**MINISTRY OF EDUCATION AND TRAINING**

**FPT UNIVERSITY**

Capstone Project Report 4

**The Laboratory Tests   
Management System**

|  |  |
| --- | --- |
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# **Software Design Description**

## **Design Overview**

This document describes the technical and user interface design of Building the laboratory tests management system (eLTMS).

Document overview:

Section 2: gives an overall description of the system architecture design.

Section 3: gives component diagrams that describe the connection and integration of the system.

Section 4: gives the details design description which includes class diagram, class explanation, and sequence diagram to detailss the application functions.

Section 5: describes screens design.

Section 6: describes a fully attributed ERD.

Section 7: describes algorithms.

## **System Architectural Design**

Our system has been developed under the 3-layer architecture. The 3-layer architecture is different from the 3-tier architecture, because 3 components are separated logically (can be deployed on the same server), not physically (on different servers).

We choose this architecture for our system because of following advantages:

* **Speed of development:** a specific layer can be upgraded with minimal impact on the other layers.
* **Scalability**: By separating out the different layers we can scale each independently depending on the need at any given time.
* **Performance:** This allows you to load balance each layer independently, improving overall performance with minimal resources.

The 3-layer architecture consists of:

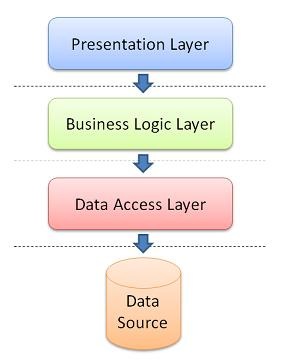


Figure 1 - System Architecture Design

* **Presentation Layer:** consists of the user interface. This user interface is often a graphical one accessible through a web browser or web-based application and which displays content and information useful to an end user.
* **Business Logic Layer:** contains the functional business logic which drives an application’s core capabilities.
* **Data Access Layer:** provides simplified access to data source.

## **Details Description**

### Class Diagram

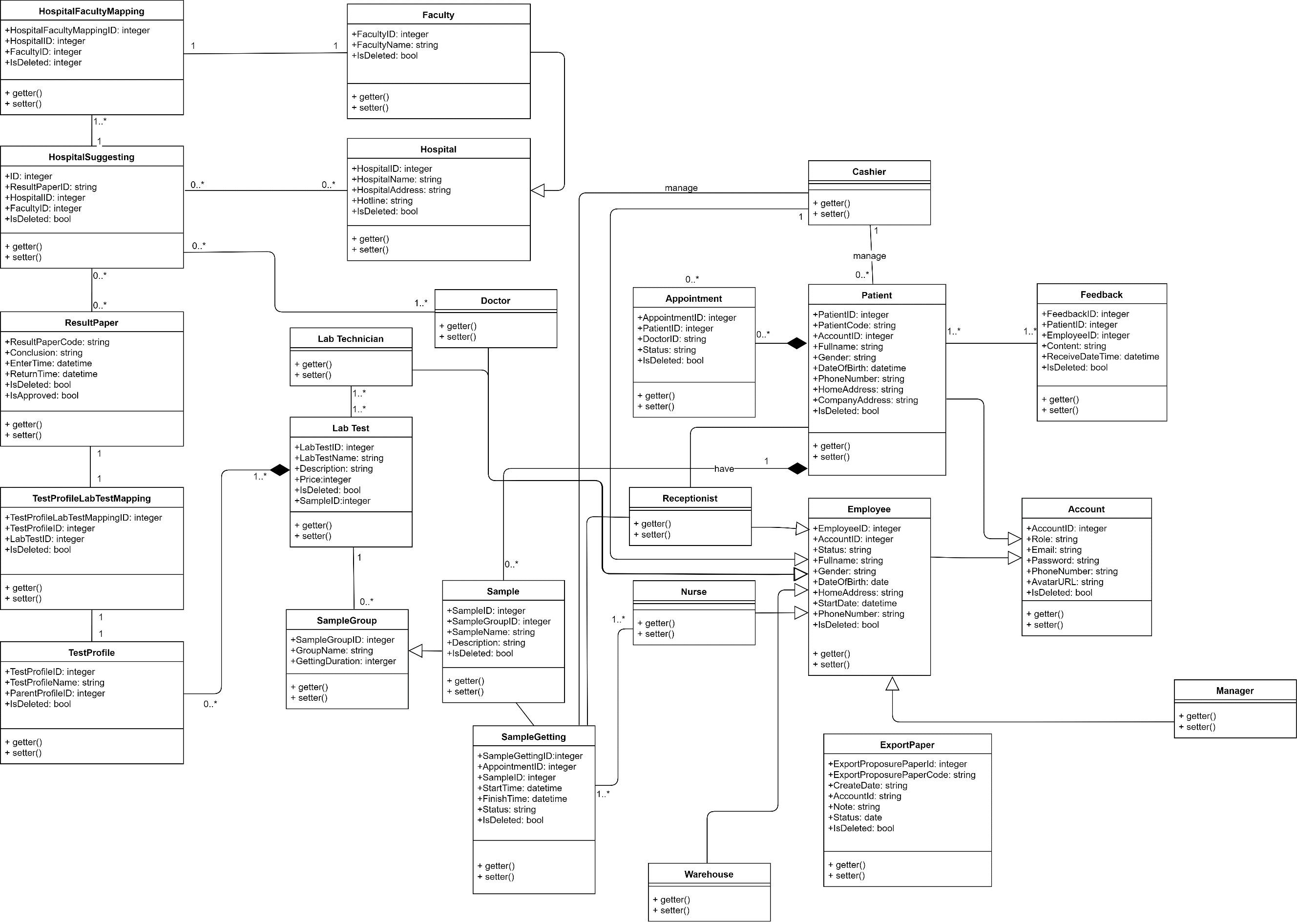


Figure 3 - Class Diagram

|  |  |
| --- | --- |
| CLASS DICTIONARY: DESCRIBE CLASS | |
| Class Name | **Description** |
| Patient | Patient |
| Employee | Employee |
| Feedback | Feedback |
| Account | Account |
| Manager | Manager |
| Receptionist | Receptionist |
| Appointment | Appointment |
| ExportPaperDetail | ExportPaperDetail |
| ExportPaper | ExportPaper |
| Supply | Supply |
| SupplyType | SupplyType |
| ImportPaperDetail | ImportPaperDetail |

Table 2 - Class Dictionary

### Class Diagram Explanation

#### Account

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| AccountID | integer | public | Unique identifier of an account |
| Role | string | public | Account’s Role |
| Email | string | public | Account’s Email |
| Password | string | public | Account’s Password |
| PhoneNumber | string | public | Account’s Phone number |
| AvatarURL | string | public | Account’s AvatarURL |
| IsDeleted | bool | public | Account’s IsDeleted |

Table 64 Account attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |
| checkLogin() | Boolean | public | check Account’s phone and password |
| register() | Boolean | public | register new user account |

Table 65 Account method explanation

#### Feedback (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| FeedbackID | integer | public | Unique identifier of a feedback |
| PatientID | integer | public | Feedback’s Patient |
| EmployeeID | integer | public | Feedback’s Employee |
| Content | string | public | Feedback’s Content |
| ReceiveDateTime | datetime | public | Feedback’s Date Receive |
| IsDeleted | bool | public | Feedback’s IsDeleted |

Table 66 Feedback attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 67 Feedback method explanation

#### Manager (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
|  |  |  |  |

Table 68 Manager attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 69 Manager method explanation

#### ExportPaper

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| ExportProposurePaperId | integer | public | Unique identifier of an Export Paper |
| ExportProposurePaperCode | string | public | ExportPaper’s Code |
| CreateDate | datetime | public | ExportPaper’s CreateDate |
| AccountId | integer | public | ExportPaper’s Account |
| Note | string | public | ExportPaper’s Note |
| Status | string | public | ExportPaper’s Status |
| IsDeleted | bool | public | ExportPaper’s IsDeleted |

Table 70 Export Paper attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 71 Export Paper method explanation

#### SupplyType

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| SupplyTypeID | integer | public | Unique identifier of a Supply Type |
| SupplyTypeName | integer | public | SupplyType’s Name |
| IsDeleted | bool | public | SupplyType’s IsDeleted |

Table 72 Supply Type attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 73 Supply Type method explanation

#### Patient (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| PatientID | integer | public | Unique identifier of a Patient |
| PatientCode | string | public | Patient’s Code |
| AccountID | integer | public | Patient’s Account |
| Fullname | string | public | Patient’s Name |
| Gender | string | public | Patient’s Gender |
| DateOfBirth | datetime | public | Patient’s BirthDay |
| PhoneNumber | string | public | Patient’s Phone |
| HomeAddress | string | public | Patient’s Home Address |
| CompanyAddress | string | public | Patient’s Company Address |
| IsDeleted | bool | public | Patient’s IsDeleted |

Table 74 Patient attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 75 Patient method explanation

#### Employee (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| EmployeeID | integer | public | Unique identifier of an Employee |
| AccountID | integer | public | Employee’s Account |
| Status | string | public | Employee’s Status |
| Fullname | string | public | Employee’s Name |
| Gender | string | public | Employee’s Gender |
| DateOfBirth | datetime | public | Employee’s BirthDay |
| PhoneNumber | string | public | Employee’s Phone |
| HomeAddress | string | public | Employee’s Home Address |
| StartDay | datetime | public | Employee’s Start Day |
| IsDeleted | bool | public | Employee’s IsDeleted |

Table 76 Employee attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 77 Employee method explanation

#### ExportPaperDetail

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| ExportProposurePaperDetailId | integer | public | Unique identifier of an Export Paper Detail |
| ExportProposurePaperId | integer | public | ExportPaperDetail’s Export Proposer Paper |
| SuppliesId | integer | public | ExportPaperDetail’s Supply |
| Unit | string | public | ExportPaperDetail’s Unit |
| Quantity | integer | public | ExportPaperDetail’s Quantity |
| Note | string | public | ExportPaperDetail’s Note |
| IsDeleted | bool | public | ExportPaperDetail’s IsDeleted |

Table 78 Export Paper Detail attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 79 Export Paper Detail method explanation

#### Supply

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| SuppliesId | integer | public | Unique identifier of a Supply |
| SuppliesCode | string | public | Supply’s Code |
| SuppliesName | string | public | Supply’s Name |
| Unit | string | public | Supply’s Unit |
| Quantity | integer | public | Supply’s Quantity |
| Note | string | public | Supply’s Note |
| IsDeleted | bool | public | Supply’s IsDeleted |

Table 80 Supply attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 81 Supply method explanation

#### Appointment

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| AppointmentID | integer | public | Unique identifier of a Appointment |
| PatientID | integer | public | Appointment’s Patient |
| DoctorID | string | public | Appointment’s Doctor |
| Status | string | public | Appointment’s Status |
| IsDeleted | bool | public | Appointment’s IsDeleted |

Table 82 Appointment attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 83 Appointment method explanation

#### R**ecepti**onist (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
|  |  |  |  |

Table 84 Receptionist attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 85 Receptionist method explanation

#### Nurse (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
|  |  |  |  |

Table 86 Nurse attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 87 Nurse method explanation

#### Warehouse Keepper (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
|  |  |  |  |

Table 88 Warehouse Keepper attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 89 Warehouse Keepper method explanation

#### ImportPaperDetail

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| ImportPaperDetailId | integer | public | Unique identifier of an Import Paper Detail |
| ImportPaperId | integer | public | ImportPaperDetail’s Import Paper |
| SuppliesId | integer | public | ImportPaperDetail’s Supply |
| Unit | string | public | ImportPaperDetail’s Unit |
| Quantity | integer | public | ImportPaperDetail’s Quantity |
| Note | string | public | ImportPaperDetail’s Note |
| IsDeleted | bool | public | ImportPaperDetail’s IsDeleted |

Table 90 Import Paper Detail attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 91 Import Paper Detail method explanation

#### Department (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| DepartmentID | integer | public | Unique identifier of an Department |
| DepartmentName | string | public | Department’s Name |
| IsDeleted | bool | public | Department’s IsDeleted |

Table 92 Department attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 93 Department method explanation

#### Hospital (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| HospitalID | integer | public | Unique identifier of a Hospital |
| HospitalName | string | public | Hospital’s Name |
| HospitalAddress | bool | public | Hospital’s Address |
| Hotline | string | public | Hospital’s Hotline |
| IsDeleted | bool | public | Hospital’s IsDeleted |

Table 94 Hospital attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 95 Hospital method explanation

#### Doctor (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
|  |  |  |  |

Table 96 Doctor attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 97 Doctor method explanation

#### Sample

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| SampleID | integer | public | Unique identifier of a Sample |
| SampleGroupID | integer | public | Sample’s Group |
| SampleName | string | public | Sample’s Name |
| Description | string | public | Sample’s Description |
| IsDeleted | bool | public | Hospital’s IsDeleted |

Table 98 Sample attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 99 Sample method explanation

#### SampleGetting

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| SampleGettingID | integer | public | Unique identifier of a SampleGetting |
| SampleGroupID | integer | public | Sample’s Group |
| SampleName | string | public | Sample’s Name |
| Description | string | public | Sample’s Description |
| IsDeleted | bool | public | Hospital’s IsDeleted |

Table 100 SampleGetting attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 101 SampleGetting method explanation

#### ImportPaper

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| ImportPaperId | integer | public | Unique identifier of an Import Paper |
| ImportPaperCode | string | public | ImportPaper’s Code |
| CreateDate | datetime | public | ImportPaper’s CreateDate |
| AccountId | integer | public | ImportPaper’s Account |
| Note | string | public | ImportPaper’s Note |
| Status | string | public | ImportPaper’s Status |
| IsDeleted | bool | public | ImportPaper’s IsDeleted |

Table 102 Import Paper attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 103 Import Paper method explanation

#### Lab Technician (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
|  |  |  |  |

Table 104 Lab Technician attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 105 Lab Technician method explanation

#### Lab Test

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| LabTestID | integer | public | Unique identifier of a Lab Test |
| LabTestName | string | public | Labtest’s Name |
| Description | string | public | Labtest’s Description |
| Price | integer | public | Labtest’s Price |
| SampleID | integer | public | Labtest’s Sample |
| IsDeleted | bool | public | Labtest’s IsDeleted |

Table 106 Lab Test attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 107 Lab Test method explanation

#### SampleGroup

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| SampleGroupID | integer | public | Unique identifier of a Sample Group |
| GroupName | string | public | Sample Group’s Name |
| GettingDuration | integer | public | Sample Group’s Duration |

Table 108 Sample Group attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 109 Sample Group method explanation

#### Hospita**lDepartment**Mapping (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| HospitalDepartmentMappingID | integer | public | Unique identifier of a Hospital Department Mapping |
| HospitalID | integer | public | HospitalDepartment’s ID |
| DepartmentID | integer | public | HospitalDepartment’s Department |
| IsDeleted | bool | public | HospitalDepartment’s IsDeleted |

Table 110 Hospital Department attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 111 Hospital Department method explanation

#### Hospital**Suggesti**ng (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| ID | integer | public | Unique identifier of a Hospital Suggest |
| ResultPaperID | string | public | HospitalSuggest’s Result Paper |
| HospitalID | integer | public | HospitalSuggest’s Hospital |
| DepartmentID | integer |  | HospitalSuggest’s Department |
| IsDeleted | bool | public | HospitalDepartment’s IsDeleted |

Table 112 Hospital Suggestion attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 113 Hospital Suggestion method explanation

#### **ResultPa**per (removed)

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| ResultPaperCode | integer | public | Unique identifier of a Result Paper |
| Conclusion | string | public | ResultPaper’s Conclusion |
| EnterTime | integer | public | ResultPaper’s EnterTime |
| ReturnTime | integer | public | ResultPaper’s ReturnTime |
| IsApproved | bool | public | ResultPaper’s IsApproved |
| IsDeleted | bool | public | ResultPaper’s IsDeleted |

Table 114 Result Paper attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 115 Result Paper method explanation

#### TestProfileLabTestMapping (removed)

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| TestProfileLabTestMappingID | integer | public | Unique identifier of a Test Profile Lab Test |
| TestProfileID | integer | public | TestProfileLabTestMapping’s Test Profile |
| LabTestID | integer | public | TestProfileLabTestMapping’s Lab |
| IsDeleted | bool | public | TestProfileLabTestMapping’s IsDeleted |

Table 116 Test Profile Lab Test Mapping attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 117 Test Profile Lab Test Mapping method explanation

#### Tes**tPr**ofile

**Attribute**

|  |  |  |  |
| --- | --- | --- | --- |
| Attribute | Type | Visibility | Description |
| TestProfileID | integer | public | Unique identifier of a Test Profile |
| TestProfileName | string | public | TestProfile’s Name |
| ParentProfileID | integer | public | TestProfile’s Profile |
| IsDeleted | bool | public | TestProfile’s IsDeleted |

Table 118 Test Profile attribute explanation

**Method**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | Return type | Visibility | Description |
| getter() | string | public | get attribute value |
| setter() | void | public | return value of attribute |

Table 119 Test Profile method explanation

### Interactive Diagram

#### Guest

##### <Guest> Make Appointment

Summary: this diagram shows process for making appointment.



Figure 4 - Sequence Diagram for Make Appointemnt < Guest

#### Patient

##### <Patient> View Appointment’s Test Result

Summary: this diagram shows process for viewing appointment’s test result.

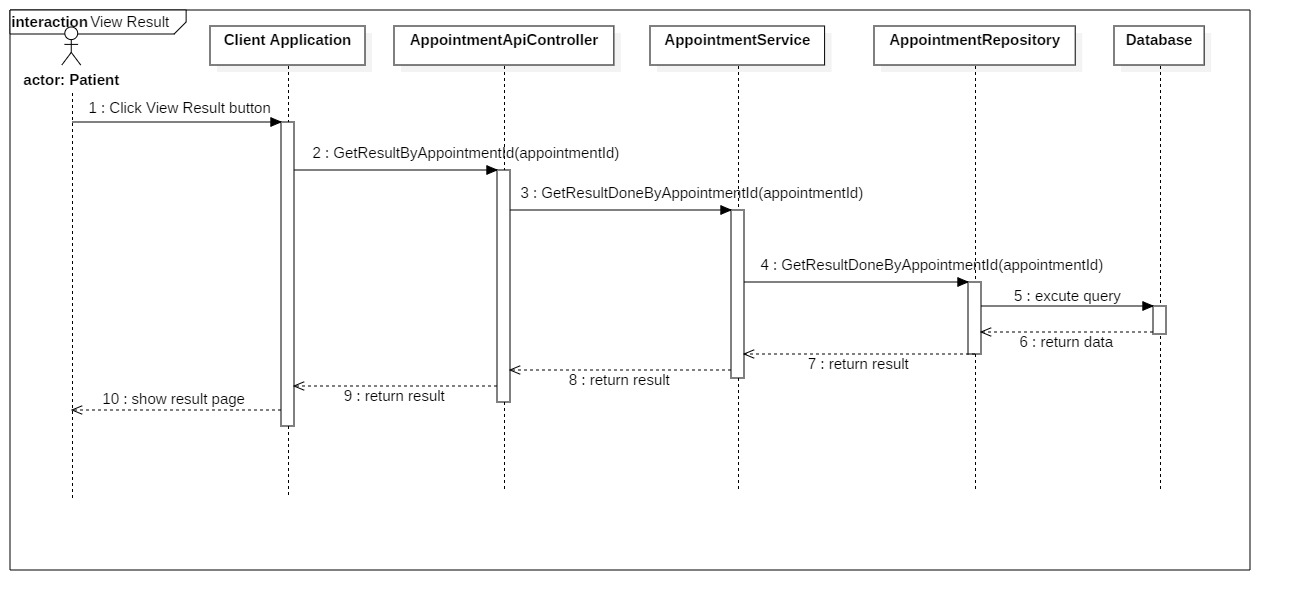


Figure 9 - Sequence Diagram for Accept Auction < Administrator >

### State Machine Diagram

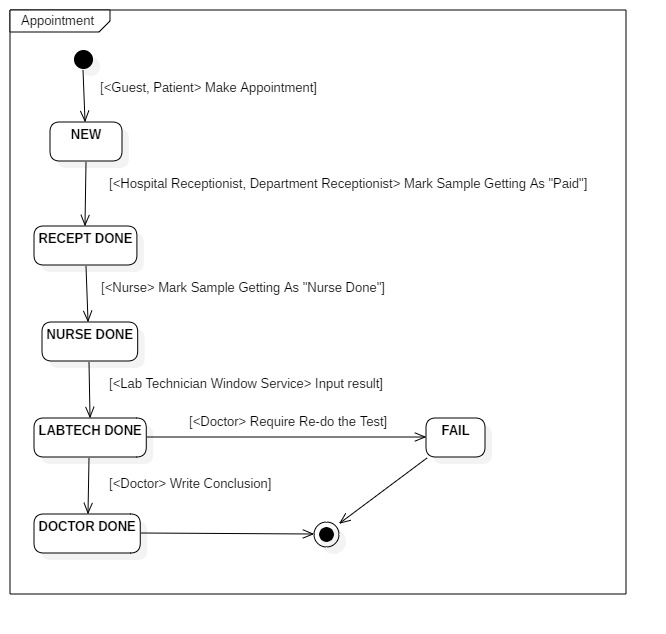


Figure 19 - State Machine Diagram of Appointment

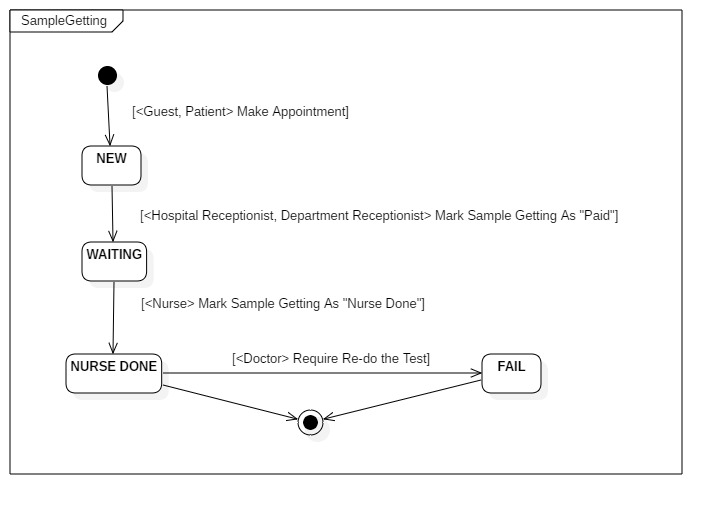


Figure 19 - State Machine Diagram of Sample Gettin

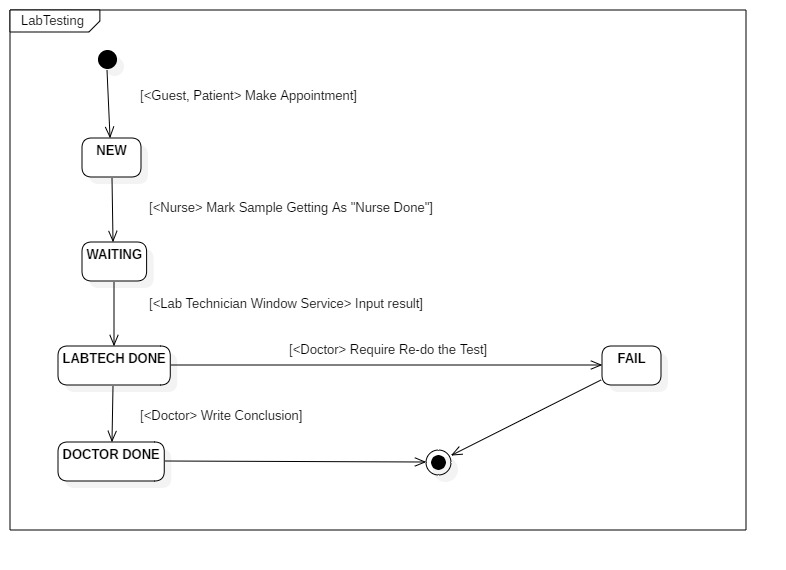


Figure 19 - State Machine Diagram of Lab Testing

## **User Interface Design**

### Web admin application user interface

#### Login Page

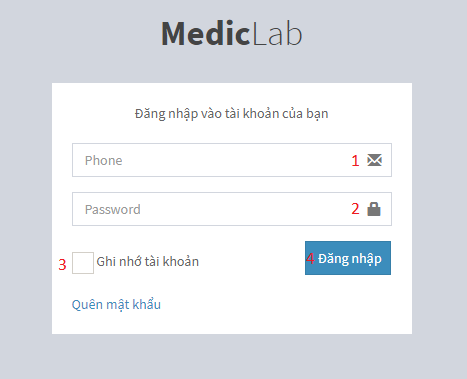


Figure 20 - Web Interface <Login>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Phone | Phone to login | No | Yes | Textbox | String |  |
| 2 | Password | Password to login | No | Yes | Textbox | String |  |
| 3 | Remember me | Auto log in | No | No | Checkbox | Boolean |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 4 | Sign In | Login into system | Validate all required fields | Navigate to Admin page |

#### Hospital Receptionist Page

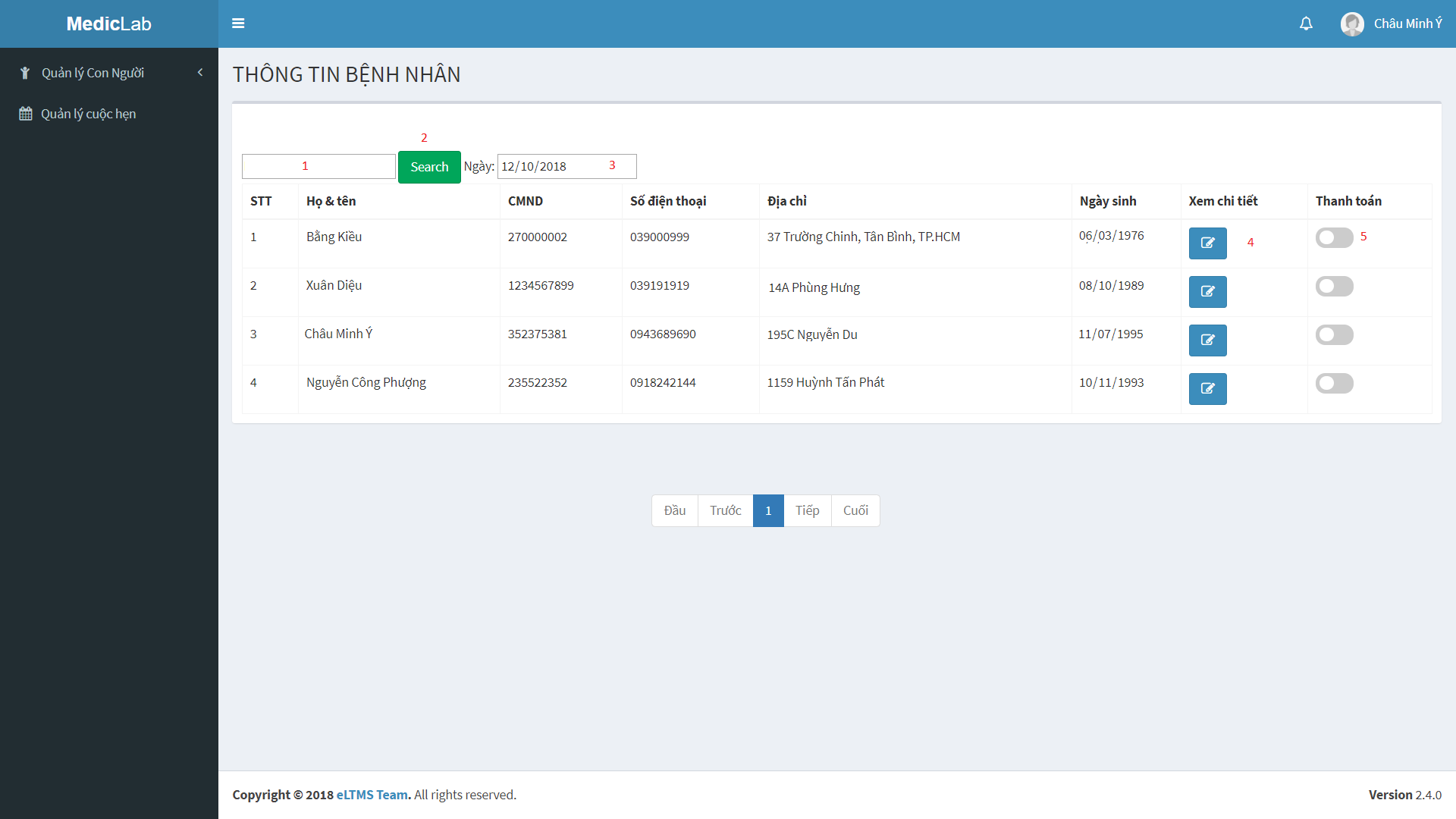


Figure 21 - Admin Web Interface <Hospital Receptionist>

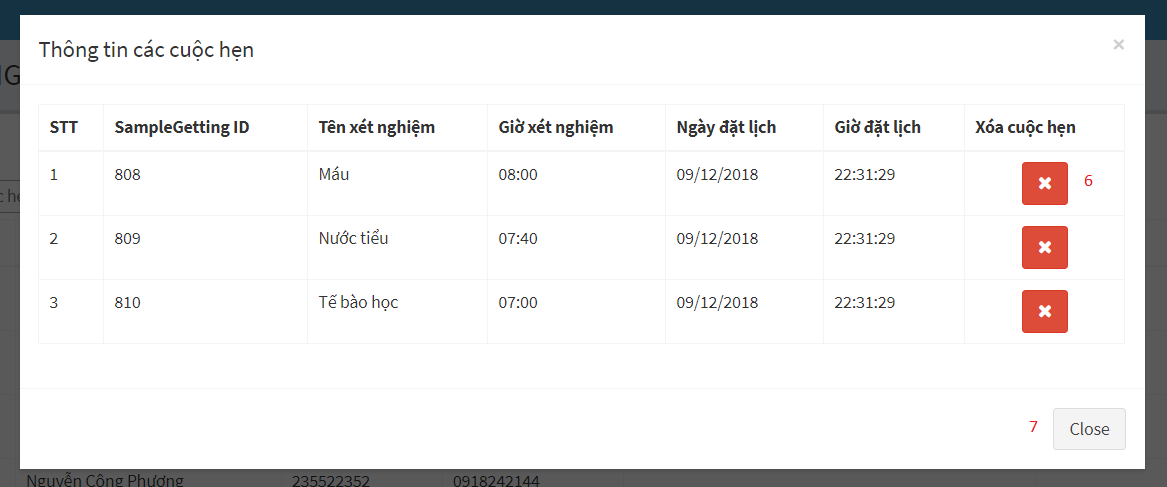


Figure 22 - Admin Web Interface <Hospital Receptionist>



Figure 23 - Admin Web Interface <Hospital Receptionist>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Keyword | Fill keyword to search | No | Yes | Text | String |  |
| 3 | Select Date | Select Date to show Patient | No | Yes | Date | Date |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 2 | Search | Search after getting keywork | N/A | Show list of patients by keywork |
| 4 | Show details appointment | Show list of appointments | N/A | Show list of appointments |
| 5 | Change status | Show popup for admin to check hospital fee for patient and pay it | N/A | Show list of price and confirm Y/N to change status |
| 6 | Delete sampleGetting | Delete sampleGetting after getting request | N/A | SampleGetting is deleted |
| 7 | Close popup | Close popup details appointment | N/A | Popup is closed |
| 8 | Cancel paying | Confirm payment | N/A | Status is not changed |
| 9 | Accept paying | Confirm payment | N/A | Status is changed |

#### View Department Receptionist Page

# 

Figure 24 - Admin Web Interface <View Department Receptionist>

# 

Figure 25 - Admin Web Interface <View Department Receptionist>



Figure 26 - Admin Web Interface <View Department Receptionist>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 2 | Keyword | Fill keyword to search | No | Yes | Text | String |  |
| 4 | Select sample | Select sample to show appointment | No | Yes | Dropdown list | String |  |
| 5 | Select Date | Select date to show appointment | No | Yes | Date | Date |  |
| 7 | Họ và Tên | Patient’s information | No | Yes | Textbox | String |  |
| 8 | CMND | Patient’s information | No | Yes | Textbox | String |  |
| 9 | Ngày sinh | Patient’s information | No | Yes | Date | Date |  |
| 10 | Số điện thoại | Patient’s information | No | Yes | Textbox | String |  |
| 11 | Địa chỉ | Patient’s information | No | Yes | Textbox | String |  |
| 12 | Loại xét nghiệm | Choose labtest | No | Yes | Checkbox | Boolean |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Create appointment | Create appointment for patient | N/A | Show popup appointment’s information |
| 3 | Search | Search after getting keywork | N/A | Show list of appointments by keywork |
| 6 | Change status | Show popup for admin to check hospital fee for patient and pay it | N/A | Show list of price and confirm Y/N to change status |
| 13 | Add a new appointment | Add a new appointment | N/A | A new appointment is created |
| 14 | Close popup | Close popup details appointment | N/A | Popup is closed |
| 15 | Cancel paying | Confirm payment | N/A | Status is not changed |
| 16 | Accept paying | Confirm payment | N/A | Status is changed |

#### View Nurse Page

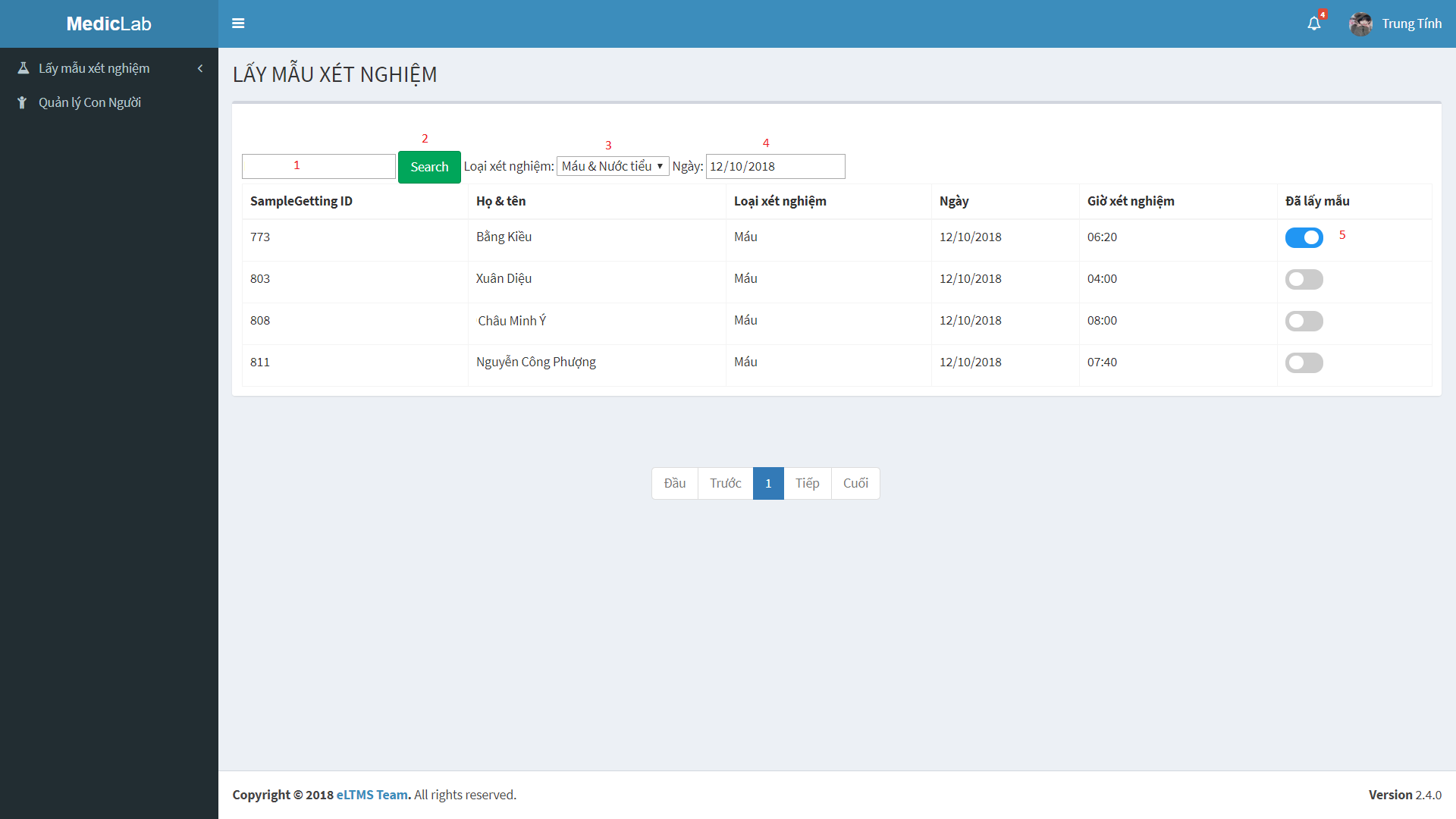


Figure 27 - Admin Web Interface <View Nurse>

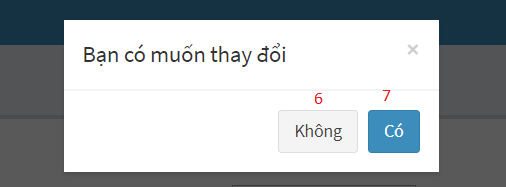


Figure 28 - Admin Web Interface <View Nurse>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Keyword | Fill Keyword to seach | No | Yes | Text | String |  |
| 3 | Select sample | Select sample to show appointment | No | Yes | Dropdown list | String |  |
| 4 | Select Date | Select date to show appointment | No | Yes | Date | Date |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 2 | Search | Search after getting keywork | N/A | Show list of appointment by keywork |
| 5 | Change status | Show popup for admin to confirm and change status | N/A | Show options to choose Y/N |
| 6 | Cancel action | Choose No | N/A | Status is not changed |
| 7 | Accept action | Choose Yes | N/A | Status is changed |

#### View Laboratory Technician Page

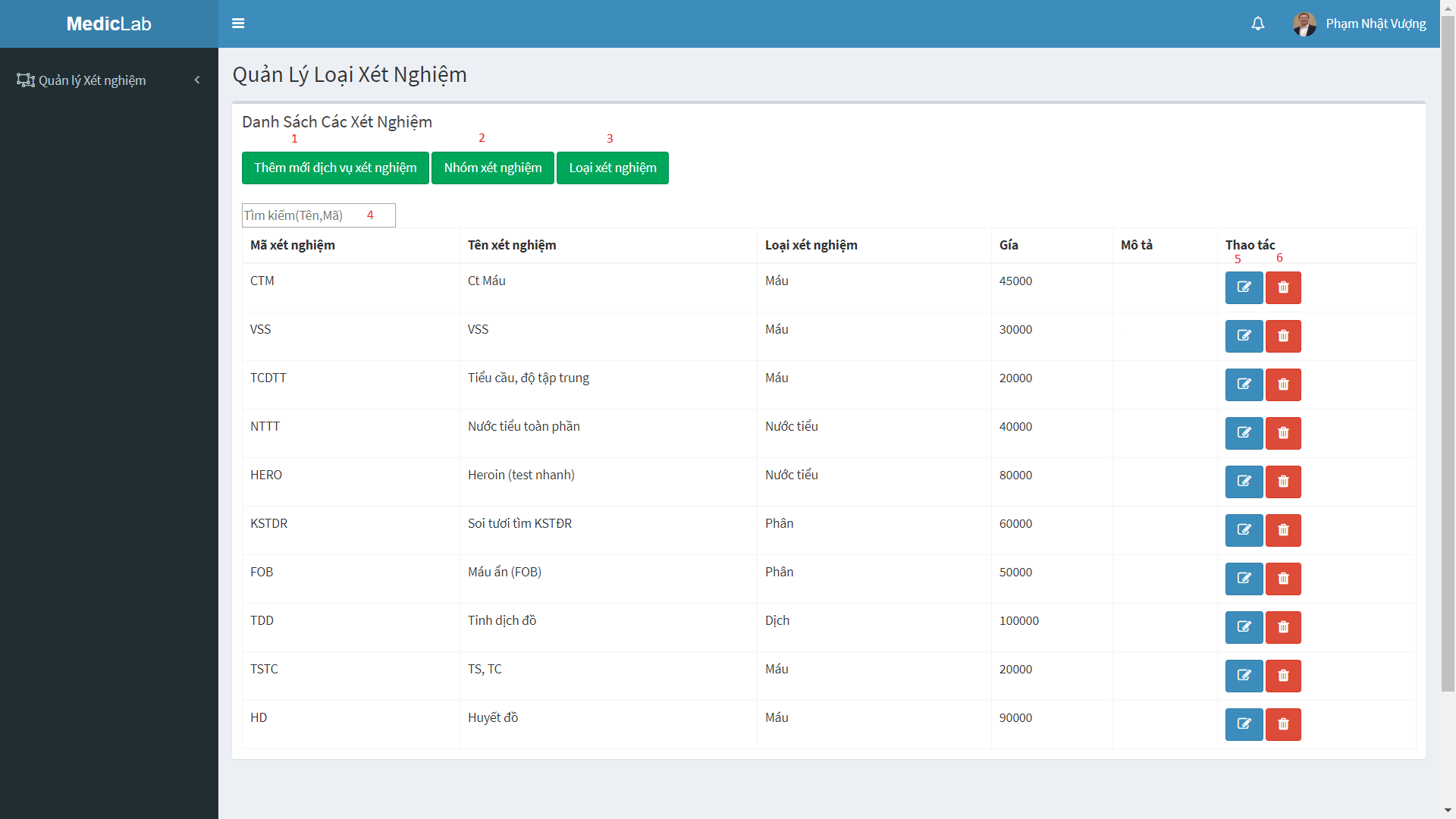


Figure 29 - Admin Web Interface <View Laboratory Technician>

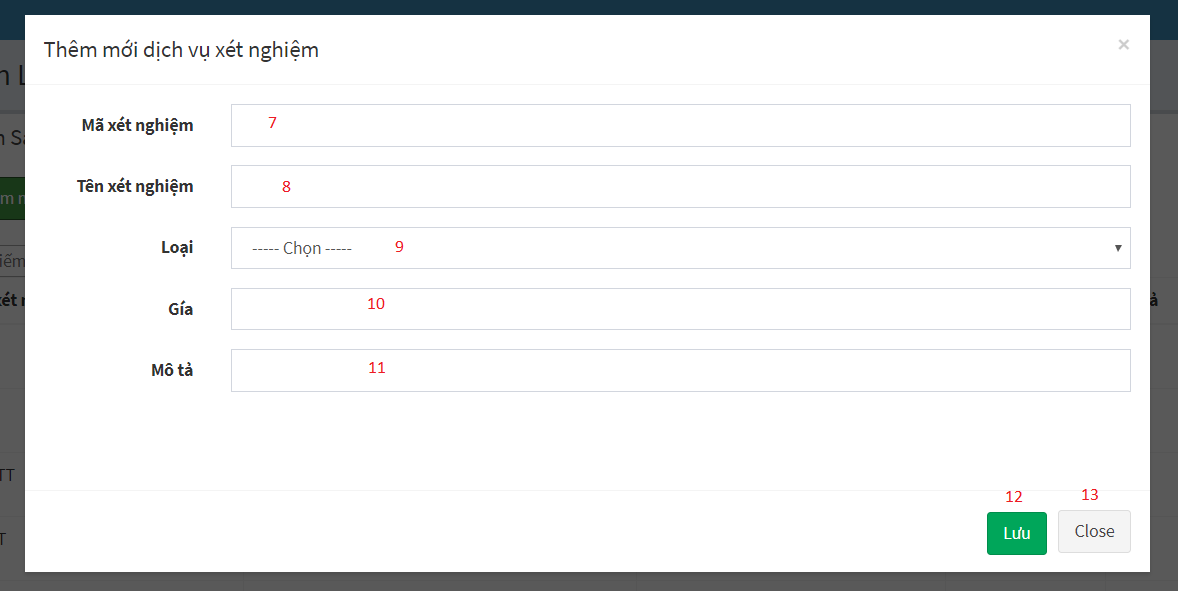


Figure 30 - Admin Web Interface <View Laboratory Technician-Add Labtest>



Figure 31 - Admin Web Interface <View Laboratory Technician-Add Sample group>

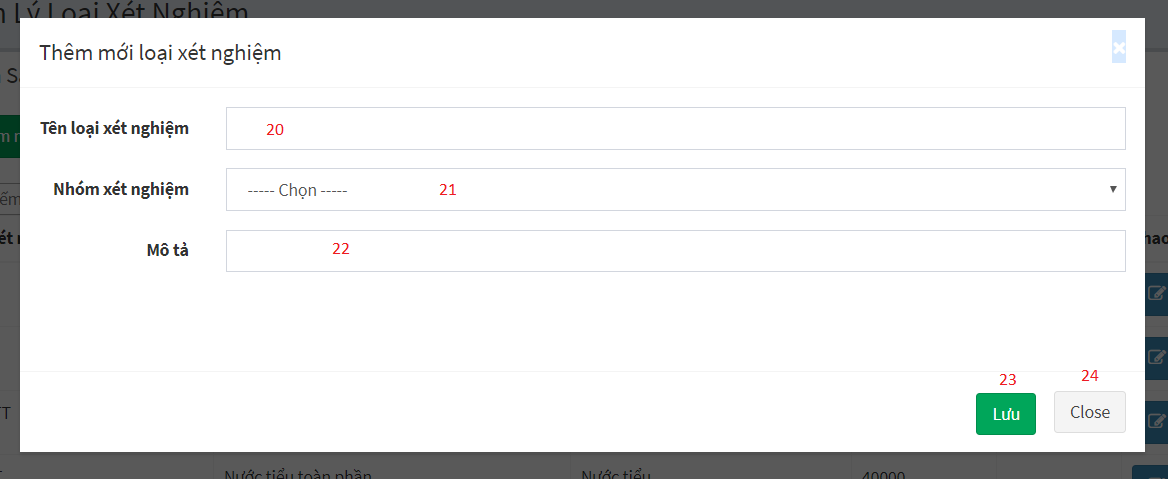


Figure 32 - Admin Web Interface <View Laboratory Technician-Add Sample>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 4 | Keyword | Fill keyword to seach | No | Yes | Text | String |  |
| 7 | Mã xét nghiệm | Labtest’s information | No | Yes | Textbox | String |  |
| 8 | Tên xét nghiệm | Labtest’s information | No | Yes | Textbox | String |  |
| 9 | Loại | Labtest’s information | No | Yes | Dropdown list | String |  |
| 10 | Giá | Labtest’s information | No | Yes | Textbox | String |  |
| 11 | Mô tả | Labtest’s information | No | Yes | Textbox | String |  |
| 14 | Tên nhóm xét nghiệm | Sample group’s information | No | Yes | Textbox | String |  |
| 15 | Thời gian tiến hành | Sample group’s information | No | Yes | Textbox | String |  |
| 16 | Bắt đầu | Sample group’s information | No | Yes | Textbox | String |  |
| 17 | Kết thúc | Sample group’s information | No | Yes | Textbox | String |  |
| 20 | Tên loại xét nghiệm | Sample’s information | No | Yes | Textbox | String |  |
| 21 | Nhóm xét nghiệm | Sample’s information | No | Yes | Dropdown list | String |  |
| 22 | Mô tả | Sample’s information | No | Yes | Textbox | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Add new labtest | Add new labtest | N/A | Show popup to fill information of labtest |
| 2 | Add new sample group | Add new sample group | N/A | Show popup to fill information of sample group |
| 3 | Add new sample | Add new sample | N/A | Show popup to fill information of sample |
| 5 | Edit labtest | Edit information of labtest | N/A | Edit information of labtest |
| 6 | Delete labtest | Delete labtest after getting request | N/A | Labtest is deleted |
| 12 | Add a new labtest | Add a new labtest | N/A | A new labtest is created |
| 13 | Close popup | Close popup | N/A | Popup is closed |
| 18 | Add a new sample group | Add a new sample group | N/A | A new sample group is created |
| 19 | Close popup | Close popup | N/A | Popup is closed |
| 23 | Add a new sample | Add a new sample | N/A | A new sample is created |
| 24 | Close popup | Close popup | N/A | Popup is closed |

#### View Doctor Page

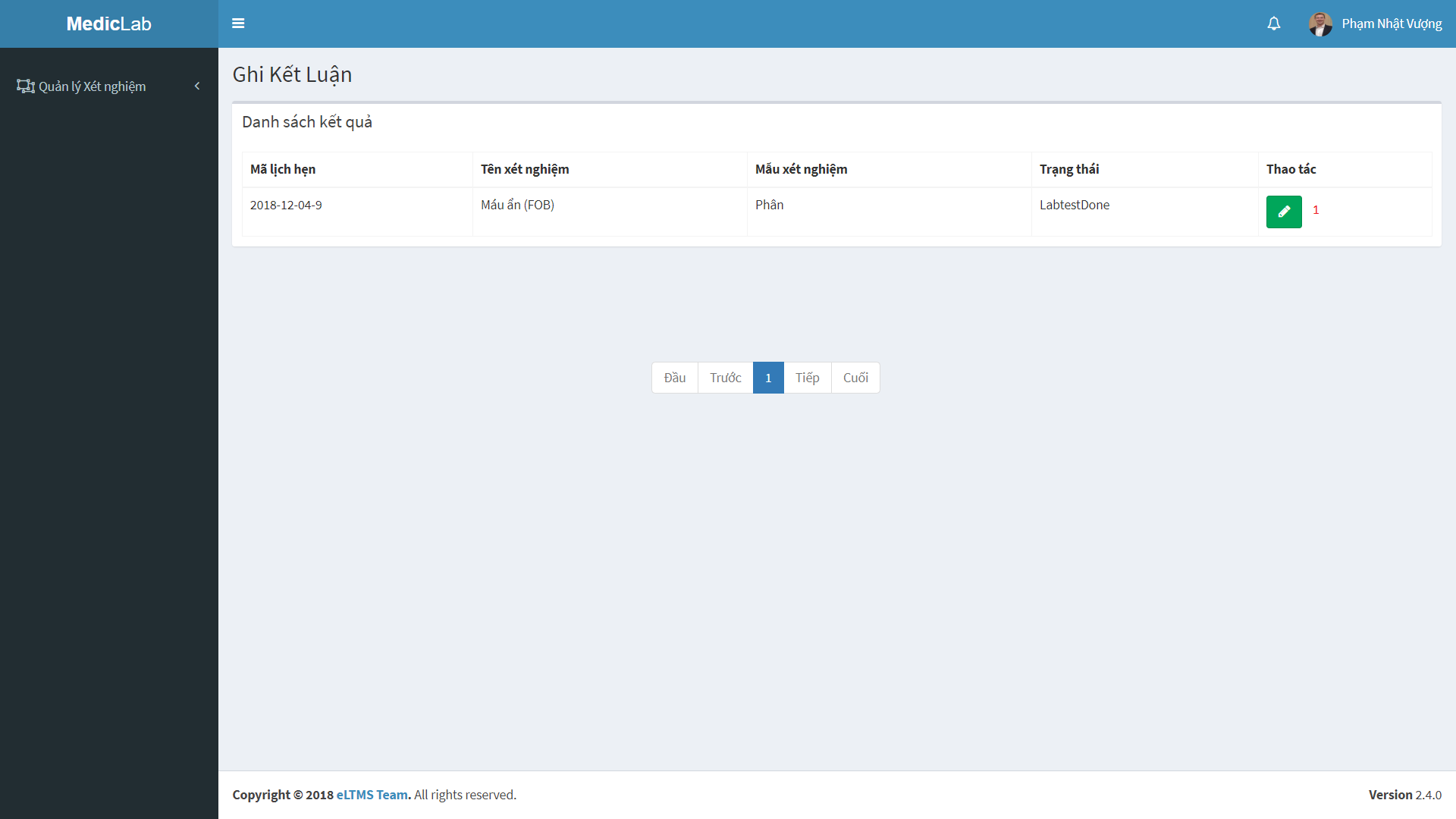


Figure 33 - Admin Web Interface <View Doctor>

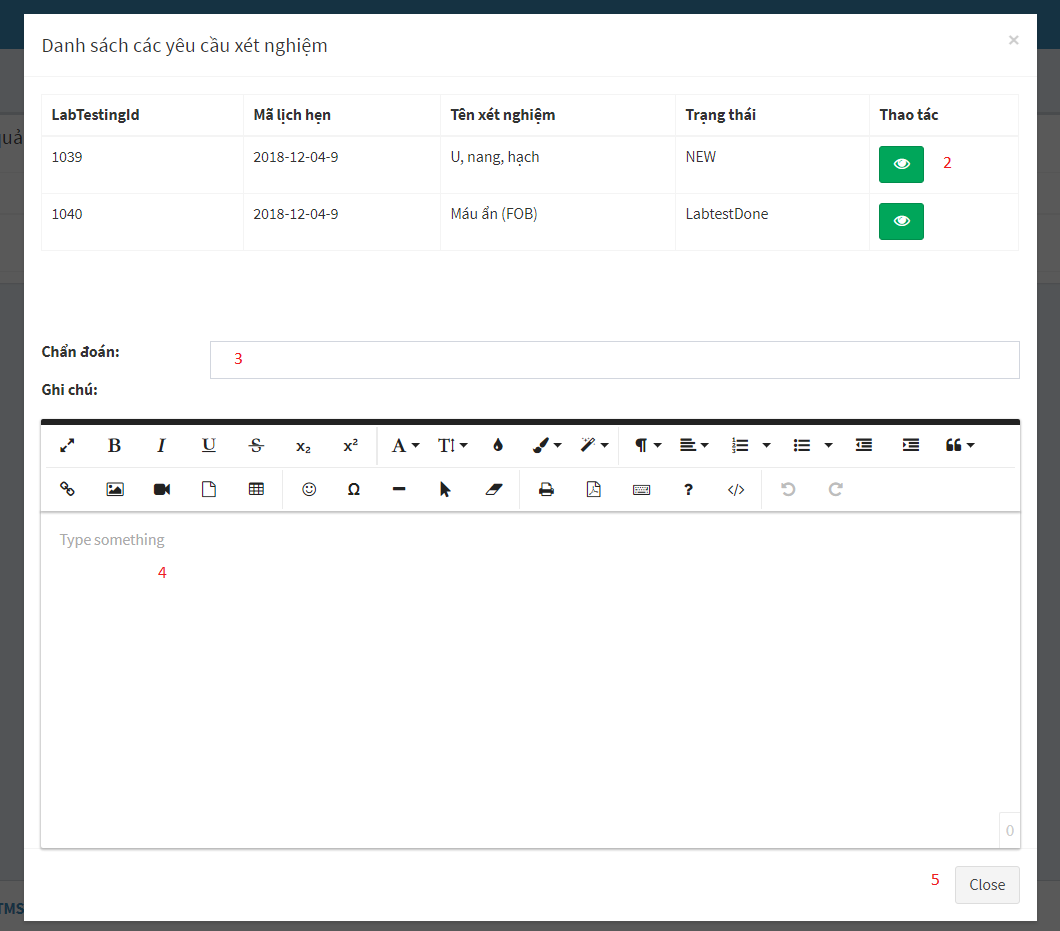


Figure 34 - Admin Web Interface <View Doctor>



Figure 35 - Admin Web Interface <View Doctor>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 3 | Chẩn đoán | Conclusion of doctor | No | Yes | Textbox | String |  |
| 4 | Ghi chú | Note of doctor | No | Yes | Textbox | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Check for disease | View testing result, write note and conclusion | N/A | Show popup with testing result, space to write note and conclusion |
| 2 | View testing result | View testing result | N/A | Show popup with the details of testing result |
| 5 | Close popup | Close popup | N/A | Popup is closed |
| 6 | Request re-testing | Request re-testing when doctor see something wrong about testing result | N/A | Send request re-testing to patient |

### Web application user interface

#### Login

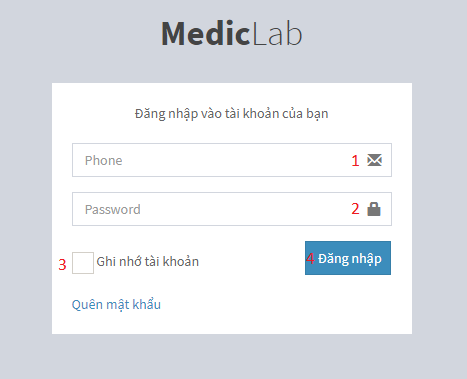


Figure 36 - Web Interface <Login>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Phone | Phone to login | No | Yes | Textbox | String |  |
| 2 | Password | Password to login | No | Yes | Textbox | String |  |
| 3 | Remember me | Auto log in | No | No | Checkbox | Boolean |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 4 | Sign In | Login into system | Validate all required fields | Navigate to User page |

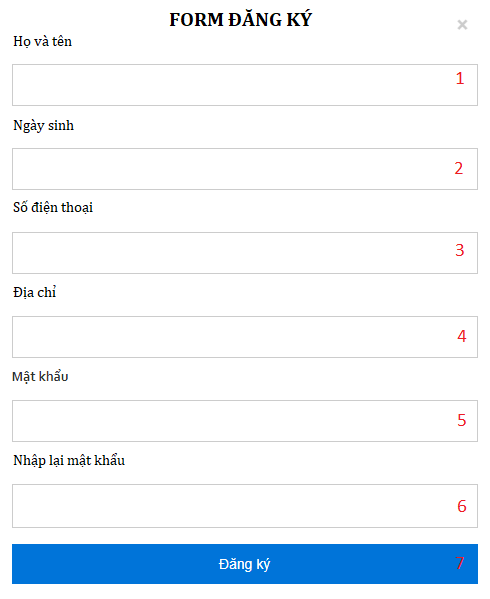


Figure 27 - Web Interface <Register account>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Username | Patient’s information | No | Yes | Text | String |  |
| 2 | DateOfBirth | Patient’s information | No | Yes | Date | Date |  |
| 3 | Phone | Patient’s information | No | Yes | Text | String |  |
| 4 | Address | Patient’s information | No | Yes | Text | String |  |
| 5 | Password | Patient’s information | No | Yes | Password | String |  |
| 6 | PasswordConfirm | Patient’s information | No | Yes | Password | String |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 7 | Register | Click to register | N/A | Navigate to Home page |

#### Nav Bar

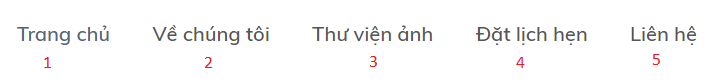


Figure 38 - Web Interface <Menu bar and Categories>

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Navigate to Home Page | N/A | N/A | Navigate to Home Page |
| 2 | Navigate to Introduction Page | Show list of categories as a drop down list | N/A | Navigate to Introduction Page |
| 3 | Navigate to Photo Library Page | N/A | N/A | Navigate to Photo Library Page |
| 4 | Navigate to Book Appointment Page | N/A | N/A | Navigate to Book Appointment Page |
| 5 | Navigate to Contact us | N/A | N/A | Navigate to Contact us |

#### Home Page

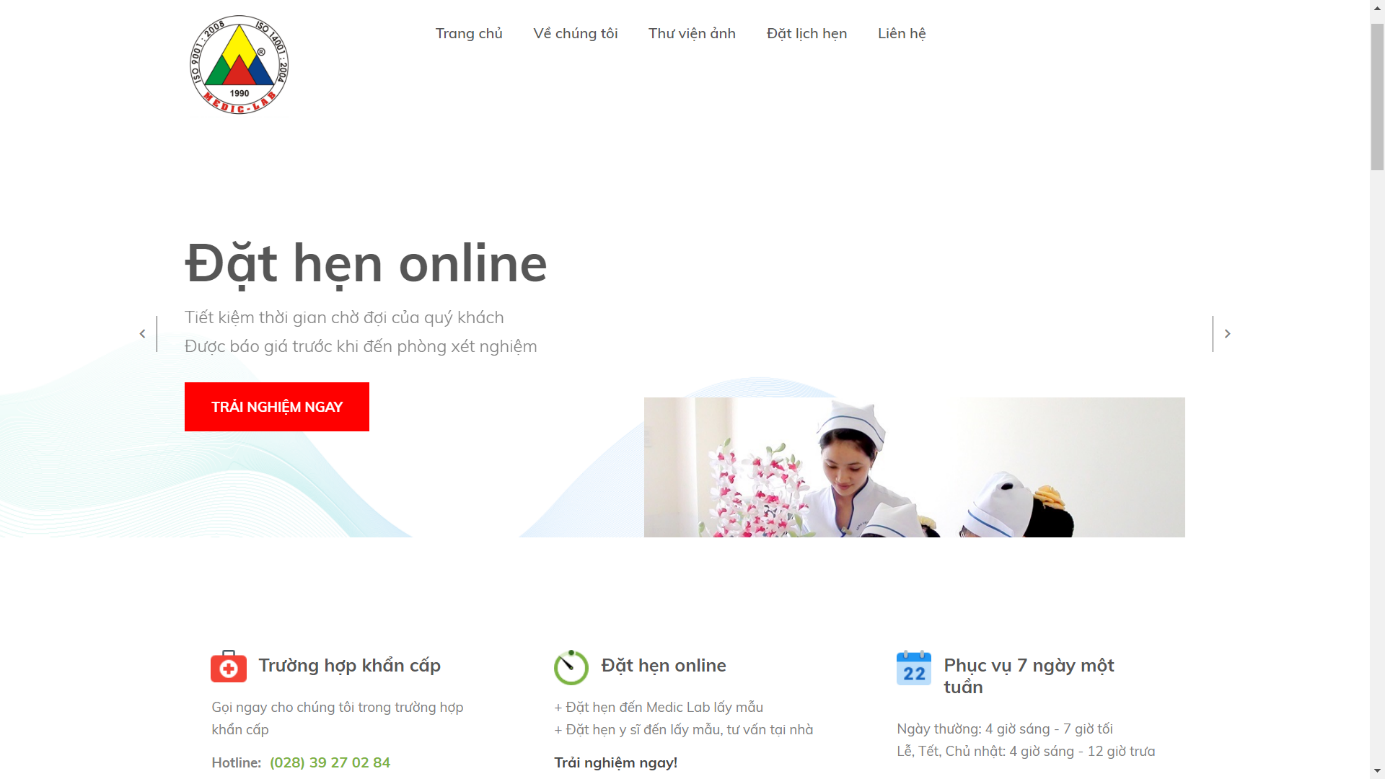


Figure 39 - Web Interface <Home page>



Figure 40 - Web Interface <Home page – Our partner>

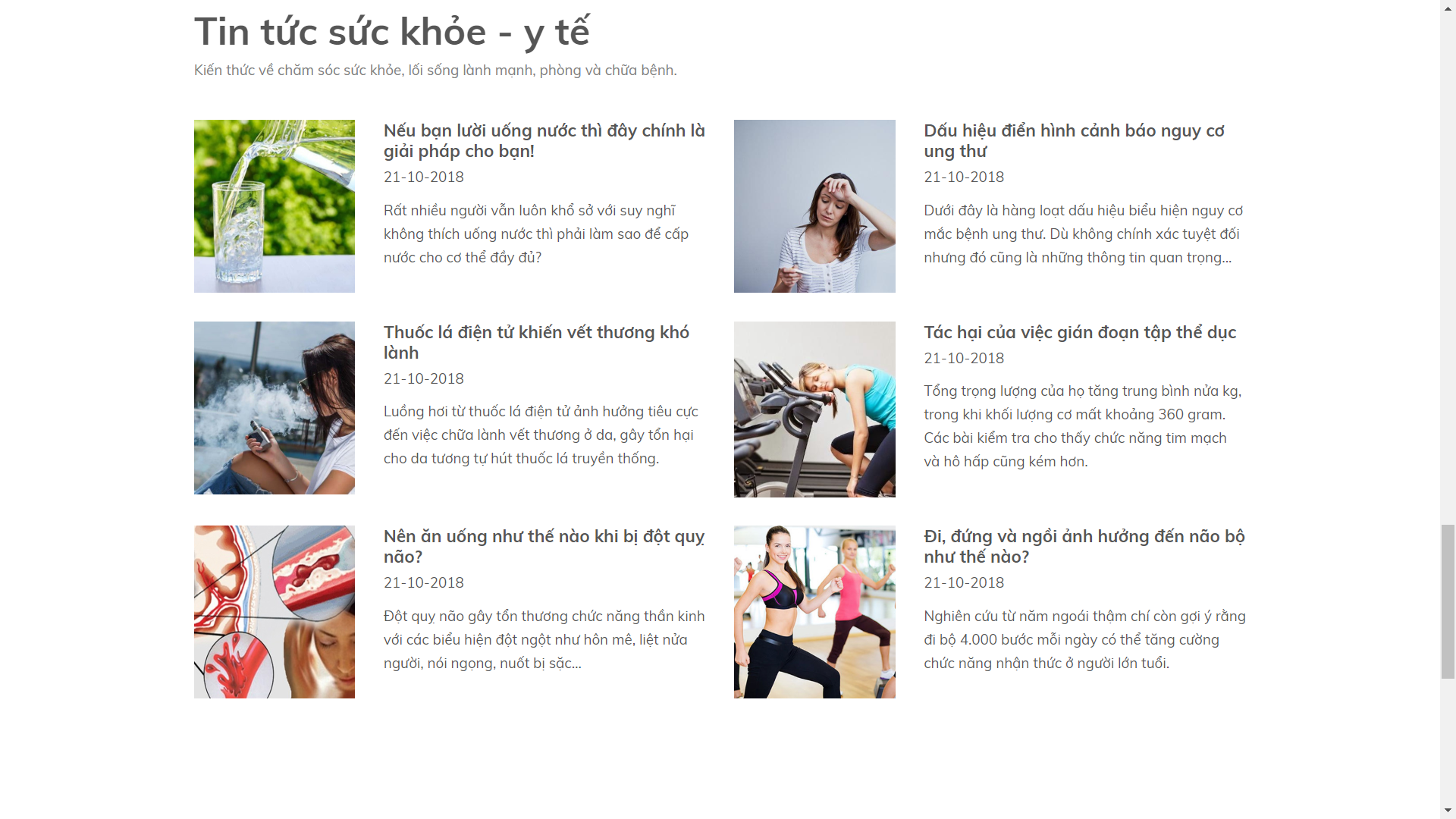


Figure 41 - Web Interface <Home page - News>

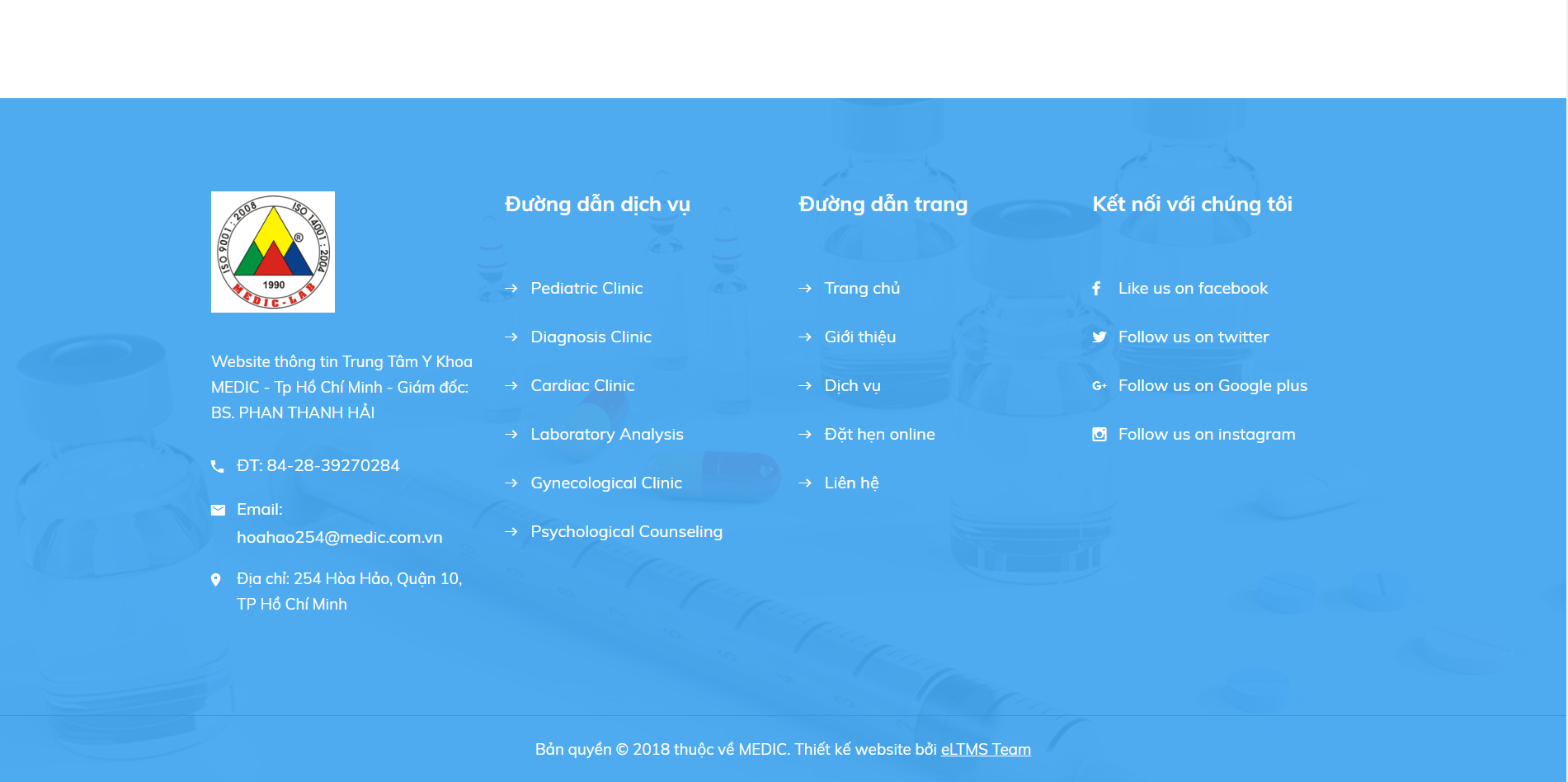


Figure 42 - Web Interface <Home page – Contact us >

#### Book Appointment

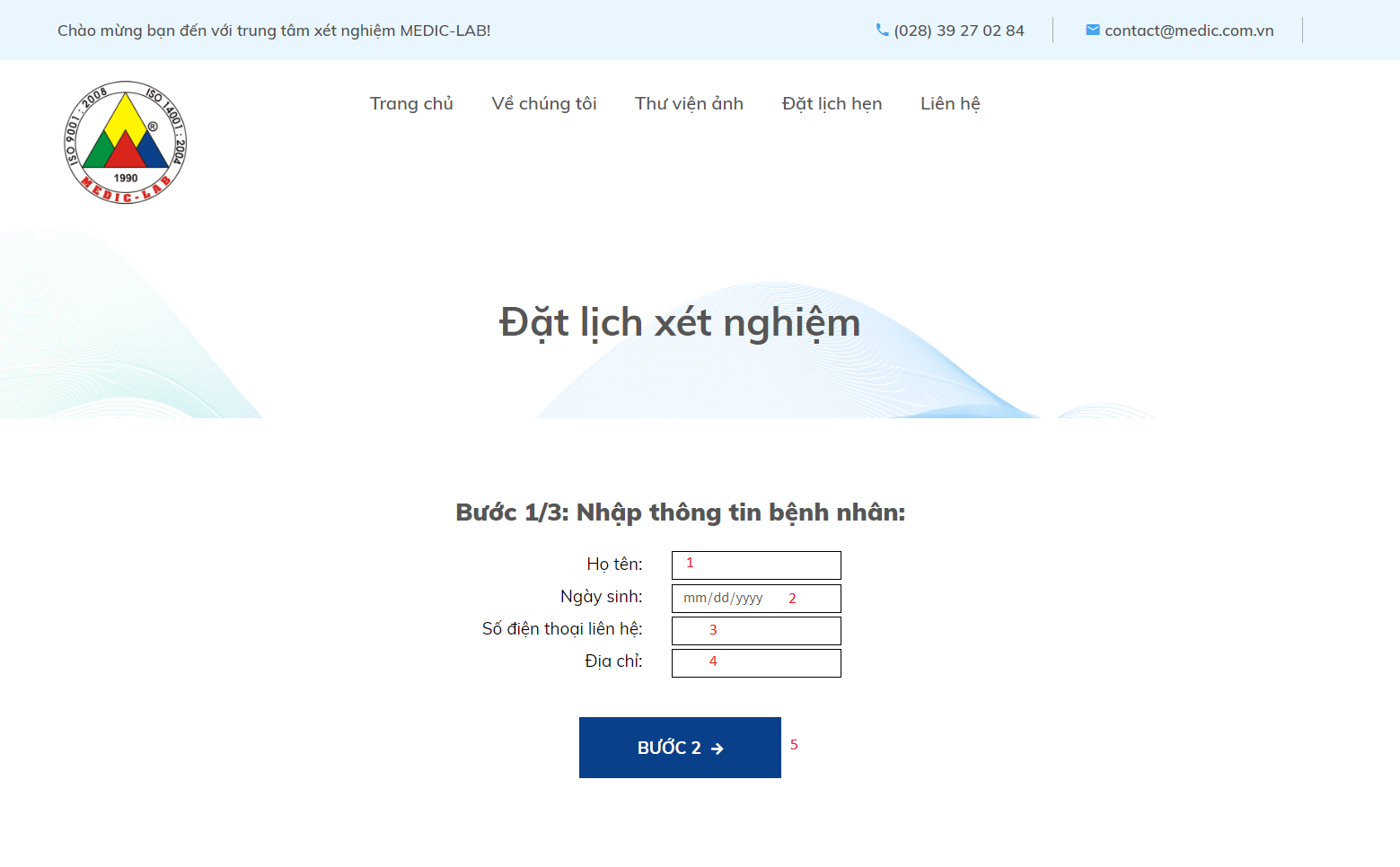


Figure 43 - Web Interface <Book Appointment>

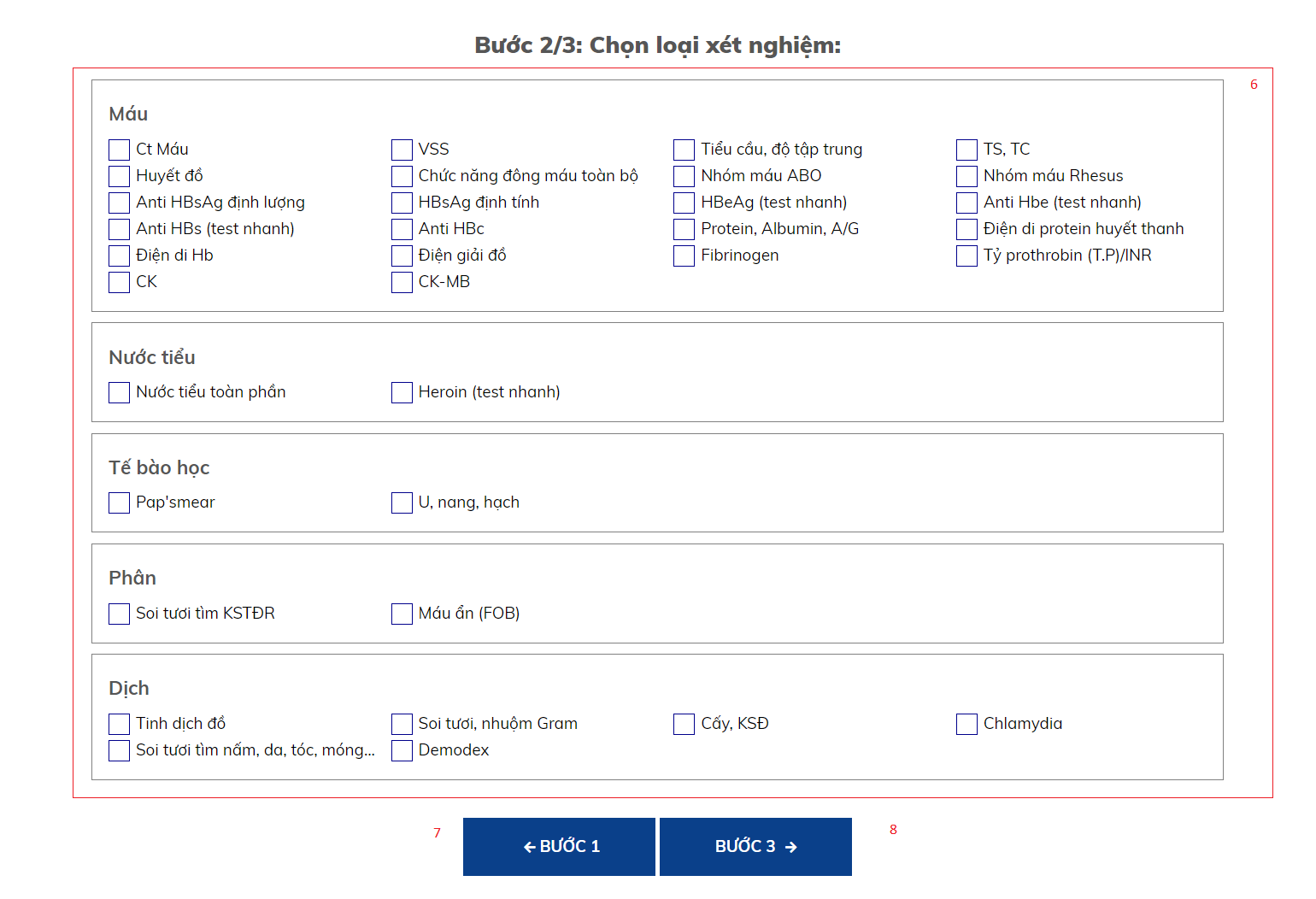


Figure 44 - Web Interface <Book Appointment>



Figure 45 - Web Interface <Book Appointment>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Họ và Tên | Patient’s information | No | Yes | Textbox | String |  |
| 2 | Ngày sinh | Patient’s information | No | Yes | Date | Date |  |
| 3 | Số điện thoại | Patient’s information | No | Yes | Textbox | String |  |
| 4 | Địa chỉ | Patient’s information | No | Yes | Textbox | String |  |
| 6 | Loại xét nghiệm | Choose labtest | No | Yes | Checkbox | Boolean |  |
| 9 | Ngày | Choose approriate time to test | No | Yes | Dropdown list | String |  |
| 10 | Giờ | Choose approriate time to test | No | Yes | Dropdown list | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 5 | Go to step 2 | Click “Bước 2” to go to step 2 | Validate all required fields | Go to step 2 |
| 7 | Go back to step 1 | Click “Bước 1” to go back to step 1 | N/A | Go back to step 1 |
| 8 | Go to step 3 | Click “Bước 3” to go to step 3 | Choose a least one labtest | Go to step 3 |
| 11 | Go back to step 2 | Click “Bước 2” to go back to step 2 | N/A | Go back to step 2 |
| 12 | Submit | Complete booking a new appointment | Validate all required fields | Booking successfully |

#### View list of Booked Appoinments

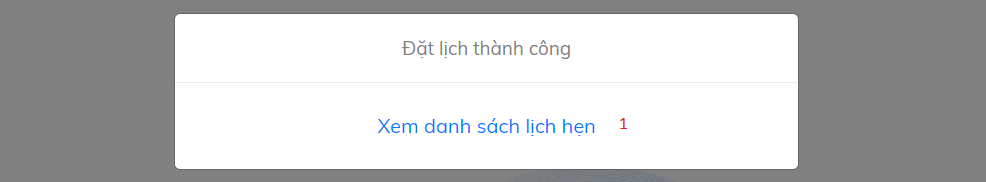


Figure 46 - Web Interface <View list of booked Appointments>

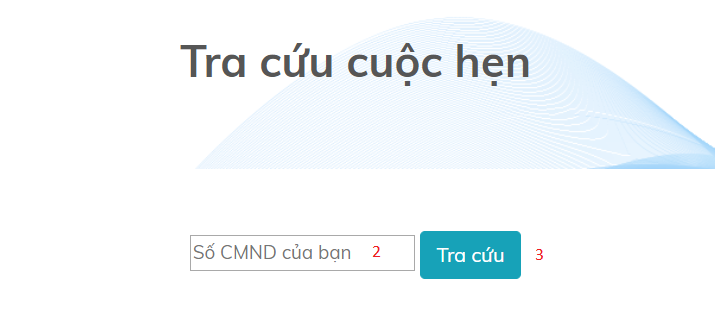


Figure 47 - Web Interface <View list of booked Appointments>

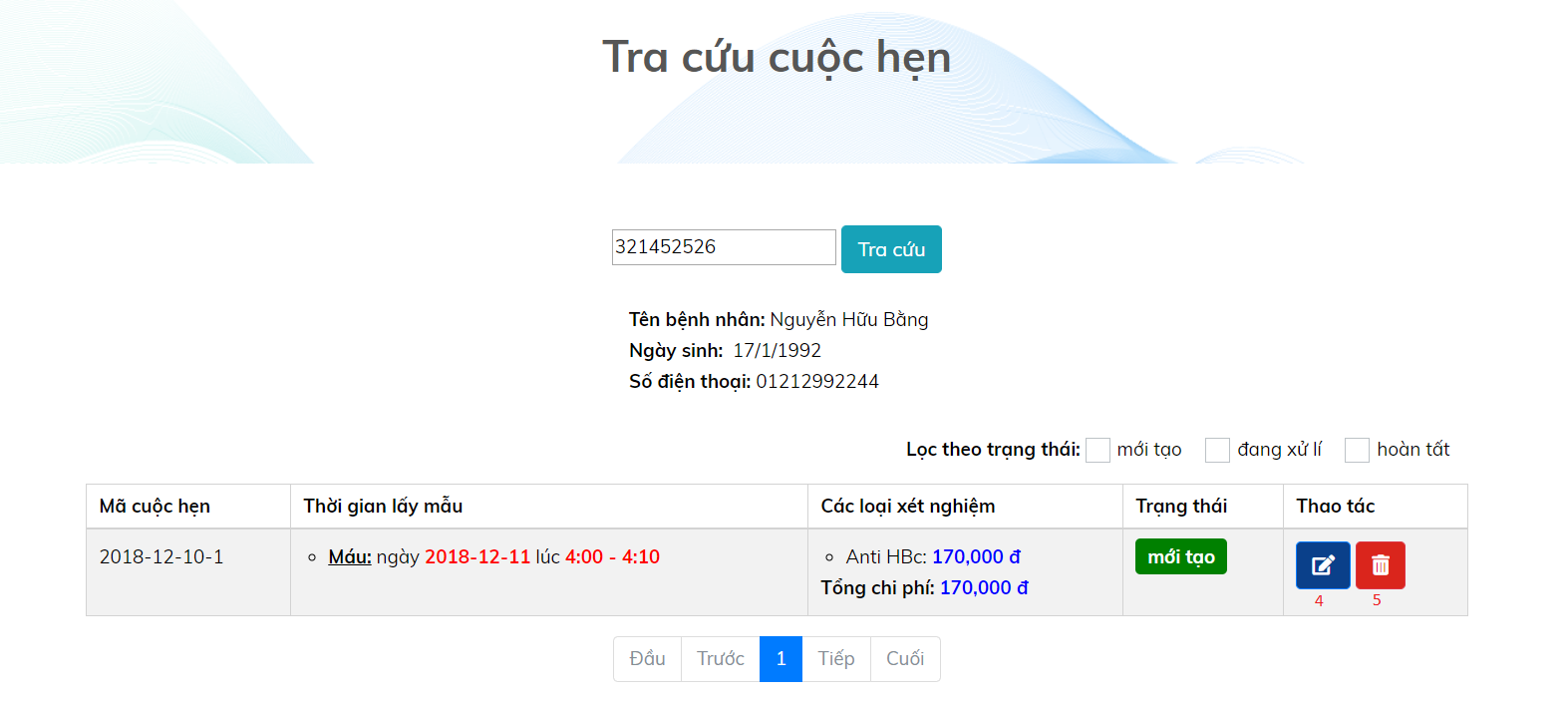


Figure 48 - Web Interface <View list of booked Appointments>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 2 | CMND | Input id into textbox area | No | No | Text | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 1 | Navigate to Auctions by View Appointment Page | When user clicks on the link, navigate to a page showing textbox to fill id | N/A | Navigate to a page show textbox to fill id of patient |
| 3 | Search | Click “Tra cứu” to get result from system | N/A | Go to View Appointment Page |
| 4 | Edit appointment | Edit time, sample, labtest for appointment | N/A | Patient’s appointment will be updated |
| 5 | Delete appointment | Delete appointment | N/A | Appointment is deleted |

Figure 36 - Web Interface < Categories bar and sort>

#### View Testing Result



Figure 49 - Web Interface <View Testing Result>

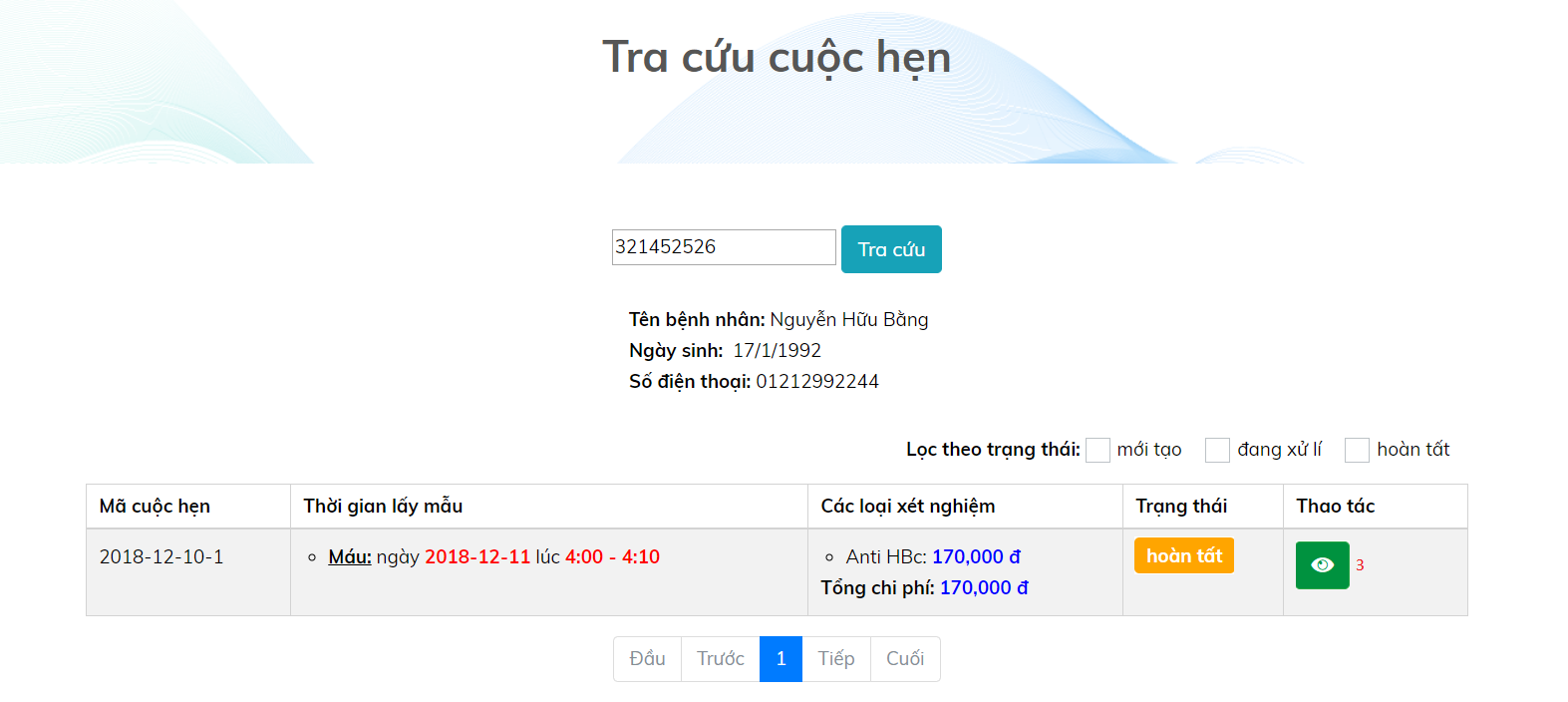


Figure 50 - Web Interface <View Testing Result>

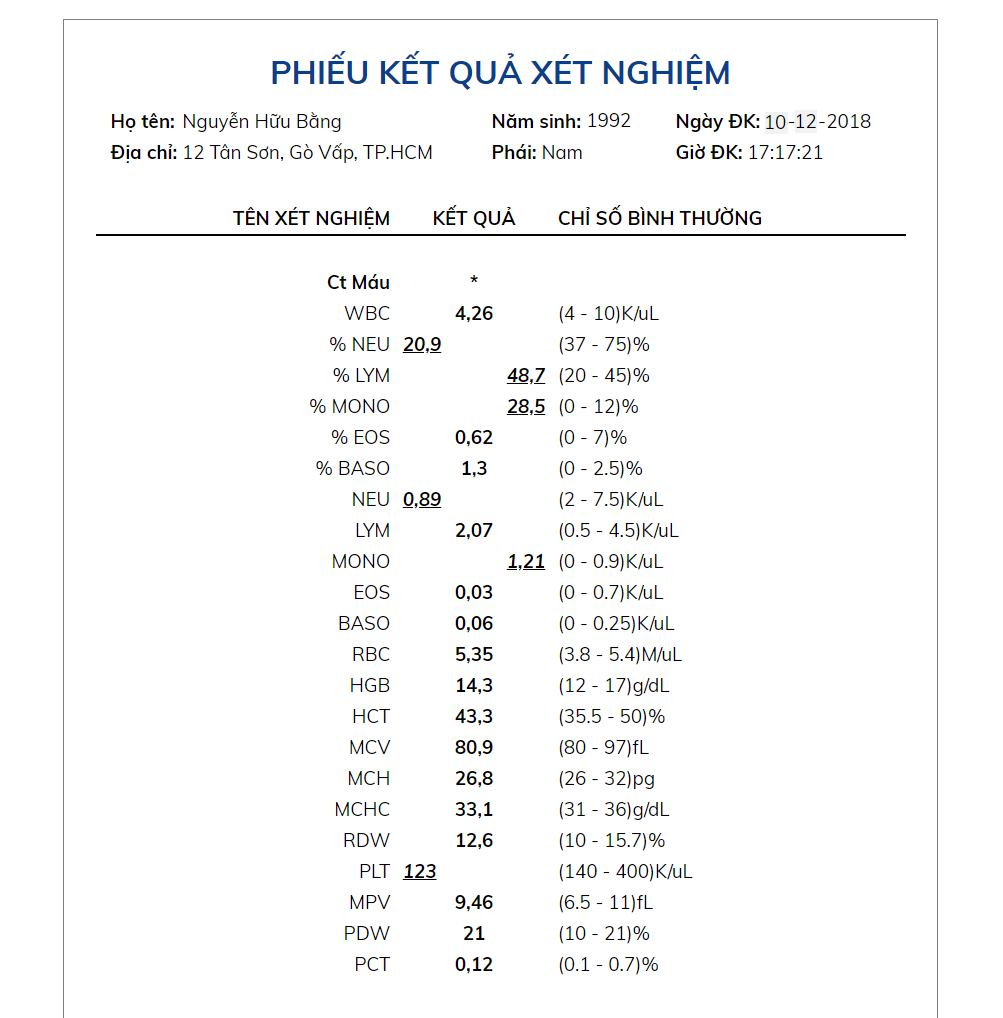


Figure 51 - Web Interface <View Testing Result>

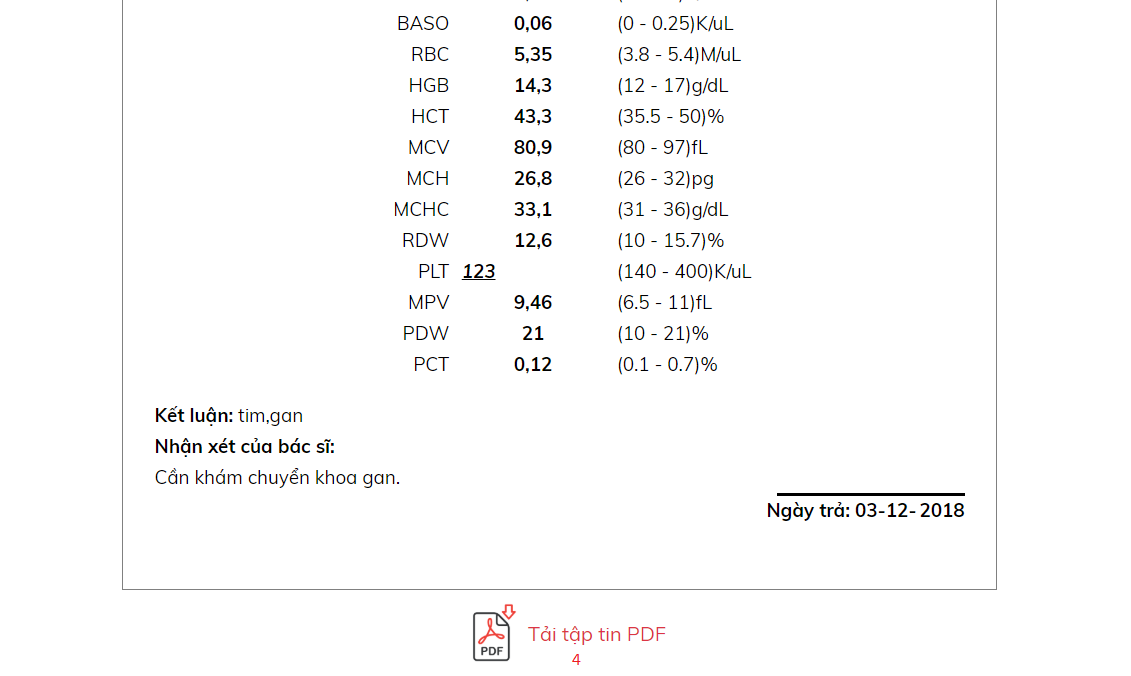


Figure 52 - Web Interface <View Testing Result>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | CMND | Input id into textbox area | No | No | Text | String |  |

**Buttons/Hyperlinks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 2 | Search | Click “Tra cứu” to get result from system | N/A | Go to View Appointment Page |
| 3 | View testing result | View testing result | N/A | Go to Result Appointment Page |
| 4 | Download testing result | User can download testing result file as pdf file | N/A | Testing result file will be downloaded |

### Mobile application user interface

#### Login page



Figure 53 - Mobile Interface <Login>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Phone | Phone to login | No | Yes | Textbox | String |  |
| 2 | Password | Password to login | No | Yes | Textbox | String |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 3 | Sign In | Login into system | Validate all required fields | Navigate to Home page |
| 4 | Navigate to Register Page | N/A | N/A | Navigate to Register Page |

#### Register Account page

Figure 55 - Mobile Interface <Register account>

**Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Field Name** | **Description** | **Read only** | **Mandatory** | **Control Type** | **Data Type** | **Length** |
| 1 | Username | Username to register | No | Yes | Textbox | String |  |
| 2 | Phone | Phone to register | No | Yes | Textbox | String |  |
| 3 | Email | Email to register | No | Yes | Textbox | String |  |
| 4 | Full name | Fullname to register | No | Yes | Textbox | String |  |
| 5 | Date of Birth | D.O.B to register | No | Yes | Datepicker | Date |  |
| 6 | Password | Password to register | No | Yes | Textbox | String |  |
| 7 | Re-Password | Re-Password to confirm password | No | Yes | Textbox | String |  |

**Buttons/Hyperlinks:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Function** | **Description** | **Validation** | **Outcome** |
| 8 | Register | Register into system | Validate all required fields | Navigate to Phone verify page, then navigate to Login Page |
| 9 | Navigate to Login Page | N/A | N/A | Navigate to Login Page |

## **Database Design**

### Entity relationship diagram (ERD)

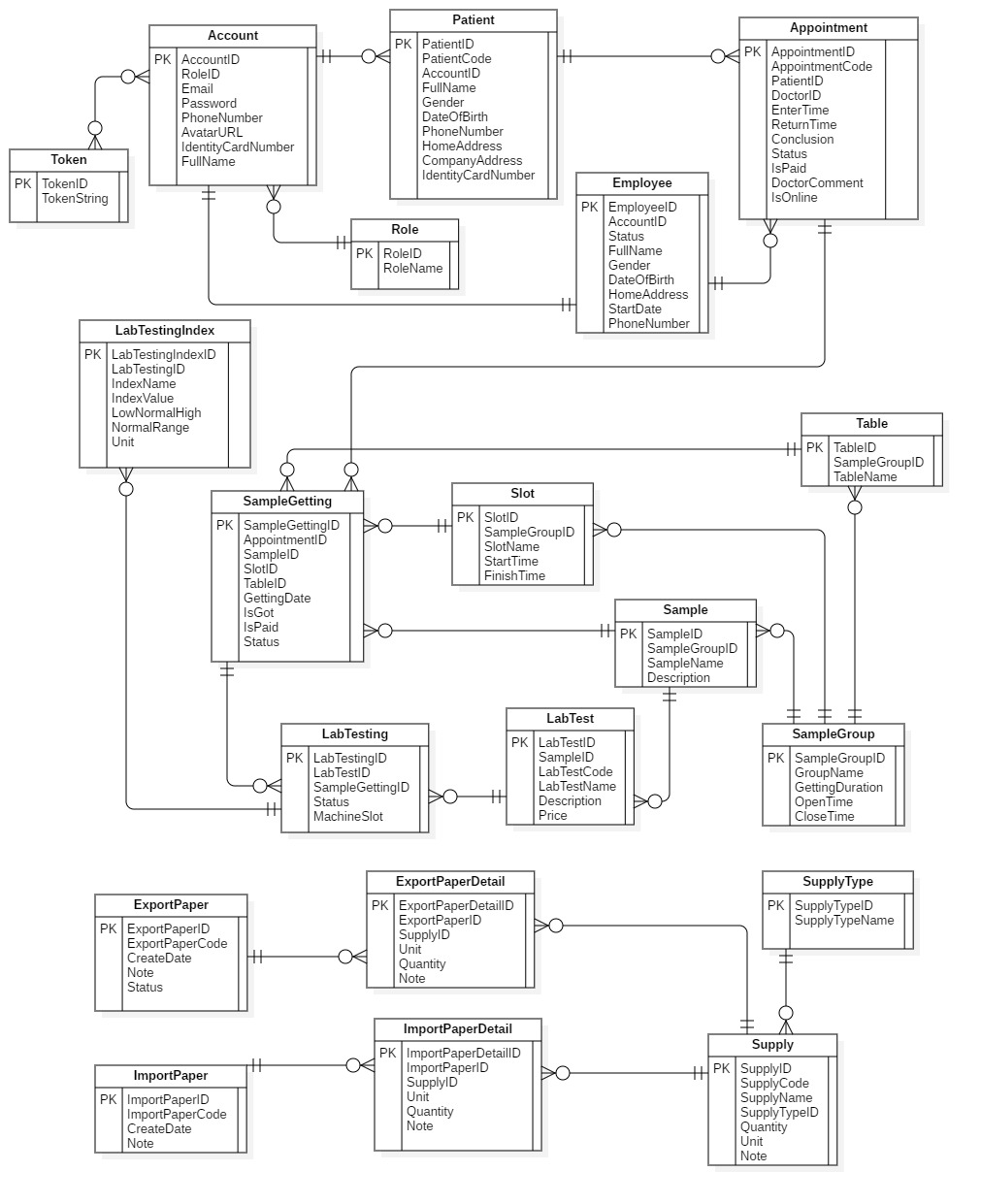


Figure 67 - Entity relationship diagram (ERD)

### Entity dictionary

|  |  |
| --- | --- |
| Entity Data Dictionary: describe content of all entities | |
| **Entity name** | **Description** |
| Account | Contain account information |
| Appointment | Contain Appointment information |
| Employee | Contain staff’s information |
| ExportPaper | Contain ExportPaper information |
| ExportPaperDetail | Contain ExportPaperDetail information |
| ImportPaper | Contain information about ImportPaper |
| ImportPaperDetail | Contain ImportPaperDetail information |
| LabTest | Contain LabTest information |
| LabTesting | Contain information about LabTesting |
| LabTestingIndex | Contain transaction information of LabTestingIndex |
| Patient | Contain Patient information |
| Role | Contain Role information |
| Sample | Contain Sample information |
| SampleGetting | Contain SampleGetting information |
| SampleGroup | Contain SampleGroup information |
| Slot | Contain Slot information |
| Supply | Contain Supply information |
| SupplyType | Contain SupplyType information |
| Table | Contain Table information |
| Token | Contain Token information |

Table 14 - Entity dictionary

## **Algorithms**

### Slot Suggestion

#### Definition

Generate the set of samples getting slots which has minimum total time.

#### Define problem

- When create a new appointment, user often have to spend a lot of effort to choose the suitable slots. Then, there is a need for an automatic solution using algorithms.

- There are N sample-gettings that the patient needs to perform. (blood getting, urine getting, are sample-gettings)

- Each room has a set of slots which have the same durations. Different sample getting rooms can have different slot durations.

- Assume that patients need to do all sample-gettings that they chosed in ONE day, so that the total time is minimum.

#### Solution

We use permutation recursive permutation and dynamic programming (DP) to solve this problem. We follow 2 steps:

* Step 1: Consider each permutation of N sample getting rooms in order, we use DP to calculate the optimized set of slots in the order of sample-gettings.
* Step 2: DP Formula:
* Assume that T[i][j].StartTime: the start time of the j-slot in the i-th slot set. (the i-th slot set belongs to the i-th sample getting).
* Assume that T[i][j].FinishTime: the finish time.
* Assume that dp[i][j] is the minimum waiting time (between slots of sample gettings) if the last sample-getting is the i-th one and the it’s chosed slot is the j-th slot. i is from 0 to N-1, j is from 0 to Length of i-th slot set – 1. Because the sample-gettings’ duration is fixed, the order, which has the minimum waiting time, has the minimum total time.
* dp[i][j] = min {dp[i-1][k] + (T[i-1][k].StartTime – T[i][j].FinishTime) | T[i-1][k].StartTime – T[i][j].FinishTime > 0}.
* Base: dp[0][j] = T[0][j] – comingTime. (comingTime: the time that the patient arrives at the hospital).
* The result of problem is min {dp[n-1][j]}.
* Step 3: Trace to get the optimized order of slots.

#### Complexity

The complexity of this algorithm is **O(N! \* N3). In which, N is the number of selected Samples of a patient on a day.**

#### Flowchart

