

Training Manual

for Scanner Identification System,
Hardware and Training Preparation



simprints
every person counts

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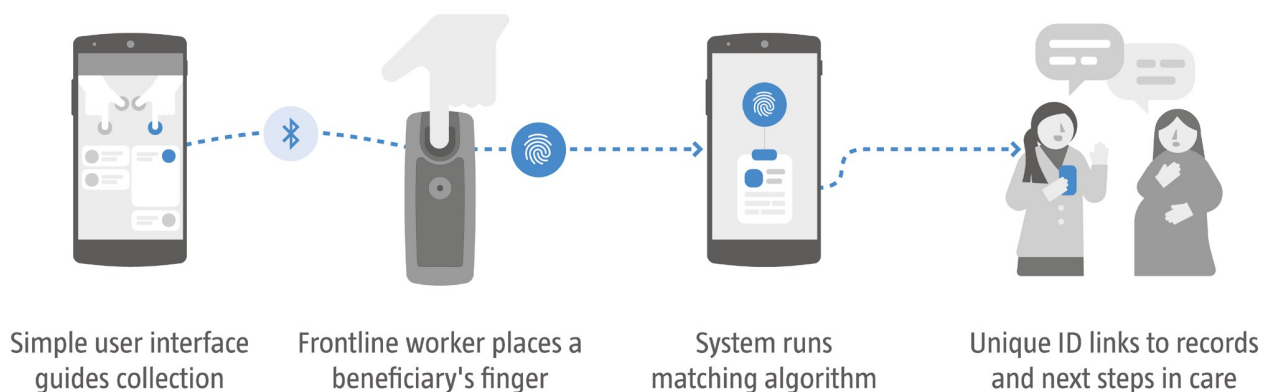
Section 1 - Objectives of the Program

1.1. A Brief Overview of the Simprints Project and Benefits for Using the Scanner and App

Over the past ten years there has been an exciting increase of mobile health (mHealth) technologies, helping bring healthcare to people who need it most. However, identifying people accurately and linking them to their health records consistently over time has proven to be a real challenge for Community Healthcare Worker Leaders (CHWLs).

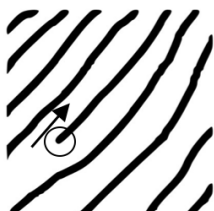
Across the world, 1.5 billion people lack formal identification (e.g. birth certificates or national ID). Many identifiers that people use, such as names or date of births (DOBs) are problematic because people may use different spellings, have common names, or may not know their exact DOBs. This can lead to poor continuity of care, duplication of records, and inaccurate metrics that hinder program improvement and organization reporting. Alternative solutions such as paper IDs and QR codes fail when cards are lost, stolen, or damaged.

In order to address this, Simprints has created a system that is able to identify people with their natural identifiers: their fingerprints. The Simprints scanner is mobile, plugs into platforms such as CommCare, and syncs wirelessly with smartphones and tablets. Now, with the touch of a finger, CHWLs are able to identify their beneficiaries reliably and link them to their health records quickly and accurately.



12 Biometrics 101

The Simprints scanner starts by taking a picture of a fingerprint just like a camera does. The software detects the features of the fingerprint that are unique to each person. These unique features include ridge endings and bifurcations present on the fingerprints, which get coded into a string of numbers, called a template. This means that we do not need to store the actual fingerprint images, making it safer.



Ridge Ending



Bifurcation

The first time a beneficiary is fingerprinted, the template is called an *enroll template*. In future visits, the template is called an *identification template*. If the fingerprint image is taken in the same way every time, then the enroll and identification templates will be the same, and can be matched.

This is why it is important for fingerprints to be taken the same way every time: you must ensure the finger placement on the sensor is correct, and that the finger is not dirty, too wet, or too dry. If the finger placement is not correct, you may not capture enough details of the fingerprint. This can result in the person not being matched correctly. In our tests, when people could not be matched, the reason was almost always because of poor finger placement on the sensor of the scanner—this is the number 1 reason for lower accuracy. See [Section 3.2.1](#) for details on how to ensure good finger placement.

The condition of the fingerprint should not be dirty, too dry, or too wet. These will impact the quality of the image (see images below). This can be fixed with simple steps outlined later in [Section 3.2.2](#).



Example of a dirty fingerprint, resulting in an empty spot in the image, as indicated in the rectangle



Example of a wet fingerprint, resulting in a very dark image and poorly defined lines (called *ridges*)



Example of a dry fingerprint, resulting in poorly defined ridges

Fingerprints are not always perfect! There will be some people with scarred or worn fingerprints. If the finger is visibly damaged, there is a chance that there are not enough details to correctly match someone, or that only a *low confidence* match will occur. A low confidence match means the system is not sure that the person being fingerprinted is the same person that is returned in the list on the phone.

There are a small number of people whose fingerprints are so damaged that they cannot be used for matching at all (see image below). If a match occurs with a low score, it may be necessary to instead identify an individual using CommCare's search functionality based on identifiers such as name.



To increase the accuracy of identification, we image more than one fingerprint. The more fingers that are imaged, the more accurate the system is. According to our research at Possible, two fingers should be sufficient for high accuracy in almost all cases.

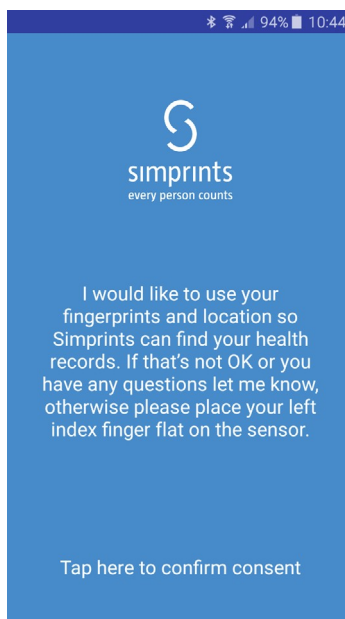
Like all systems of identification, fingerprinting is not 100% perfect! This is why even when you get a high confidence match, it is critical to always confirm the identity of the beneficiary with additional information, such as their name, address, birth date, and photo. Otherwise someone can be given the wrong treatment, causing harm. However, when used correctly, fingerprint identification provides a means to greatly improve people's consistent access to healthcare.

1.3. Privacy and Consent

Fingerprints count as personal data. Thus it is important that the beneficiary gives informed consent before sharing this data with anyone including CHWLs, even if it is to be identified so they can receive better care.

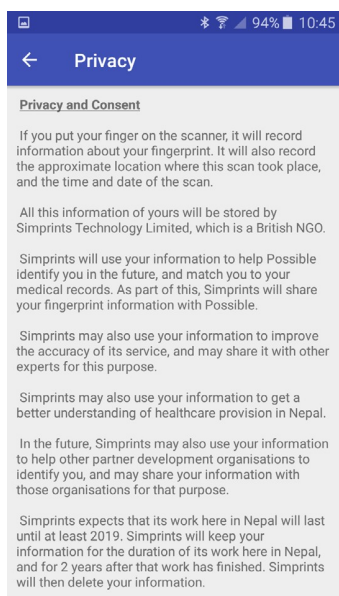
1.3.1. Beneficiary Consent

Make sure that CHWLs read the brief privacy notice on the Simprints loading screen out loud to the beneficiary every time they take a fingerprint. If the beneficiary consents, tap the screen to confirm this and proceed.



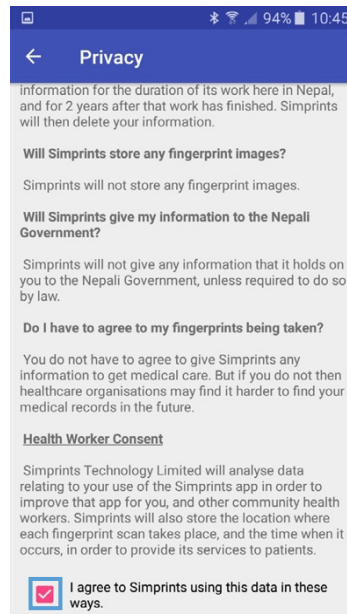
1.3.2. Full Consent Text and Frequently Asked Questions (FAQ)

If a beneficiary has questions, you can access the full text consent form and a Frequently Asked Questions section in the app Settings under Privacy and Consent (see [Section 2.6. Expanded Menu](#) for more details).



1.3.3. Health Worker Consent Section

Finally, when a new CHWL starts using the Simprints system, make sure they read and accept the usage consent form available in the app Settings under Privacy and Consent. This is done by tapping on the square below so that a checkmark appears. This only needs to be done once per CHWL.



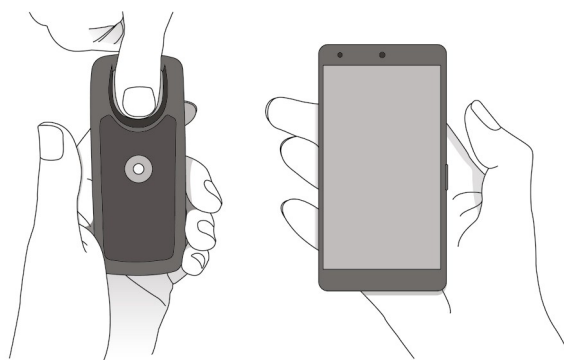
Furthermore, it is critical to maintain the security of the phone holding fingerprint data. The Simprints app is encrypted and compliant with EU Data Protection regulation, arguably the strictest in the world. Nevertheless, make sure that CHWLs:

- Keep their phones safe, and report missing phones immediately
- Do not download suspicious apps or programs onto their phones

Section 2 - Overview of Simprints Identification System

2.1. General Overview

Simprints easily integrates into any existing workflow, plugging in seamlessly with existing mHealth apps. Our identification system contains both hardware (scanner) and software (app) components. The app provides detailed, step-by-step instructions, guiding the CHWL through the process of using the scanner to capture fingerprints and link the beneficiary with their health records.



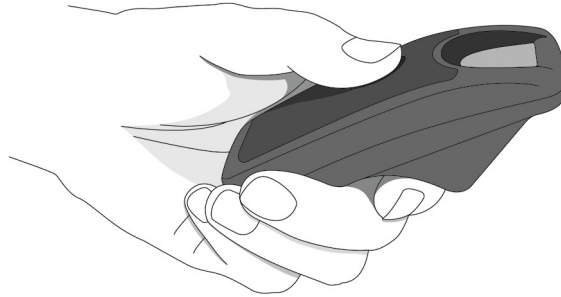
2.2. Understanding Your Scanner



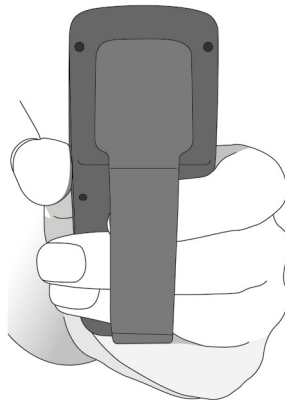
What is it?	What does it do?
Fingerprint Sensor	Where a finger needs to be placed for scanning
Guide Ridge	A raised marker on the case to indicate how far forward the finger needs to be placed on the fingerprint sensor
LED Indicators	<p>Glow to alert the CHWL of the success of capturing a fingerprint image:</p> <ul style="list-style-type: none"> • Centre light only = Waiting for finger • Fully green = Good scan • Fully red = Bad scan
Scanner Button	Optional feature to control the app
Bluetooth Indicator	<p>Indicates the status of the Bluetooth connection between the scanner and the phone:</p> <ul style="list-style-type: none"> • Blinking = Not connected • Solid blue = Connected
Power Button	Press down to turn scanner on or off
Battery Indicator	<p>Indicates the battery power status:</p> <ul style="list-style-type: none"> • Blinking green (when scanner plugged in) = Charging • Solid green (when scanner plugged in) = Fully charged • Blinking red = Low battery
USB Port	Connect a USB cable and charger here for battery charging
Clip	Allows for the attachment of a lanyard if preferred
Strap	Allows CHWL to slide their fingers through for additional support while holding the scanner
Scanner Name	Gives the label for the specific scanner in the format SPXXXX. This number is needed for pairing to a phone.

2.3. How to Hold Your Scanner

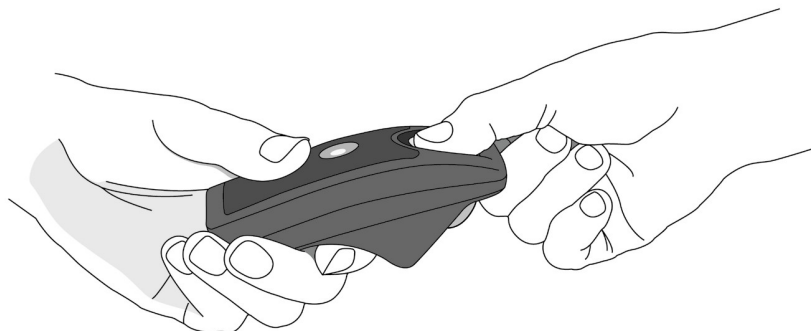
The scanner was designed together with CHWLs to ensure an ergonomic and comfortable design. CHWLs can choose to hold the scanner without the strap, as shown below:



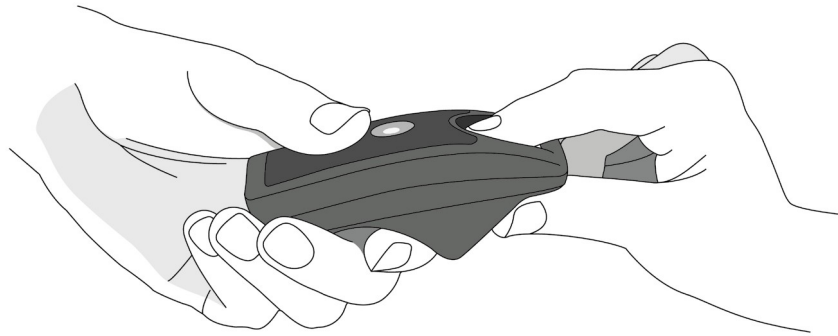
For additional support, the CHWL can slide their fingers through the strap for additional support, as shown below:



CHWLs can then ask beneficiaries to either place their finger as shown below:



Or to pinch the end of the scanner with the finger of interest placed on the fingerprint sensor, as shown below:



2.4. App Set-Up

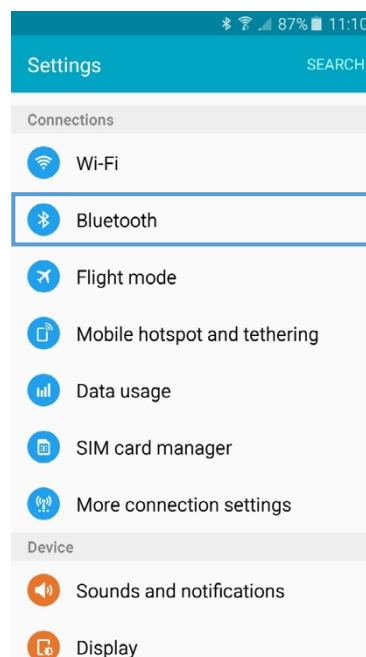
The app is available on Google's Play Store. Go to <https://play.google.com/store> or Google Play Store app, search for Simprints, and tap Install.

2.5. Bluetooth Pairing

Follow the pairing instructions for your Android phone to pair with the scanner, according to the numbered label written on the back of the scanner. Below is a step by step guide of this process for some Android phones, however, please be aware that your phone may not look exactly like this.

Steps:

1. Turn on the scanner by pressing the Power Button
2. Go to Settings on your Android phone
3. Select Bluetooth

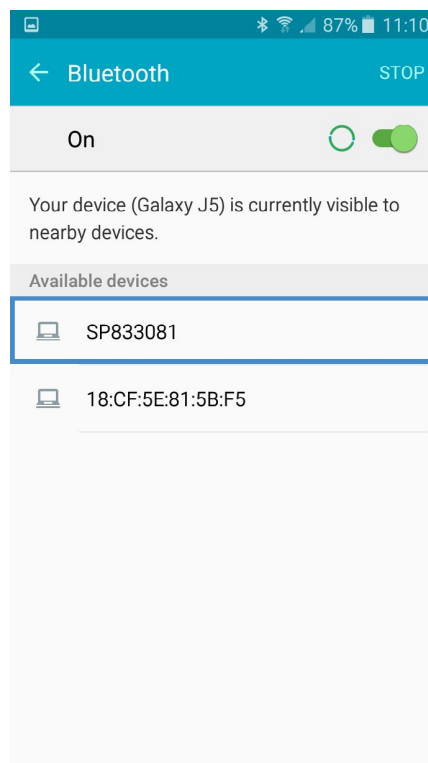


Section 2 - Overview of Simprints Identification System

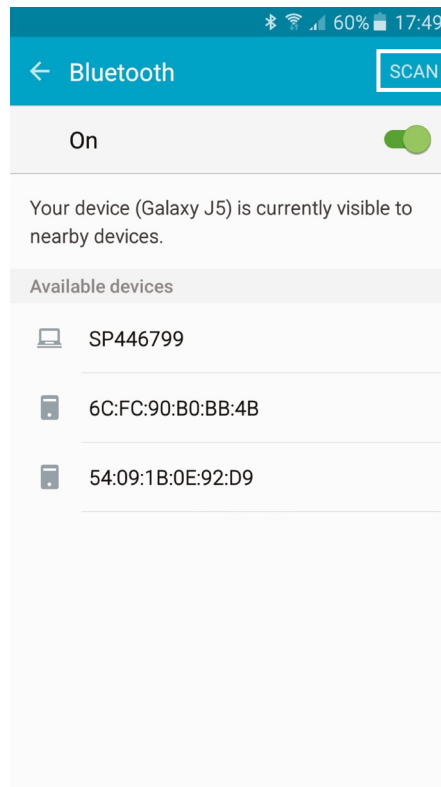
4. Check the number on the label on the back of the scanner (as shown in the image below), as in the image below, and look for it under *Available devices*



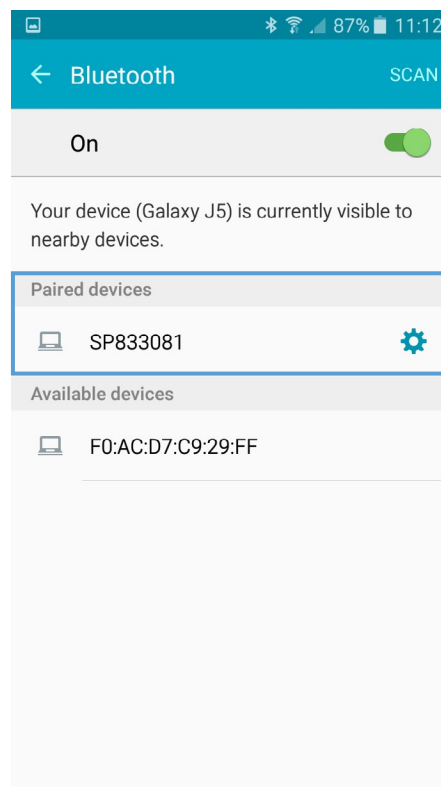
5. Select the number for your scanner, it should be in the format SPXXXX



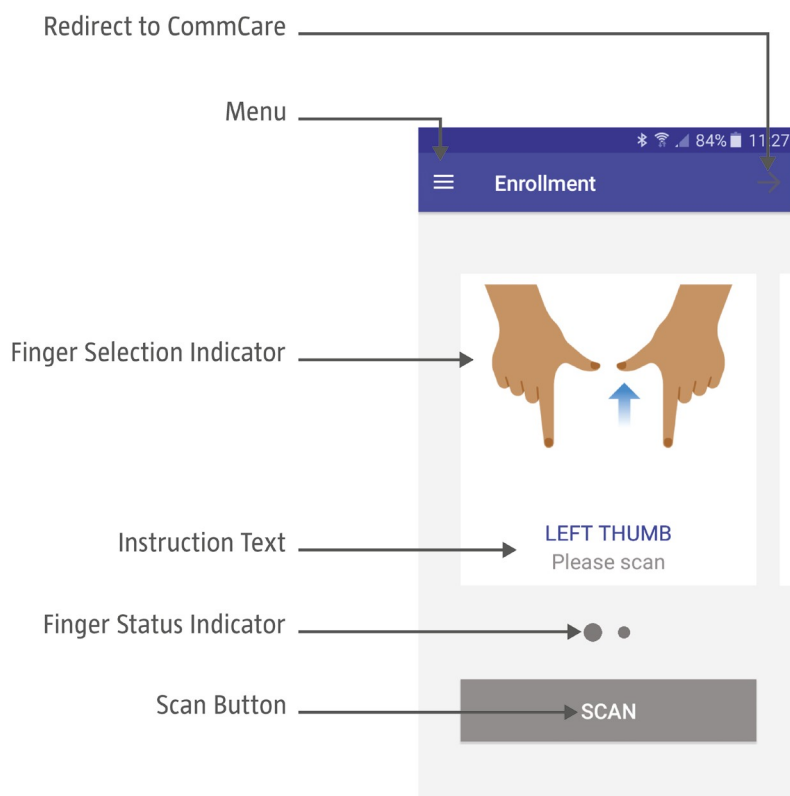
If your scanner does not appear, tap *SCAN* from the top right menu



6. The scanner and phone should now be paired, and will appear under *Paired devices*

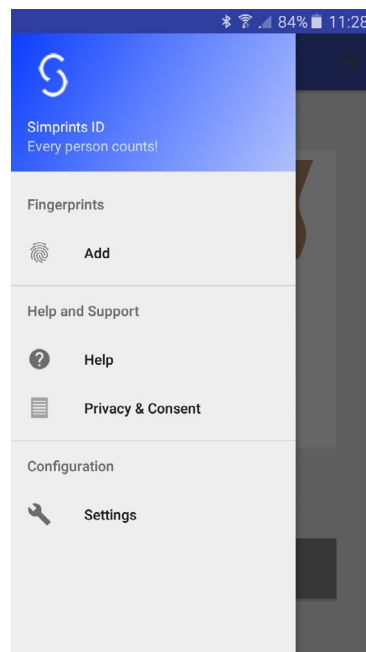


2.6. App Layout



What is it?	What does it do?
RedirecttoCommCare	Goes back to the CommCare app
Menu	Opens the Simprints menu
Finger Selection Indicator	Shows which finger to scan
Instruction Text	Guides the CHWL through the process
Finger Status Indicator	Shows the scanning status of different fingers: <ul style="list-style-type: none"> • Grey = Finger not scanned • Green = Finger successfully scanned • Red = Low quality image scanned
Scan Button	Press to start scanning sequence

Expanded Menu



What is it?	What does it do?
Add	Gives options to add or remove different fingers to the workflow
Privacy & Consent	Gives access to consent forms: <ul style="list-style-type: none"> • Long Beneficiary Consent Notice • CHWL Consent Notice • Frequently Asked Questions (FAQs)
Settings	Allows for advanced customisation, including activating/deactivating Nudge Mode and selecting graphic colours, including changing skin tone

2.7. Workflow

27.1. CommCare - Simprints Workflow

27.1a. Consent

It is critical to always get consent at the beginning of a visit with a beneficiary. See [Section 1.3.1. Beneficiary Consent](#) for more details.

27.1b. Enrollment

The enrollment of a new beneficiary can be done using traditional identifiers using CommCare, or with fingerprints using Simprints.

When tapping the *Enroll new person* icon in CommCare, you will automatically be redirected to the Simprints app to capture fingerprint images, which will be explained in detail below in [Section 2.7.2.b. Scanning Fingers](#). In the event the CHWL does not have the fingerprint scanner with them or it is not charged, they can skip this step and proceed without using fingerprints. They will however be prompted several times during later stages to use fingerprints.

For adding fingerprints to an existing case, you can tap on the fingerprint/Simprints icon present on the screen in various places.

27.1c. Identification

For care delivery, the default option will be to look for a person using their fingerprints. There will be an automatic redirection to the Simprints app for fingerprint collection, in a similar way as is done in enrollment ([Section 2.7.2.b. Scanning Fingers](#) for details).

After the fingerprints are scanned, they will be run through a matching algorithm (as outlined in [Section 1.2. Biometrics 101](#)) and the 5-10 best matches will be displayed in the returns list. Each beneficiary will have a confidence score next to their name, symbolised by different numbers of stars:

- 5 stars: very high confidence
- 4 stars: high confidence
- 3 stars: medium confidence
- 1-2 stars: low confidence

There is a very high probability (over 98%) that the beneficiary will be the first or the second on this list, with a very high or high confidence. Generally if 4 or 5 stars are displayed, the image captured is of good quality and there is a high likelihood that the correct person is listed (although there is never absolute certainty). If 3 or less stars are displayed, there is a higher probability that they are not the correct person.

Warning: be aware that a high ranking or high confidence does not necessarily mean that the correct person is displayed in the list. This should be always confirmed by secondary identifiers such as name and date of birth.

For more information about identification errors go to [Section 3.3. Identification Errors](#).

27.1.d. Care Delivery

After the correct beneficiary is selected, proceed with CommCare in the standard way.

272 Simprints Workflow

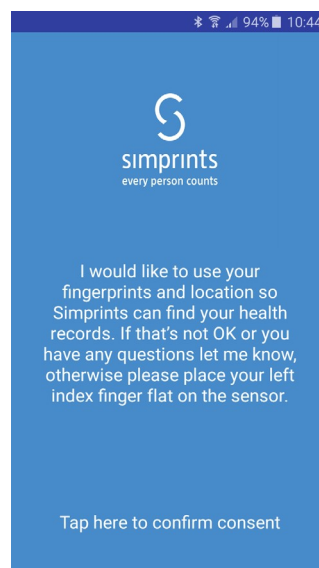
272a Consent

The first step to the Simprints workflow involves getting consent from the beneficiary for scanning their finger. This should be done by explaining why this is done. Here is an example script to follow:

Whenever I come and visit you, I need to find your personal medical record. This allows me to see your previous visits and use that information to deliver better care to you. The hospital has given me this new technology [show the scanner] which will help me with this process, and make sure that you always get the correct treatment and medicine from me.

Here is how it works: first you will place your left thumb and then your left index, onto this piece of glass [point out the fingerprint sensor]. The scanner will then take a picture of your finger, just like a camera would. The next time I come to visit you, we can use the same fingers, take a picture again with the scanner, and the phone will recognise you and bring up your medical records.

All this information is going to be safe and secure, and I will make sure that every time I come here I will ask you for your permission and legal consent will need to be attained. I will read the consent form to you and if you require I can read you the longer consent form and answer any questions you have.



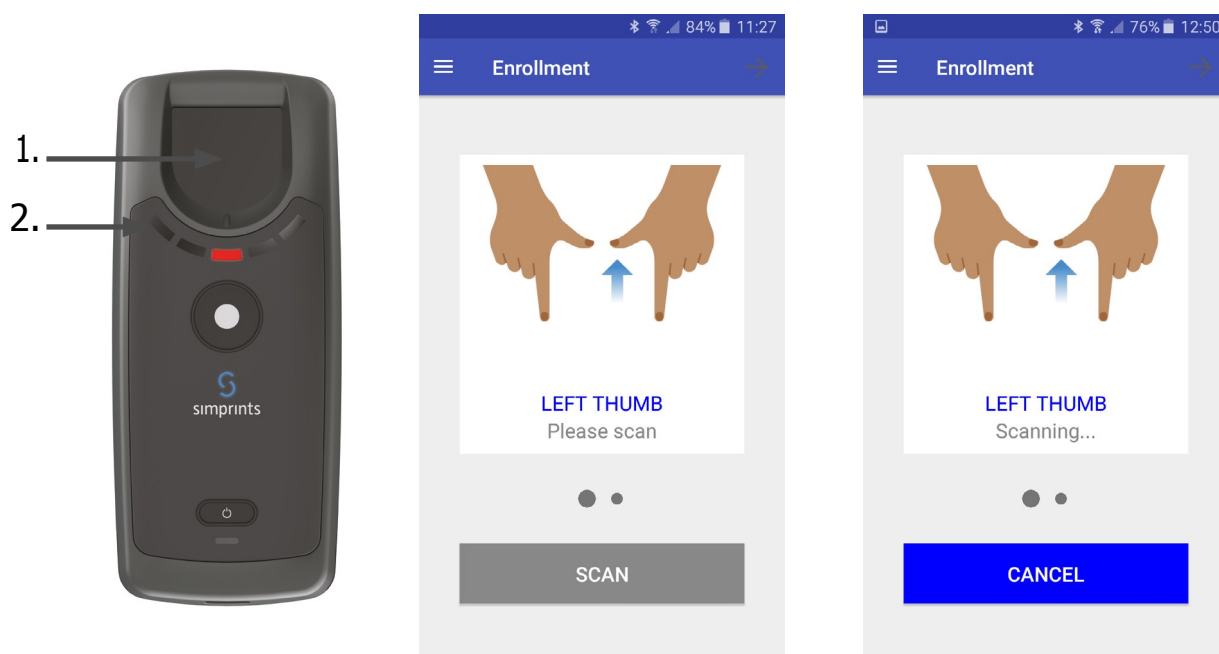
The CHWL needs to read this outloud to the beneficiary. If the beneficiary consents, the CHWL taps to confirm consent. If they do not consent to fingerprinting but do consent to the original CommCare system, use the CommCare app instead.

Section 2 - Overview of Simprints Identification System

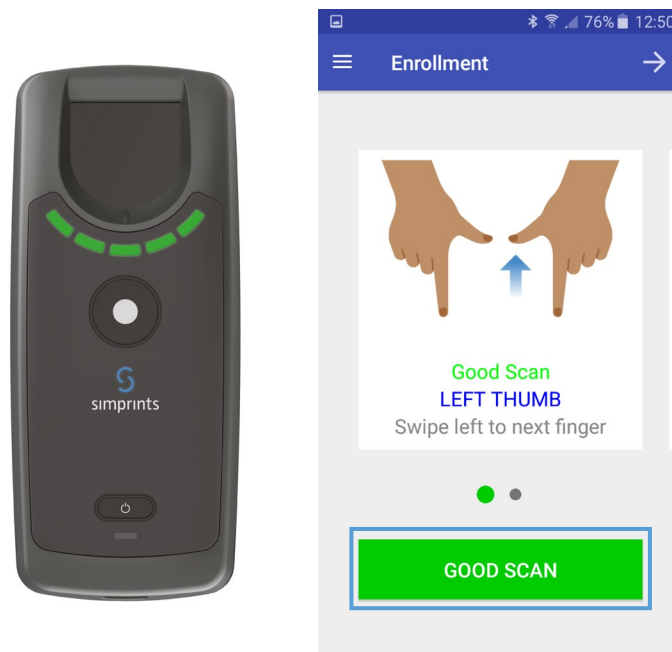
272b. Scanning Fingers

To ensure accurate identification we will be scanning two fingers; in this case, the left thumb and index have been chosen (but can be changed upon request).

- **Place Finger** - The finger that needs to be scanned first is indicated with an arrow as well as by text on the phone. Ask the beneficiary to place the left index on the fingerprint sensor (1). Remember that in order to get the best reading, ensure their finger is clean, dry, and placed properly.
- **Click Scanner Button** - Click on the scanner button on the scanner directly to take a photo of the fingerprint. The middle red/orange light on the scanner (2) will light up when the scanner is ready to capture, please do not move the beneficiary's finger until all the lights on the scanner turn on (red or green). The screen on the phone will now move to the next finger if the image was successful. Now repeat the first two steps with the next finger. An alternative to pressing the button on the scanner is to tap *Scan* on the app.

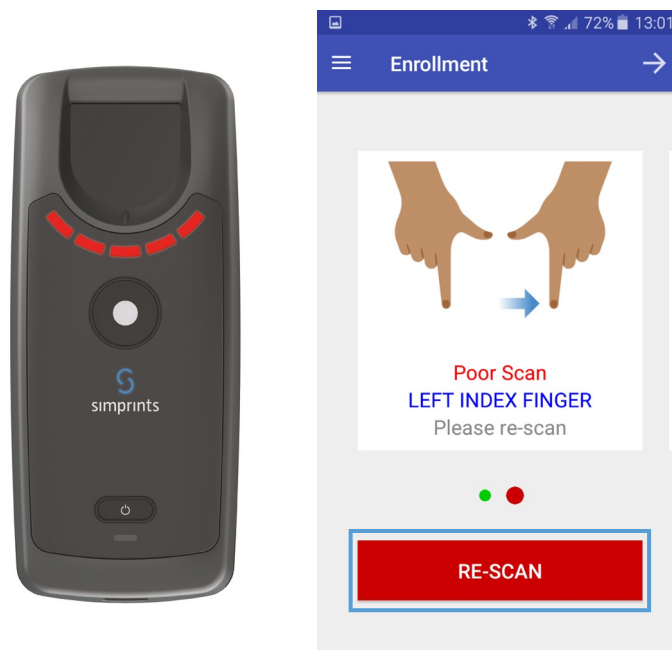


- **Good/Poor Scan** - If the first fingerprint is of good quality, the scan button on the phone will turn into a green button and the screen will automatically display the next finger to be scanned. The lights on the scanner will turn green.



If you scanned the wrong finger by mistake, you can swipe back to the previous screen and tap on the green button. This button will now say: *Re-scan* and you can re-scan the correct finger either by tapping this button or by tapping the scanner button.

If the first fingerprint has a poor quality, the scan button on the phone will turn red and will say *Re-scan*. The lights on the scanner will also turn red.



You can reposition or clean the finger and tap Re-scan until you get a good image. See [Section 3.2. Scanning Errors](#) for more information on how to fix a bad scan.

Section 2 - Overview of Simprints Identification System

272c Returning to CommCare

You have now successfully captured the fingerprints to identify your beneficiary. Please press the arrow on the top right-hand corner of the screen to be transferred back to CommCare for further instructions.

2.8. Caring for the Scanner

28.1. Charging and Storage

When the battery indicator flashes red, the scanner battery has low power and will need to be charged as soon as possible.

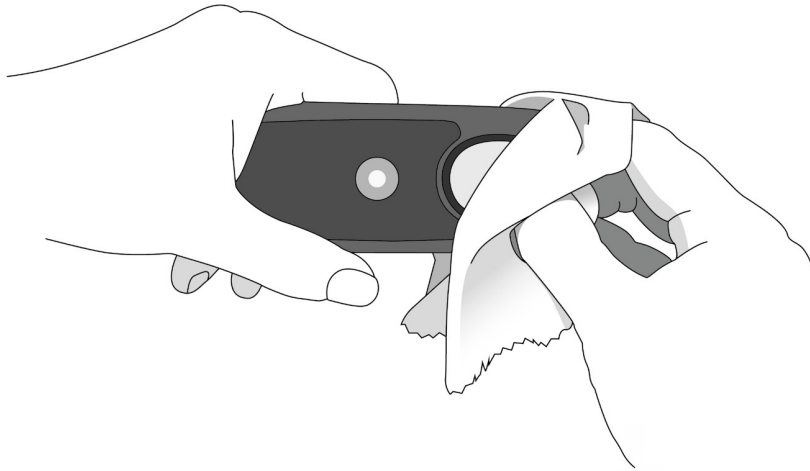


When plugged in, the green light will flash during charging, and will stay a solid green when fully charged. We recommend charging the scanner every evening after a day of use, and whenever you charge your phone. Charging should last a minimum of two hours, or can be left to charge overnight.

Please keep the scanner out of direct sunlight.

2.8.2 Cleaning

Cleaning should occur after use with each beneficiary, and at the end of the day, to ensure there is no contamination between beneficiaries. Please use the soft cloth provided and an antibacterial spray to wipe the glass platform and the front of the scanner, which has the most beneficiary contact. The cloth should be washed with soap and water every two weeks, or when it becomes dirty.

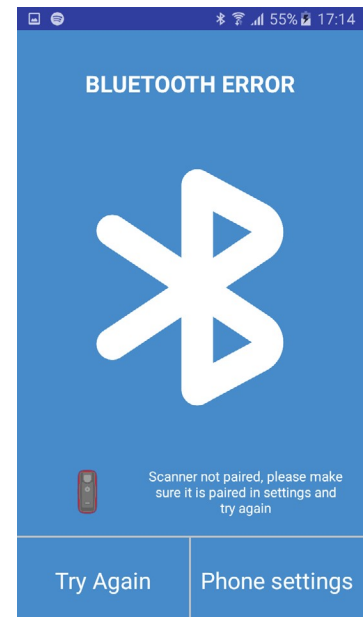


Section 3 - Troubleshooting

3.1. Connection Errors

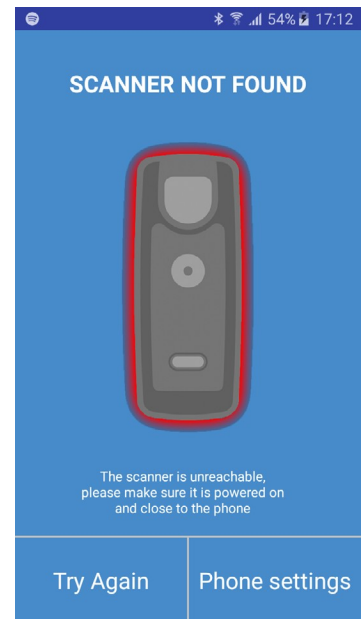
3.1.1. Bluetooth Error

- Check if the scanner is turned on – if off, turn it on by tapping the power button
- Tap *Phone Settings* to open the Bluetooth settings of your phone. There are three things that could cause the error:
 - Make sure your Bluetooth is turned on
 - Make sure that the Simprints scanner is paired – you can find the scanner name on the back of the scanner, underneath the USB charging port in the format SPXXXXXX. See [Section 2.5. Bluetooth Pairing](#) for details. If the Simprints scanner does not appear, turn the Bluetooth off and on
 - Make sure that the only paired scanner is the one you want to use. Unpair from all Simprints scanners that you do not intend to use by tapping the wheel on the right of the name, then tap *Unpair*
- Tap your phone's back button, and return to the error screen
- Wait 5 seconds, then tap *Try Again* and you will be brought to the next stage of the enrollment/identification (the consent form)



3.1.2 Scanner Not Found

- Check if the scanner is turned on – if off, turn it on by pressing the power button on the scanner
- Check if scanner is charged (the battery indicator light is not flashing red) – if red light flashing, charge the scanner using cable provided
- If turned on and charged, wait 5 seconds, then select *Try again* and you will be brought to the next stage of the enrollment/identification (the consent form)
- If still not successful, turn the scanner off and on again by pressing the power button on the scanner and make sure the scanner is not more than 5 metres away from the phone
- Once the scanner is on again, wait 5 seconds, then select *Try Again* and you will be brought to the next stage of the enrollment/identification (the consent form)
- If still not successful, tap on *Phone Settings* which will bring you to the Bluetooth settings of your scanner
- You will now see the Simprints scanner that you are paired with under Paired Devices, all in the format SPXXXXXX
- Check the specific name of the scanner you want to use. You can find the name at the back of the scanner underneath the USB charging port
- Unpair from any Simprints scanners you are not using and pair with the correct Simprints scanner
- Tap the back button on the phone or on the top left of the screen to return to the original error screen
- Wait 5 seconds, then select *Try Again* and you will be brought to the next stage of the enrollment/identification (the consent form)



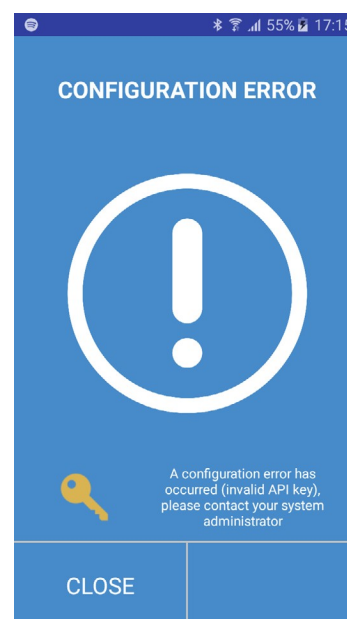
Section 3 - Troubleshooting

3.1.3 Configuration Error

This problem occurs when your phone has not been set up with a proper/valid API key. It will prevent you from using the app and you cannot solve this yourself. Please get in touch with a system administrator.

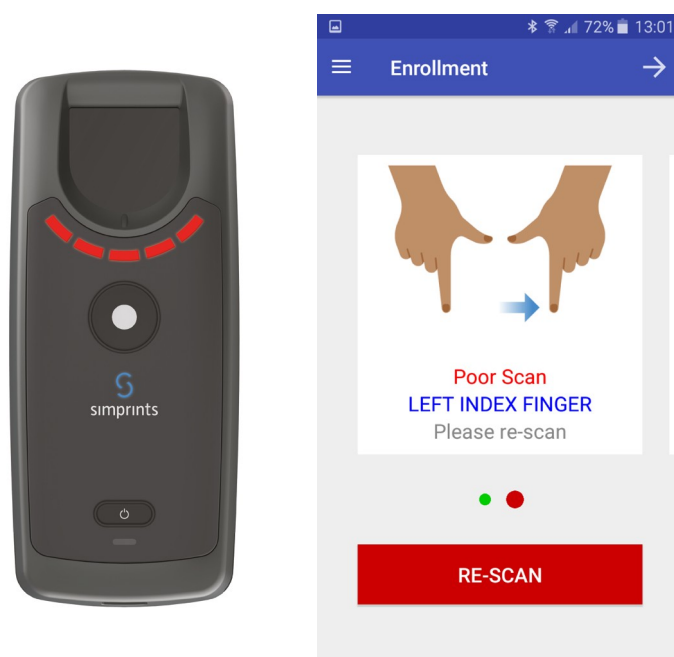
NOTE:

If you lost the connection during the scanning process (either because the scanner was turned off or because the battery was low), the app will return to the beginning and not save previous fingerprints – make sure you capture all the fingerprints again.



3.2 Scanning Errors

If a low quality scan of a finger occurs, a *Poor Image* message and *Re-scan* option will appear on the app, and the LED indicators on the scanner will glow red.

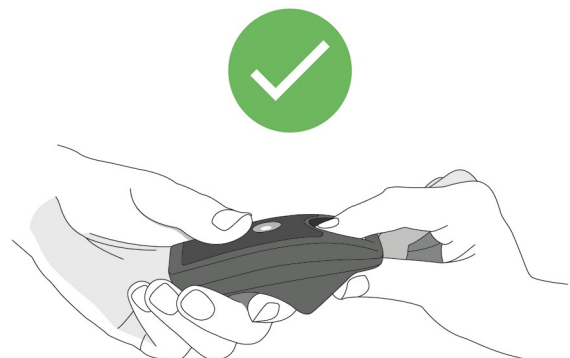
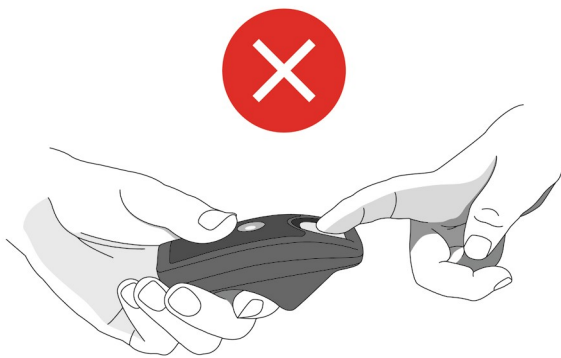


There are several reasons why this might have happened, the most common being poor finger placement on the sensor, followed by finger condition. Rarely, a fingerprint may be impossible to capture due to damage to the fingerprint itself.

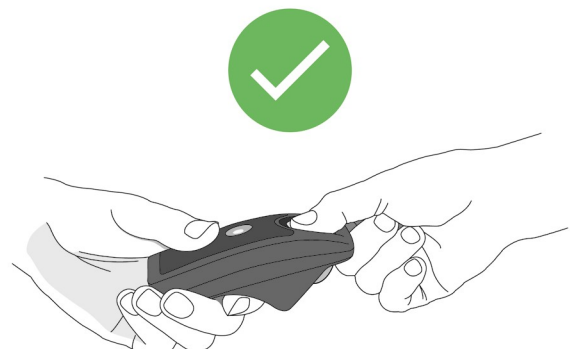
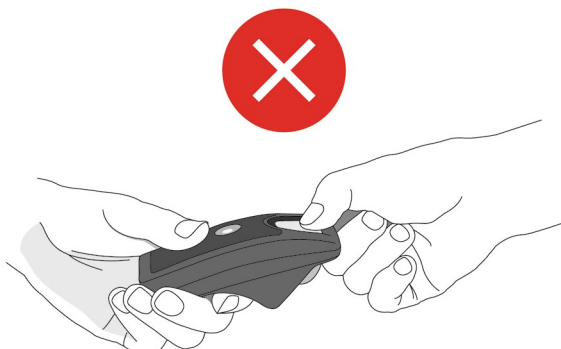
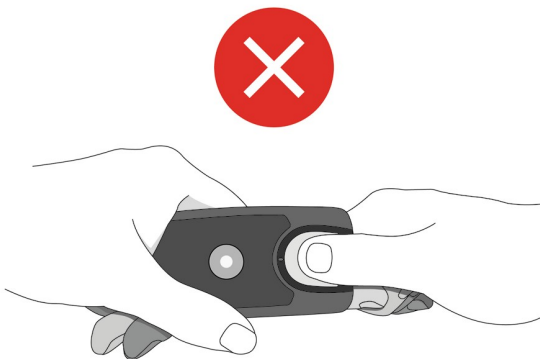
3.2.1. Finger Placement

The most common mistakes are:

- Finger is Placed Too Lightly – ensure there is sufficient pressure between the finger and the sensor
- Finger is Pressed Too Hard – ensure that the finger is not pressing down on the sensor with too much force
- Finger is Not Straight – ensure the finger is in line with the scanner
- Finger is Placed Laterally (not fully flat on the glass surface) – ensure the finger is fully facing down



- Finger is Not Touching the Guide Ridge – ensure the finger is placed to maximize contact with the glass area, with the tip in contact with the guide ridge



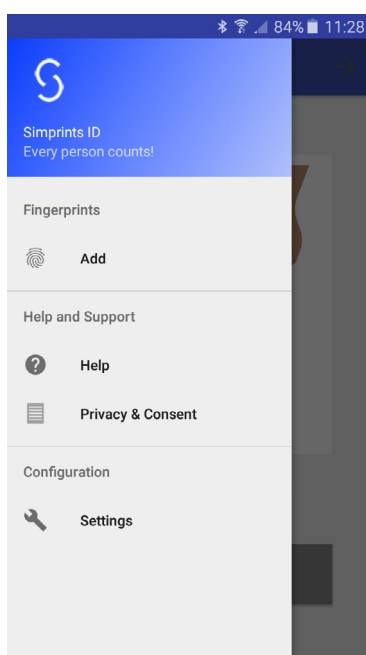
322. Finger Condition

- If the finger is dirty, ask the beneficiary to wipe the finger on their clothes to clean it
- If the finger is too dry, ask the beneficiary to wipe the finger on the back of their neck to collect oils and moisten their finger
- If the finger is too wet, ask the beneficiary to dry the finger on their clothes

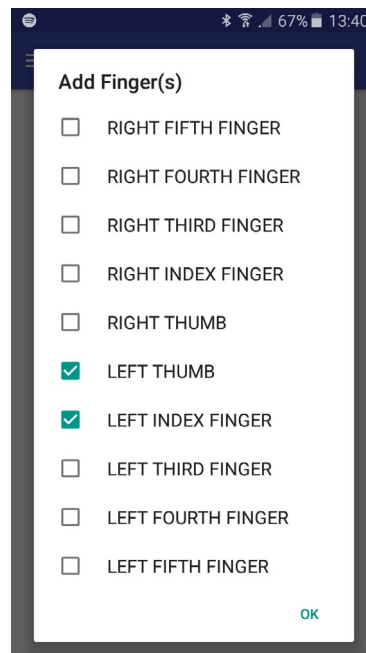
323. Finger Damage

There will be some instances where a fingerprint is too worn or too scarred/damaged to be able to capture a good fingerprint. In this case you will need to capture a different finger by following these steps:

1. Tap the *triple bar* symbol on the top right of the screen. The Simprints menu will appear



2. Under *Fingerprints*, select *Add*. A list of potential fingers to image will appear (see image below)
3. Check the box for any fingers you would like to add. In total at least 2 fingers should be scanned successfully. We recommend using the indexes and thumbs, but any can be used if necessary. The CHWL should ask the beneficiary to try remember which fingers were used in order to speed up this process in future visits



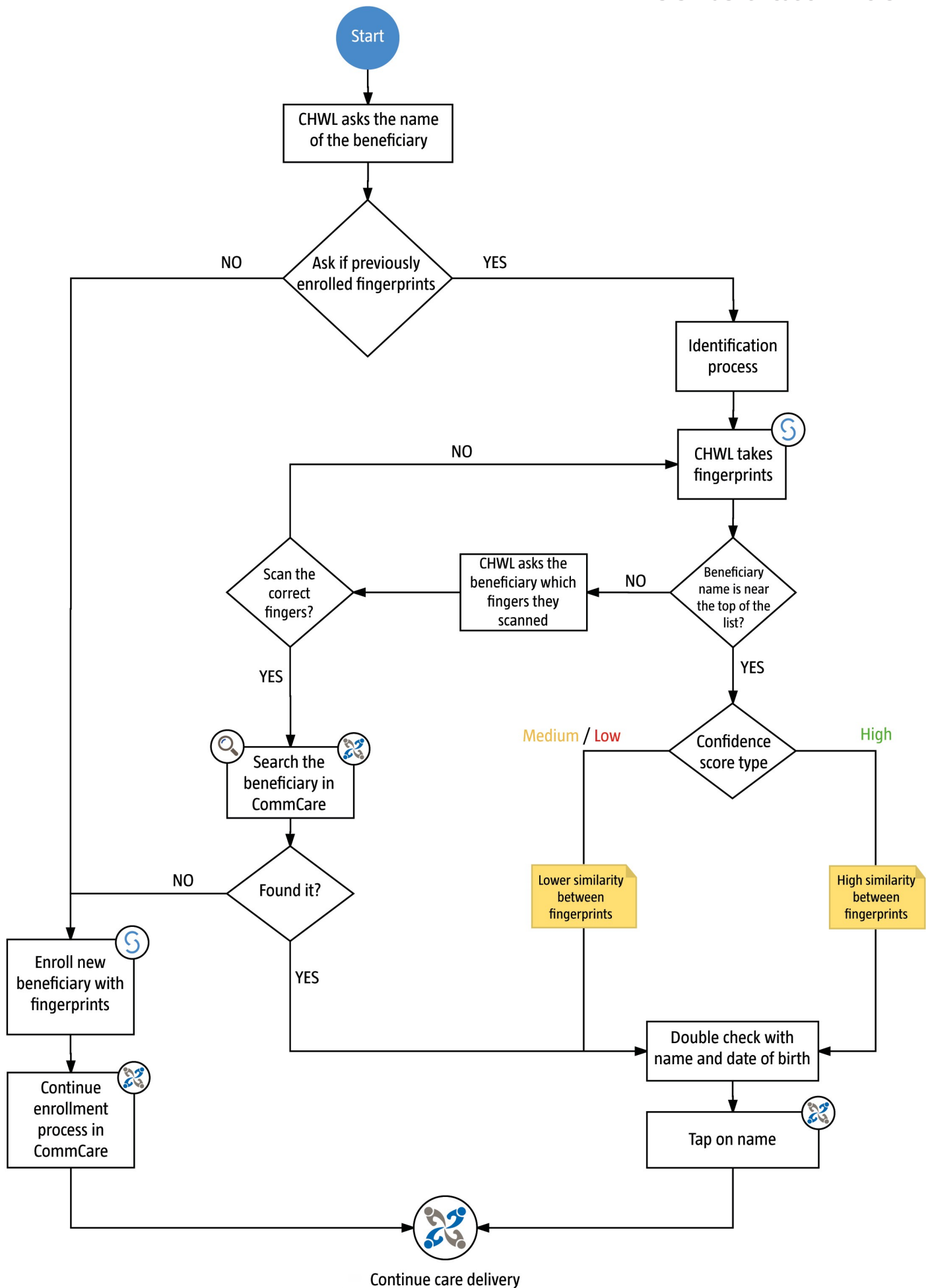
4. Tap *OK*, and continue scanning

In rare instances, a beneficiary may have damage to all fingers and cannot be successfully enrolled or identified using fingerprinting. In this case, tap the arrow at the top right of the screen and use CommCare to manage this case. Ask the beneficiary to tell the CHWL in the future that they cannot be fingerprinted.

3.3. Identification Errors

In most cases, after fingerprinting an individual, their name will appear on the returns list. Before continuing with care delivery, you must tap on the name of beneficiary you think is correct, and first confirm they are indeed the correct individual using secondary means, such as their name, address, birth date, and photo.

In some cases, it may be less straightforward to find the correct beneficiary. Follow the steps in the flow diagram on the next page to prevent errors.



Section 4 - Training Preparation

4.1. Provided Training Materials Overview

For training the CHWLs we have put together some materials that will help in the teaching process. These include:

- Double-sided Laminated Card - This contains information on correct finger placement and how to deal with common errors
- PowerPoint Presentation - This runs through key information needed to use Simprints' identification system. It uses graphic elements to communicate key concepts such as finger placement

4.2. Set-up for Training

- Set up fully charged scanners and phones for each CHWL
- Make sure scanners are not paired (CHWLs will do this in the training process)
- Arrange for the PowerPoint presentation to be projected on a screen, leaving sufficient space at the front of the room to allow for a couple individuals to demonstrate concepts such as enrollment with the scanner
- Set up mobile screen casting on the projector

4.3. Best Practices

When teaching a new concept there should be a balance between lectures and more interactive activities. Lecturing may be the fastest way to convey information and give a broader understanding of a subject, however the longer the lecture is the harder it is for an audience to focus. Mixing lectures with hands-on learning can help balance this as it encourages communication and engagement, and allows for direct observation and participation.

See One, Do One - Hands-on training is a valuable way to increase the individual's confidence in the subject, and can demonstrate to the teacher where an individual has difficulties. This can therefore be tackled immediately before they become problems in the field. A useful exercise for this is roleplay.

Create time to check in with CHWLs during training and after implementation. Regular feedback allows for any issues to be quickly corrected and can inform future training sessions.

Shadowing - is a valuable way to gain feedback from training and can offer insights into which subjects / issues need to be re-addressed in later training sessions.

Schedule Refresher Sessions - Refreshers help to reinforce information over time and build a confidence in doing new processes.

4.4. Tips for Encouraging Struggling Learners

Try to identify anyone who is struggling with concepts early on and make time to help these individuals as early as possible, so that they do not fall behind.

Promote the idea that everyone is part of a unit and encourage everyone to help each other in the training process. At the start of the training, the Trainers could use a motivational speech with the aim to remind the group that we all struggle at something and we are all equal regardless.

Pairing individuals with difficulties with others who do not struggle is a common technique, however this method can have mixed results if more knowledgeable CHWLs become frustrated or too controlling in the learning process. When pairing people up for this process, Trainers should try to create a level playing field of knowledge and experience in the selected pairs in advance so the weaknesses and strengths balance each other out.

Glossary

- App - the software application that runs on the phone (e.g. CommCare)
- Beneficiary - a person who is benefited from a program, such as a patient in a health system
- Biometric - a measurement of people's natural identifiers, such as their fingerprints or iris. Simprints uses fingerprints to identify people
- Bluetooth - a short-range wireless standard that enables wireless communication between devices, such as between mobile phones, computers, and other electronic devices. Bluetooth is used between the scanner and phone
- CHWL - a frontline health worker who visits and interacts with beneficiaries. CHWLs here directly use the CommCare/Simprints system
- CommCare - the world's leading mobile data collection platforms for low-resource settings
- Confidence Score - a measurement of the similarity between fingerprints. It indicates the likelihood of the beneficiary being correctly matched
- Ergonomic - something that is designed in a way so that the users interact with it efficiently and safely
- Identifiers - something that can be used to help identify a specific person, such as their name or fingerprint
- Informed Consent - permission granted with full understanding of the possible consequences
- LED Indicator - lights used on the scanner to give feedback to the user, for example, as to whether a scan was successful
- Match Score - a number indicating the similarity between multiple fingerprint templates. The higher the number, the more similar the fingerprints are, and the more likely it is that they came from the same individual
- Probability - the chance that a given event will occur
- QR Code - a machine-readable code consisting of an array of black and white squares. This functions in the same way as a bar code
- Scanner - a device that scans something like a fingerprint to make it digital. The hardware component of the Simprints system is a scanner

- Template
 - Enrol Template - a string of numbers that describe the unique aspects of a fingerprint collected during the enrolment process
 - Identification Template - a string of numbers that describe the unique aspects of a fingerprint collected during the identification process

