scale
- Sprint 6 to 8: User Acceptance Testing (UAT) across the entire ecosystem
- Sprint 9: Final regression testing and preparation for production deployment.



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### 5.2 RISKS & ASSUMPTIONS

*List the key risks and assumptions of the project and the test plan.*

Risks/Assumptions	Mitigation
Resource Constraints	Implement efficient resource allocation strategies and prioritize critical tasks.
Technical Dependencies	Identify and document technical dependencies early and establish contingency plans.
System Reliability	Conduct thorough testing and implement robust monitoring mechanisms.
User Adoption	Provide adequate training and support to end-users for smooth adoption of the new system.
Vendor Performance	Establish clear performance metrics and SLAs with vendors and regularly review their performance.

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#### 5.3 DATA APPROACH

This section details the strategy for managing and using test data in the QA and UAT environments, ensuring that it mirrors the complexities and requirements of the production environment while safeguarding patient privacy.

##### Data Sources:

The test data will be sourced from anonymized patient records and simulated interaction data between e\_Dialysis Clinicals System and other systems (e.g., Pfizer System Lab and e\_Finance).

##### Data Types:

The test data will include:

- Patient admission records
- Treatment and dialysis session data
- Lab orders and results data
- Billing and insurance claim data
- Payment reconciliation data

##### Data Generation and Preparation

Test Data Creation: Generate an anonymized dataset that includes:

- 100K patient records with varying clinical and financial clearance statuses.
- 200K treatment session records.
- Lab orders and results data for all treatment sessions.
- Detailed insurance billing data, including claims sent to insurance companies.

Data Characteristics: Include both valid and invalid data sets to test system validations for:

- Financial and Clinical Clearance flags.
- Insurance types and conditions.
- Lab order integrity and result accuracy.

##### Data Anonymization:

Employ masking techniques to ensure that no actual sensitive patient data is used. Anonymization protocols will be applied to all patient-identifiable information to ensure compliance with health data protection standards.

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### Data Management and Security:

- **Baseline Data Set:** Establish a baseline dataset that will be refreshed and extended with new scenarios in each testing sprint to validate additional functionalities as they are developed.
- **Access Controls:** Implement strict access controls to govern who can view and modify test data, ensuring that only authorized personnel have access during the testing phases

## 5.4 TYPES OF TESTING

*List the types of testing to be performed.*

Test Type	Description	Responsible Parties
Unit Testing	Validate functionality of individual software components and modules	Developers
Functional Testing	Evaluate system behavior against documented requirements	QA Team Leads, Business Analysts
User Acceptance Testing	Validate functionality as per business needs before production deployment	Business Users, QA Facilitators
Regression Testing	Validate existing features have no defects introduced due to code changes	QA Automation Engineers
Performance Testing	Validate response times, load capacity and stability under varying concurrent user loads	Performance Test Lead, QA Automation Engineers
Usability Testing	Assess workflow, ease of use, simplicity and learnability for end users	QA Leads, UX Testers
Security Testing	Evaluate mechanisms for data protection, access controls and attack prevention	Security Architects, Penetration Testers

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#### 5.5 UNIT TESTING

Unit testing will focus on components and modules of the following areas:

##### **Patient Admission Workflows:**

Testing the admission procedures based on FinAdmit\_Flag and Diaylsis\_Flag, ensuring that patients are correctly categorized and processed based on their clinical and financial statuses.

##### **Dialysis Treatment Processing:**

Verifying the system manages dialysis sessions appropriately, initiating and tracking treatments based on the Diaylsis\_Flag.

##### **Integration Interfaces:**

Testing the data exchange interfaces with external systems such as the Pfizer System Lab for lab orders and results, and the e\_Finance system for billing and claims processing.

##### **Database Validation Procedures:**

Ensuring the integrity and accuracy of data storage and retrieval processes within the e\_Dialysis Clinicals System, focusing on patient data, treatment records, and lab results.

##### **Payment Processing Modules:**

Confirming that all treatment and lab charges are correctly calculated, processed, and transmitted to the e\_Finance system for claims generation and subsequent payment processing.

Participants:

Tester's Name	Department/ Area	Role
Shreyas Rai	Development	Dev Manager
Marcus Jun	Development	Software Developer
Talia Ramirez	Development	Software Developer

#### 5.6 FUNCTIONAL TESTING

Functional testing will cover end-to-end flows spanning:

1. Ensuring the patient admission process is accurate for new and existing patients based on FinAdmit\_Flag status and insurance type
2. Verifying that treatment processes, including medication administration and treatment modalities, are correctly applied as per the Diaylsis\_Flag.

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3. Testing the interface between the e\_Dialysis system and the Pfizer System Lab for correct sending, receiving, and storing of lab orders and results.
4. Checking that treatment and lab charges are accurately recorded and communicated to the e\_Finance system based on treatment data.
5. Ensuring that claims are correctly generated, sent to insurance companies, and that payments are processed according to the business rules.
6. Verifying the reconciliation process between the e\_Dialysis Clinical System and the Recon\_Trus Company for auditing purposes.

Participants:

Tester's Name	Department/ Area	Role
Krupa Patel	QA	Test Manager
Swetha Paturu	QA	QA Lead
Flynn Robertson	Business	Business Analyst

## 5.7 USER ACCEPTANCE TESTING

UAT will focus on validating business flows and use cases from the user perspective:

1. Admission Validations
2. Dialysis Treatment Workflows
3. Lab Integration Checks
4. Financial Transaction Accuracy
5. Claims Processing and Payments
6. Reconciliation Procedures

Participants:

Tester's Name	Department/ Area	Role
Sienna Li	Nursing	User Representative
Leon Kozlov	Dialysis Center Admin	User Representative
Greta Holm	Business	UAT Lead

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### 5.8 REGRESSION TESTING

Regression testing will validate the following areas have no defects introduced due to code changes:

**Core Treatment Processes:**

Validate the functionality of core treatment admission and management processes, ensuring no new defects are introduced.

**Integration with Financial Systems:**

Verify the integrity of integration points with financial systems for accurate transmission of treatment and billing data.

**Database Persistence for Patient Records:**

Ensure that patient records, including admission details and treatment history, persist correctly in the database after any system updates.

**Authentication Systems:**

Validate the authentication mechanisms to ensure that authorized users can access the system without issues.

Participants:

Tester's Name	Department/ Area	Role
Alankrutha Reddy	QA	Test Analyst
Ethan Nyugen	QA Automation	Automation Lead
Isabella Smith	QA Automation	Automation Engineer

### 5.9 PERFORMANCE TESTING

The following will be covered during performance testing cycles:

1. Simulate up to 500 concurrent users accessing the system concurrently.
2. Continuously maintain peak load conditions, equivalent to 100 concurrent treatments, for a duration of 12 hours.
3. Monitor system performance metrics during peak load to identify any performance bottlenecks, such as slow database queries or resource constraints.
4. Measure the response times of critical transactions, ensuring they complete within 2 seconds under peak load conditions.
5. Conduct performance tests to validate response times for key transactions, such as lab order processing and treatment scheduling.

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6. Execute failover and recovery tests under peak load conditions to verify system resilience and data integrity in case of failures.
7. Implement a dashboard to monitor CPU, memory, and other resource utilization metrics during performance testing for analysis and optimization purposes.

Participants:

Tester's Name	Department/ Area	Role
William Brown	Performance Engineering	Performance Test Engineer
Krupa Patel	QA	Test Manager
Ava Martinez	Infrastructure	Environment
Sraddha Pedda Gangireddy Gari	QA	Test Analyst

#### 5.10 USABILITY TESTING

Usability testing will focus on evaluating following aspects:

- Workflow efficiency for frequent tasks
- Intuitiveness of application navigation
- Visual appeal of UI design
- Understanding terminology from user perspective

Participants:

Tester's Name	Department/ Area	Role
Priya Reddy	QA	Usability Testing Lead
Sofia Gonzalez	User Research	UX Researcher/ Specialist
Flynn Robertson	Business	Business Analyst

#### 5.11 SECURITY TESTING

Security testing will evaluate following aspects:

- OWASP top 10 vulnerabilities
- SSL/TLS testing for encryption
- SQL injection, XSS attack vectors
- Session management and redirection
- API security standards compliance
- Penetration testing all input forms

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Participants:

Tester's Name	Department/ Area	Role
Mia Wong	Information Security	Lead
Juan Martinez	Information Security	Security Engineer
David Wong	Information Security	Ethical Hacker

## 6 Execution Strategy

### 6.1 QA ENTRANCE CRITERIA

- The entrance criteria refer to the desirable conditions to start test execution.
- Entrance criteria are flexible benchmarks. If they are not met, the test team will assess the risk, identify mitigation actions, and provide a recommendation.

QA Entrance Criteria	Test Team	Technical Team	Notes
<i>Test environment(s) is available</i>			Check Stability of Environment
<i>Test data is available</i>			cover the edge cases and Negative test cases
<i>The code has been merged successfully</i>			Ensure no errors while merging
<i>Development has completed unit testing</i>			Verify Unit test, coverages and results
<i>Test scripts are completed, reviewed, and approved by the Project Team</i>			Include traceability Matrix











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#### 6.2 QA EXIT CRITERIA

- The QA exit criteria are the desirable conditions that need to be met in order to proceed with the implementation.
- QA Exit criteria are flexible benchmarks. If they are not met, the test team will assess the risk, identify mitigation actions, and provide a recommendation.

Exit Criteria	Test Team	Technical Team	Notes
<i>100% Test Scripts executed</i>			Document test evidence.
<i>90% pass rate of Test Scripts</i>			Prioritize critical tests.
<i>No open Critical and High severity defects</i>			Mitigate high risks.
<i>All remaining defects are either canceled or documented as Change Requests for a future release</i>			Track in defect management system.
<i>All expected and actual results are captured and documented with the test script</i>			Verify clarity for audit purposes.
<i>All test metrics collected based on reports from daily and Weekly Status reports</i>			Use for project assessment and reporting.
<i>All defects logged in the Defect Tracker/Spreadsheet</i>			Full defect life cycle tracking.
<i>Test environment cleanup completed and a new backup of the environment</i>			Prepare for subsequent projects.

#### 6.3 DEFECT MANAGEMENT

- Validating test cases and scenarios involves ensuring they align with the functional requirements and provide clear, testable steps with expected outcomes. Each test case should be scrutinized to verify its clarity and alignment with the anticipated results for given inputs.

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- For defect management, any issues uncovered during testing should be logged in a designated Defect Tracker or Spreadsheet. This log should include comprehensive details such as the defect's nature, severity, impact, and its status throughout its lifecycle.
- Testers hold the responsibility for managing defects throughout the entire cycle. This encompasses identifying defects, recording them in the tracker, validating fixes once they are applied, and ultimately closing the defects once they pass retesting successfully.
- In executing test scripts, testers are accountable for meticulously following the test plan for each testing phase. This ensures thorough verification of all functionalities to guarantee comprehensive testing coverage.
- After defect resolution, testers must retest the affected functionality to confirm that the issue has been adequately addressed. Only upon successful retesting can the defect be closed, ensuring the integrity of the software's functionality.

Defects found during the Testing should be categorized as below:

Severity	Impact
1 (Critical)	<ul style="list-style-type: none"><li>▪ <i>Functionality is blocked and no testing can proceed</i></li><li>▪ <i>Application/program/feature is unusable in the current state</i></li></ul>
2 (High)	<ul style="list-style-type: none"><li>▪ <i>Functionality is not usable and there is no workaround but testing can proceed</i></li></ul>
3 (Medium)	<ul style="list-style-type: none"><li>▪ <i>Functionality issues but there is a workaround for achieving the desired functionality</i></li></ul>
4 (Low)	<ul style="list-style-type: none"><li>▪ <i>Unclear error message or cosmetic error which has minimum impact on product use.</i></li></ul>

## 7 Environment Requirements

### 7.1 TEST ENVIRONMENTS

#### Test Environment Requirements:

##### Software :

- Operating systems (e.g., Windows Server, Linux) for the servers/VMs.
- Database management systems (e.g., SQL Server, Oracle, PostgreSQL).
- Application servers (e.g., IIS, Apache Tomcat) to host the web applications.
- Automated testing tools (e.g., Selenium, Appium) for UI testing.

##### Data :

- Test data for various scenarios, including patient demographics, insurance information, treatment details, lab orders, financial data, etc.

##### Environments

- Development environment for coding and unit testing.
- Integration testing environment for testing the integrated components.
- System testing environment for end-to-end testing, mimicking the production environment.
- Performance testing environment for load and stress testing.
- User acceptance testing (UAT) environment for client testing and signoff.

##### Security Requirements :

- Access controls and role-based permissions for different user groups (e.g., administrators, clinicians, finance staff).
- Encryption of data at rest and in transit (e.g., using SSL/TLS for web communications).
- Secure authentication and authorization mechanisms (e.g., multi-factor authentication, single sign-on).
- Auditing and logging of user activities, system events, and security incidents.

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### 8 Dependencies

Identify any dependencies on testing, such as test item availability, testing resource availability, and deadlines.

Dependencies	Comments
<i>Test Data Availability</i>	Access to comprehensive test data sets is required for effective validation of system functionalities.
<i>Software availability</i>	Essential tools such as Selenium, JIRA, and Load Runner must be available for thorough testing procedures.
<i>Testing Resource Availability</i>	Sufficient staffing with the necessary expertise is crucial for the timely completion of testing phases.
<i>Budget</i>	Adequate funding is vital to support the testing infrastructure and resources.

#### Test Schedule

Deliverable	Start Date	End Date
<i>Requirement Verification</i>	May 1 ,2024	May 23, 2024
<i>User Story Reviews</i>	June 2, 2024	June 12,2024
<i>Sprint 1 to Sprint 5</i>	June 15, 2024	July 28, 2024
<i>Performance &amp; Load Testing</i>	Aug 1 , 2024	Aug 14 ,2024
<i>User Acceptance Testing (UAT)</i>	Aug 16, 2024	Sep 2, 2024
<i>Pre-Release Review</i>	Sep 25, 2024	-
<i>Final Deployment</i>	Oct 15 , 2024	-
<i>Post-Deployment Review</i>	Nov15 , 2024	-