
# Patient Biometric System

## Implementation Guide

**Implemented by:**

## Version History

| | DATE | AUTHOR | PURPOSE |
|---|---|---|---|
| 1 | 9th August, 2019 | University of Maryland, Baltimore | Initial draft |

# 1. OVERVIEW

The main purpose of this document is to provide a guide to the implementation of patient biometric (fingerprint) unique identifiers in EMRs in-country, as approved by the Federal Government of Nigeria in the guidelines for electronic medical records for HIV/AIDS care and treatment. The unique identifier serves to link all records of patient encounters with each other and is critical to maintaining a chronological account of patient encounters and status. The developed Patient Biometric System (PBS) serves as de-duplication platform of patient records in the National Data Repository (NDR).

## 1.1 NDR ACCEPTANCE CRITERIA

The Nigeria National Data Repository (NDR) is a repository of de-identified patient level data collected from health facilities across the country. Patient data are collected at the facilities entered directly into Electronic Medical Records (EMR) System or transcribed from paper-based records into the various EMRs.

In view of de-duplicating patients on the NDR, patient records are matched to their biometric data gotten from EMRs. The NDR accepts biometric data from various EMRs in the structure below.

```
- <FingerPrints present="true/false">
    <dateCaptured>1900-01-01</dateCaptured>
  - <rightHand>
      <RightThumb>RightThumb1</RightThumb>
      <RightIndex>RightIndex1</RightIndex>
      <RightMiddle>RightMiddle1</RightMiddle>
      <RightWedding>RightWedding1</RightWedding>
      <RightSmall>RightSmall1</RightSmall>
    </rightHand>
  - <leftHand>
      <LeftThumb>LeftThumb1</LeftThumb>
      <LeftIndex>LeftIndex1</LeftIndex>
      <LeftMiddle>LeftMiddle1</LeftMiddle>
      <LeftWedding>LeftWedding1</LeftWedding>
      <LeftSmall>LeftSmall1</LeftSmall>
    </leftHand>
</FingerPrints>
```

## 2. METHODOLOGY

This section describes the approach and technology used in the development of the patient biometric system.

### 2.1 DEVELOPMENT APPROACH

The PBS module, developed in java, is built to be interoperable across different operating system platforms (windows and Linux).

#### 2.1.1 ALGORITHM

A successful scan of a fingerprint translates to a quality value of 60 or higher. A minimum of 6 fingers and a maximum of 10 is the requirement for a complete scan process. Upon successful scan, a save action is initiated which triggers a match process. The matching algorithm renders the predefined template to the captured fingerprint and runs a comparison of the template info against existing template info in the database. If no match is found, the captured fingerprint is saved in the database along with some vital metadata (ImageHeight, ImageWidth, ImageQuality, ImageDPI, FingerPositions, PatienId.) and encoded, else it returns the patient ID of existing record in the database having that matches the template info. The flow chart below depicts a graphical representation of the process flow.

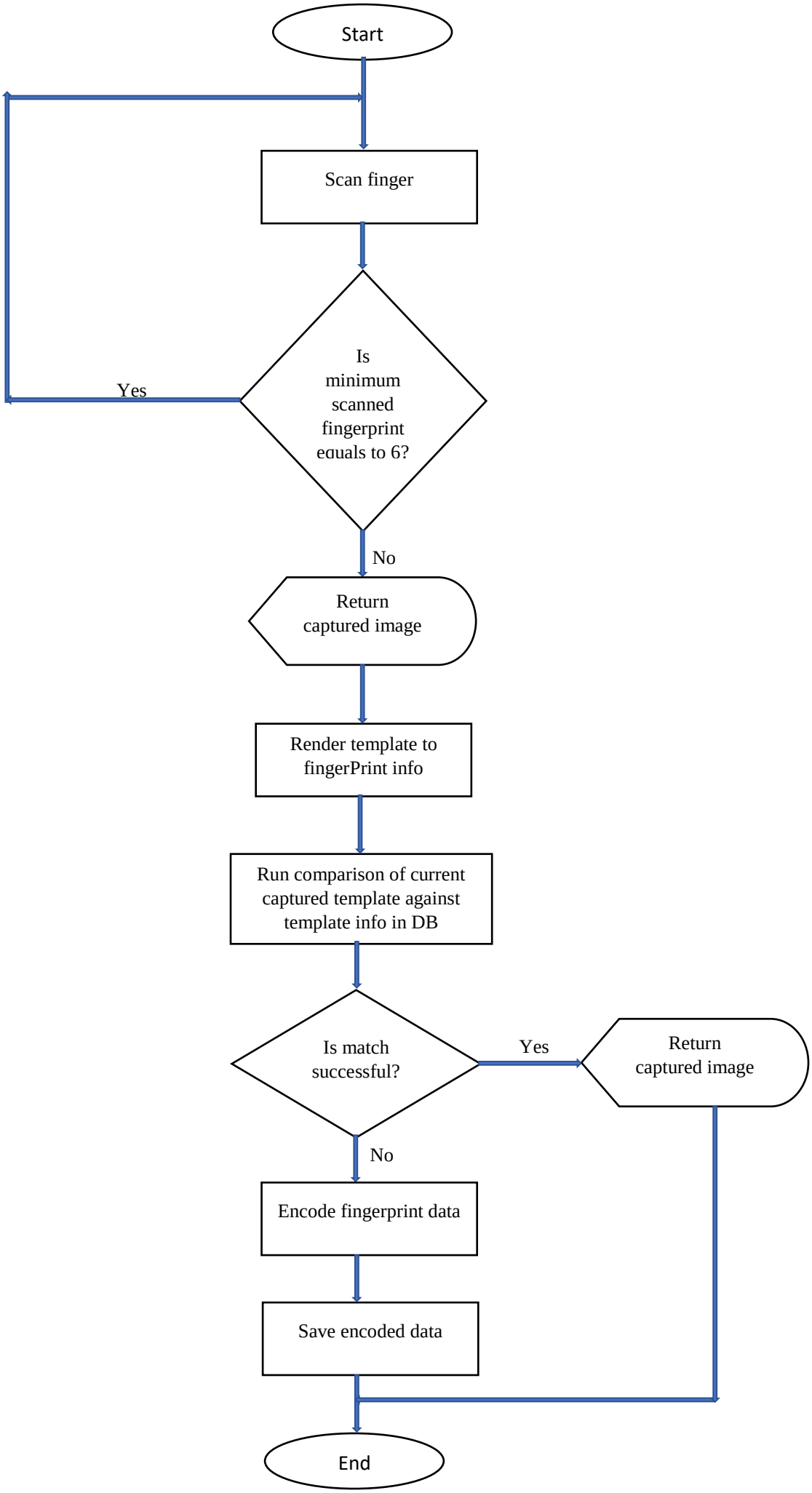


Fig 1.1 Process flow chart

## 2.2 FINGERPRINT TEMPLATE

For interoperability across different biometric vendors, the ISO/IEC 19794-2 fingerprint template is used. This is to introduce flexibility in fingerprint matching across different fingerprint algorithms.

## 2.3 FINGERPRINT FORMAT

The scanned fingerprint is stored in base64 format after encoding the binary data. Base64 is a group of binary-to-text encoding schemes that represent binary data in an ASCII string format by translating it into a radix-64 representation. Each Base64 digit represents exactly 6 bits of data. Three 8-bit bytes (i.e., a total of 24 bits) can therefore be represented by four 6-bit Base64 digits. The base64 format is used in order to keep the binary data uncorrupted as it is being transferred over different media.

## 2.4 FINGERPRINT REQUIREMENT

A minimum of 6 finger and a maximum of 10 is required for a successful fingerprint capture as predefined by the algorithm. The National data repository accepts fingerprint data in the following position enums; RightThumb, RightIndex, RightMiddle, RightWedding, RightSmall, LeftThumb, LeftIndex, LeftMiddle, LeftWedding, LeftSmall.

## 2.5 REQUIREMENTS & DEPENDENCIES

- Fingerprint scanning device (Secugen). At the time this document was created, only the Secugen fingerprint scanning device was used for the implementation. More test will be carried out to accommodate various fingerprint devices.
- ISO/IEC 19794-2 fingerprint template