**e\_Dialysis Clinical Systems**

**QA Test Plan**

**Version: <1.0>**

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Table of Contents

[1 Document Acceptance and Sign-Off 3](#_Toc151925305)

[2 Revision History 4](#_Toc151925306)

[3 Introduction 5](#_Toc151925307)

[3.1 Purpose 5](#_Toc151925308)

[3.2 Project Overview 5](#_Toc151925309)

[4 Scope 5](#_Toc151925310)

[4.1 In-Scope 5](#_Toc151925311)

[4.2 Out-of-Scope 5](#_Toc151925312)

[5 Testing Strategy 5](#_Toc151925313)

[5.1 Test Objectives 5](#_Toc151925314)

[5.2 Risks & Assumptions 5](#_Toc151925315)

[5.3 Data Approach 5](#_Toc151925316)

[5.4 Types of Testing 5](#_Toc151925317)

[5.5 Unit Testing 6](#_Toc151925318)

[5.6 Functional Testing 6](#_Toc151925319)

[5.7 User Acceptance Testing 6](#_Toc151925320)

[5.8 Regression Testing 7](#_Toc151925321)

[5.9 Performance Testing 7](#_Toc151925322)

[6 Execution Strategy 7](#_Toc151925323)

[6.1 QA Entrance Criteria 7](#_Toc151925324)

[6.2 QA Exit criteria 8](#_Toc151925325)

[6.3 Defect Management 9](#_Toc151925326)

[7 Environment Requirements 9](#_Toc151925327)

[7.1 Test Environments 9](#_Toc151925328)

[8 Dependencies 9](#_Toc151925329)

# 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** |
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| Group 4 | Ritika Mangamuru | Ritika Mangamuru | 04/24/2024 |
| Group 4 | Lance Main | Lance Main | 04/24/2024 |
| Group 4 | Saranya Machavaram | Saranya Machavaram | 04/24/2024 |

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Document/Department Editor: | | | |
| **Date** | **Revision #** | **Editor** | **Description of Change** |
| 04/19/2024 | 1 | Lance, Rushikesh | Introduction and Scope Added |
| 04/20/2024 | 2 | Ritika, Saranya | Testing Strategies added |
| 04/23/2024 | 3 | Lance, Saranya | Execution Strategy |
| 04/23/2024 | 4 | Rushikesh, Ritika | Environment Requirements, dependencies added |
| 04/24/2024 | 5 | Lance, Rushikesh, Ritika, Saranya | Updated and formatted the document for final submission. |

# Introduction

## Purpose

The e\_Dialysis Clinical System testing is important in determining if the system meets the requirement of speeding up the patients' admissions and the delivery of treatment services. The following ensures the validation of critical functionalities such as patient record management, treatment modalities across various locations and interfacing with external systems that include lab and billing. Not only that but testing also ensures the right identification of liability of treatments and lab charges, proper production of claims for various health care organizations and all receipts so that finance audits can be done correctly. By the end, the goal is to verify that the system gives efficient, secure, and correct care.

## Project Overview

The e\_Dialysis Clinical System is an interactive system aimed to simplify the patients' admission processes. By maintaining patients’ electronic medical records, it allows the hospital administration to make treatment and the performance management of patient care more effectively. Most patients receive their treatment either at home or in a clinic. The treatment options at the home or clinic may differ, and there may be different medication options and types of insurance policies.

The treated patient data is safely stored in the system's database during every visit. Once the laboratory orders are transmitted during the treatment, the lab should report the results, and then they should be transmitted back to the e\_Dialysis Clinical System. Both charges for treatment and test lab results are posted in a system that is part of the system every day and sent to the e\_Finance system for billing.

The e\_Finance system automatically does the verification of these charges and electronic submission of claims of insurance organizations including Medicare/Medicaid, Tufts, and United health. The insurance companies make the payments through the accounts of the Recon Trust group. This is the result of the received claims. Each week, Recon Trust group rechecks that the results with e\_Finance System are in line, providing audit accuracy and transparency.

# Scope

## In-Scope

* *Patient Management:* Administer the system test to ensure the patients can be admitted into the system in an appropriate manner*.*
* *Test possible test sites*: At home/in clinic, methodologies, and drugs associated with them.
* Payment error can be avoided by making sure that the system receives the charges for treatment and lab correctly from e-Finance.
* Make sure of insurance information from the patients that are passed has been received by the concerned Insurance Company and Recon Trust.
* *Data Integration*: Ensure seamless data exchange between e-dialysis and external systems:
  + Demographics sent to e-Finance, e-Storage, and Pfizer System Lab.
  + Patient folder retrieval and updates in these external systems.

## Out-of-Scope

* System issues arising outside documented functionalities, such as malfunctions within the Recon Trust company or reconciliation process.
* Scenarios beyond core functionalities, such as an at-home patient unexpectedly requiring in-clinic treatment. These situations would require additional workflows or manual intervention.

# Testing Strategy

## Test Objectives

* Patient Admission:
  + - Verify system admits new and existing patients based on "FinAdmit\_Flag."
    - Check if demographics are sent to external systems upon admission and data storage in e-Finance.
* Patient Treatment:
  + - Test "dialysis\_flag" functionality to determine treatment eligibility.
    - Verify treatment options (at-home/in-clinic), modalities, and associated drugs based on location and insurance.
* Treatment & Lab Charges:
  + - Ensure patient treatment and lab results are stored in the system's database.
    - Confirm collection and transfer of treatment & lab charges to e-Finance for billing.
* Financial Billing & Reconciliation:
  + - Verify e-Finance sends claims to relevant insurance companies (Medicare/Medicaid, Tufts, United health).
    - Confirm successful claim processing and payment transfer from insurance companies to Recon Trust.
    - Ensure weekly reconciliation between Recon Trust and e-Finance for accurate billing records.

## Risks & Assumptions

|  |  |
| --- | --- |
| **Risks/Assumptions** | **Mitigation** |
| **Risk:** Challenges may arise during data exchange between e-dialysis and external systems (e-Finance, e-Storage, Pfizer System Lab) | Thorough testing of data exchange protocols, defining clear error handling mechanisms, and establishing communication channels with external system owners. |
| **Risk:** Functionality gaps or unclear specifications might lead to incomplete testing. | Close collaboration between testers, developers, and stakeholders to ensure comprehensive requirements definition before testing commences. |
| **Assumption:** A stable and representative test environment mirroring the production setup is readily available. | Early establishment and configuration of a robust test environment to minimize delays. |

## Data Approach

**Approach for functional Testing:** For functional testing, the QA team will likely create and maintain a variety of test data sets that reflect different patient scenarios, treatment options, insurance providers, and potential error conditions. This data variation ensures the system can handle diverse real-world situations effectively**.**

**Approach for User Acceptance Testing:** During UAT, the focus shifts to ensuring the system is user-friendly and meets the needs of actual users (hospital staff). The test data should closely resemble real-world patient information and treatment scenarios. This could involve anonymized data extracted from existing hospital records or using tools to generate realistic patient profiles.

## Types of Testing

The types of testing we are performing are:

* Unit testing
* Functional Testing
* User Acceptance Testing
* Regression Testing
* Performance Testing

|  |  |  |
| --- | --- | --- |
| **Test Type** | **Description** | **Responsible Parties** |
| Unit testing | Unit testing involves testing individual units or components of the software in isolation. It focuses on verifying that each unit of code performs as expected. | Ritika Mangamuru  Lance Main |
| Functional Testing | Functional testing verifies that the e\_Dialysis Clinical System meets the functional requirements outlined. It tests the system against specified functions and features to ensure they work as intended. | Ritika Mangamuru  Rushikesh Karwankar |
| User Acceptance Testing | User Acceptance Testing involves validating the e\_Dialysis Clinical System by end users to ensure it meets their requirements and expectations. It focuses on confirming that the system is usable, meets business needs, and aligns with user preferences. | Saranya Machavaram  Lance Main |
| Regression Testing | Regression testing ensures that recent changes or system updates have not adversely affected existing functionalities. | Ritika Mangamuru  Saranya Machavaram |
| Performance Testing | Performance testing evaluates the speed, responsiveness, stability, and scalability of the e\_Dialysis Clinical System under various conditions. | Saranya Machavaram  Rushikesh Karwankar |

## Unit Testing

* In-Scope:
* *Patient Admission Functionality:* Testing functions/methods responsible for admitting new and existing patients into the system.
* *Insurance Information Handling:* Testing functions/methods responsible for handling insurance information and sending it to the appropriate systems.
* *Treatment Administration Logic:* Testing functions/methods responsible for administering treatments based on patient attributes such as treatment location, modality, and insurance type.
* *Lab Orders and Results Processing:* Testing functions/methods responsible for sending lab orders to the Pfizer System Lab and processing lab results received from external systems.
* *Charges Recording and Calculation:* Testing functions/methods responsible for recording treatment and lab charges in the system's database and calculating total charges accurately.
* *Claims Submission Logic:* Testing functions/methods responsible for generating and submitting claims to insurance companies based on treatment and insurance information.
* *Payment Handling Logic:* Testing functions/methods responsible for receiving payments from insurance companies and processing them accordingly.
* *Reconciliation Process Logic:* Testing functions/methods responsible for performing weekly reconciliations with the Recon Trust Company and handling any reconciliation failures.
* *Exception Handling:* Testing functions/methods responsible for handling exceptions, errors, and edge cases gracefully within the system.
* Out-of-Scope:
* Integration with External Systems: Testing interactions between e\_Dialysis Clinical System and external systems like e\_Finance System) is beyond the scope of unit testing.

Participants:

|  |  |  |
| --- | --- | --- |
| **Tester’s Name** | **Department/ Area** | **Role** |
| Lance Main | Clinical | Test Manager |
| Saranya Machavaram | Finance | Test Lead |
| Rushikesh Karwankar | Clinical | Test Analyst |

## Functional Testing

* In-Scope:
* *Patient Admission:* Verify that new patients can be admitted with all required demographics information sent to the designated systems. Test the update process for existing patient records when admitted. Validate rejection of patients with “FinAdmit\_Flag” = No and those with unacceptable insurance types, unacceptable drugs, unacceptable Treatment modality.
* *Treatment Administration:* Confirm that patients are correctly categorized as "Clinically Cleared" or "Not Clinically Cleared" based on “Diaylsis\_Flag” and various other parameters insurance types, drugs,Treatment modality. Test treatment administration is based on accepted insurance types, treatment locations, and modalities. Validate drug administration based on insurance and treatment modality.
* *Lab Orders and Results:* Validate that lab orders are correctly sent to Pfizer System Lab for treatments received by patients. Verify the receipt of lab results in the e\_Dialysis System and proper association with patient records.
* *Treatment and Lab Charges:* Verify the calculation and transmission of treatment and lab charges to the e\_Finance system. Confirm that charges are only sent for patients receiving treatments.
* *Financial Billing:* Test the transmission and generation of claims to the respective insurance companies. Validate the processing of claims and receipt of payments from insurance companies.
* *Reconciliation Process:* Ensure that the Recon Trust Company performs weekly reconciliations accurately. Validate the auditing of claims and payments for accuracy and completeness.
* *System Integration:* Test the integration between e\_Dialysis Clinical System, e\_Finance System, e\_Storage System, and Pfizer System Lab. Confirm that data transfers and updates between systems occur seamlessly.
* *Error Handling:* Test system responses and error messages for invalid inputs or scenarios such as rejected patients or failed data transmissions. Ensure appropriate error handling mechanisms are in place for system failures.
* *Data Validation:* Validate the accuracy and completeness of patient demographics, treatment records, and financial data across systems. Ensure data consistency and integrity throughout the system.
* *Security Testing:* Test the system's security measures to ensure patient data confidentiality and protection against unauthorized access. Validate user authentication and authorization mechanisms to prevent data breaches.

Participants:

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| --- | --- | --- |
| **Tester’s Name** | **Department/ Area** | **Role** |
| Ritika Mangamuru | Finance | Test Manager |
| Saranya Machavaram | Finance | Test Lead |
| Rushikesh Karwankar | Clinical | Test Analyst |

## User Acceptance Testing

* In-Scope:
* *Patient Admission Process:* Verify the accuracy and efficiency of admitting new and existing patients into the system. Ensure that demographic information is captured correctly and sent to the relevant systems.
* *Treatment Administration:* Test the functionality to administer treatments accurately according to patient needs and protocols. Ensure that the correct drugs are administered based on treatment modality and insurance type.
* *Lab Orders and Results Handling:* Validate the process of sending lab orders to the Pfizer System Lab and receiving accurate results. Ensure that lab results are accurate, timely, and integrated into the e\_Dialysis Clinical System effectively.
* *Charges Recording and Billing:* Ensure that treatment and lab charges are recorded accurately and submitted for billing correctly.
* *Reconciliation Process:* Validate the accuracy of the weekly reconciliation process with the Recon Trust Company.

Participants:

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| --- | --- | --- |
| **Tester’s Name** | **Department/ Area** | **Role** |
| Lance Main | Clinical | Test Manager |
| Saranya Machavaram | Finance | Test Lead |
| Ritika Mangamuru | Clinical | Test Analyst |

## Regression Testing

* In-Scope:
* *Admission Process Regression:* Check if both new and existing patients are correctly admitted into the system with all required demographic information mentioned and stored.
* *Insurance Information Verification:* Validate the insurance information is processed correctly during admission, and patients are categorized based on accepted insurance types.
* *Treatment Protocol Regression:* Confirmation of patients that are classified accurately as "Clinically Cleared" or "Not Clinically Cleared" based on their diagnosis and treatment eligibility.
* *Treatment Location and Modality:* Confirmation of patients are assigned and routed to proper treatment locations and modalities based on their clinical needs and insurance coverage.
* *Lab Orders and Results Verification:* Confirmation of lab orders are generated and processed accurately for patients receiving treatments, and lab results are stored into the system.
* *Billing and Financial Processing:* Verify the correctness of billing processes, including the treatment generation and charges of lab, and ensure that claims are submitted correctly to insurance companies.
* *Data Integrity Checks:* Confirm that all the data of patient records, treatment histories, and financial transactions remain consistent and accurate across the whole system.
* *Error Handling and Exception Testing:* Check the system's response to various error scenarios, including invalid data input, network failures, and system crashes, to ensure robust error handling.
* *Performance Regression Testing:* Measure the system performance under load conditions to ensure that recent changes have not introduced any performance regressions or bottlenecks.

Participants:

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| --- | --- | --- |
| **Tester’s Name** | **Department/ Area** | **Role** |
| Lance Main | Clinical | Test Manager |
| Rushikesh Karwankar | Finance | Test Lead |
| Ritika Mangamuru | Clinical | Test Analyst |

## Performance Testing

* In-Scope:
* *Admission Processing Time:* Time taken to admit a new patient into the system and update the existing patient records.
* *Insurance Information Retrieval Speed:* Measuring the time to retrieve the record and to process the information insurance during patient admission to make sure it doesn't cause delays in the admission process.
* *Treatment Processing Time:* Assess the time taken to process treatments for patients, including sending lab orders, receiving lab results, and updating treatment records.
* *System Responsiveness:* Test the system's responsiveness under different loads to ensure it remains stable and responsive even during peak usage periods.
* *Database Performance:* To measure the Database performance under load to handle concurrent transactions efficiently without performance degradation.
* *File Transfer Speed:* Measure the rate of speed of file transfers between the e\_Dialysis Clinical System and other external systems for timely data exchange.
* *Billing Process Performance:* Test the performance of the billing process that includes generating claims and sending them to insurance companies, to make sure it can handle large volumes of transactions efficiently.
* *Reconciliation Time:* Measure the time taken to reconcile claims and payments with the Recon Trust Company for accurate financial auditing.
* *Concurrency Testing:* Measure the ability of system to handle multiple concurrent users performing different actions simultaneously to ensure it can scale and handle peak loads effectively without system breakdown.
* *Error Handling Under Load:* Check how the system handles errors and exceptions under heavy load conditions to ensure it handles failures, errors and exceptions without compromising data integrity or user experience.

Participants:

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| --- | --- | --- |
| **Tester’s Name** | **Department/ Area** | **Role** |
| Lance Main | Clinical | Test Manager |
| Saranya Machavaram | Finance | Test Lead |
| Ritika Mangamuru | Clinical | Test Analyst |

# Execution Strategy

## QA Entrance Criteria

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| --- | --- | --- | --- |
| **QA Entrance Criteria** | **Test Team** | **Technical Team** | **Notes** |
| *All necessary hardware and software components are installed and configured according to specifications* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |
| *The Business Requirements Document (BRD) and Functional Specification Document (FSD) should be complete and reviewed.* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |
| *The code has to be merged successfully* |  | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |
| *Sample data that reflects real-world scenarios (anonymized) should be populated in the test environments.* |  | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |
| *Test scripts for all functionalities should be developed and reviewed.* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |
| *Security protocols should be in the test environments.* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |

## QA Exit criteria

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| **Exit Criteria** | **Test Team** | **Technical Team** | **Notes** |
| *All of the functionalities defined in the FSD should be covered by executed test cases.* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |
| *All critical and high-priority defects identified during testing should be resolved or have documented.* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |
| *No open Critical and High severity defects* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |
| *Load testing should be performed to ensure the system can handle expected user volumes.* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |
| *Regression testing should be performed to ensure no new regressions were introduced during code changes* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |
| *Create Formal test completion report documenting the testing process, results, outstanding defects, and recommendations.* | C:\Users\arxp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\7F9Z3IW4\MC900441310[1].png |  |  |

## Defect Management

* + - *Defect Tracking:*
      * + *A defect tracking system (spreadsheet) should be used to log, track, and manage defects.*
    - *Defect Reporting:*
      * + *Testers are responsible for documenting defects in the tracking system, including:*

*Description of the issue*

*Steps to reproduce the issue*

*Expected behavior*

*Actual behavior*

*Severity (critical, high, medium, low)*

*Priority (high, medium, low)*

* + - *Defect Resolution:*
      * + *The development team is responsible for analyzing, fixing, and retesting defects.*
        + *Testers should retest the fix and verify the defect is resolved.*
        + *Defects can be closed upon successful retesting.*

Defects found during the Testing should be categorized as below:

|  |  |  |  |
| --- | --- | --- | --- |
| Severity | Impact | Description | Who Addresses? |
| 1 (Critical) | Blocks all testing | The system is completely unusable, and no testing can be conducted. | Both Test & Technical Teams (Urgent) |
| Application crash | The application crashes consistently, preventing any interaction. |
| 2 (High) | Major functionality issue | A critical function is not working, and there is no workaround. Testing can proceed on unaffected areas, but the core issue needs immediate attention. | High Priority for Technical Team, Test Team to Report |
| Incorrect data handling | Data is processed or displayed incorrectly, causing significant errors. |
| 3 (Medium) | Functionality works with workaround | A function has issues, but a workaround exists allowing partial testing to proceed. The defect should be addressed but is not considered critical. | Technical Team, Test Team to Report |
| Missing functionality for specific edge cases | Functionality works for most scenarios but fails in specific edge cases. |
| 4 (Low) | Minor cosmetic issue | Minor issues like unclear error messages or formatting problems that don't affect core functionality. | Low Priority for Technical Team, Test Team to Report if Necessary |
| Typographical errors | Misspelled words or labels in the user interface. |

# Environment Requirements

## Test Environments

* + **Test Environment Requirement**
    - Development environment: Used by developers for unit testing and integration testing.
    - Staging environment: Used for simulating a production environment for user acceptance testing (UAT) and system integration testing (SIT).
    - Regression environment: Used for re-running regression test cases to ensure existing functionalities haven't broken after code changes.
  + **Security Requirements**
    - The test environments must be secured to protect the confidentiality, integrity, and availability of the e\_Dialysis Clinical System and the test data.
    - Mask or remove sensitive patient data from the test environments to minimize the risk of privacy breaches.
    - Implement network segmentation to isolate the test environments from the production environment and other systems.
    - Implement a robust logging and monitoring system to track user activity, system events, and potential security incidents in the test.

# Dependencies

* **Functional Specifications:** The FSD documents the specific functionalities of the system. Testers need this document to understand what needs to be tested and how.
* **Test Environment:** A complete and configured test environment that mimics the production environment is crucial for testing the system's functionality and performance. This includes the e\_Dialysis Clinical System, e\_Finance System, e\_Storage System, Pfizer System Lab, and the systems of the three insurance companies (Medicare/Medicaid, Tufts, and United Health).
* **Test Data:** There should be sufficient test data covering various scenarios like new and existing patients with different insurance types, treatment locations, modalities, etc. This data should be anonymized to comply with patient privacy regulations.
* **Test Deadlines:** Test cases need to be developed based on the FSD and reviewed before each sprint (starting June 30th, 2024) to ensure they are ready for testing during the sprint (July 10th onwards).
* **Test Plan Review (June 10, 2024):** A successful test plan review ensures the testing approach is aligned with the project goals and timelines.