CARDIOVASCULAR
HEALTH

Designing an Optimal Digital Tool
FOR HYPERTENSION AND OTHER LONG-TERM TREATMENT PROGRAMS

TABLE OF CONTENTS

ABOUT RESOLVE TO SAVE LIVES

Resolve to Save Lives is a not-for-profit organization partnering with countries, communities and organizations to prevent 100 million deaths from cardiovascular disease and make the world safer from epidemics.

Resolve to Save Lives believes in speed, simplicity and scale.

Simplicity

We promote and create simple, innovative, user-centered programs. Our technology is open-source and interoperable.
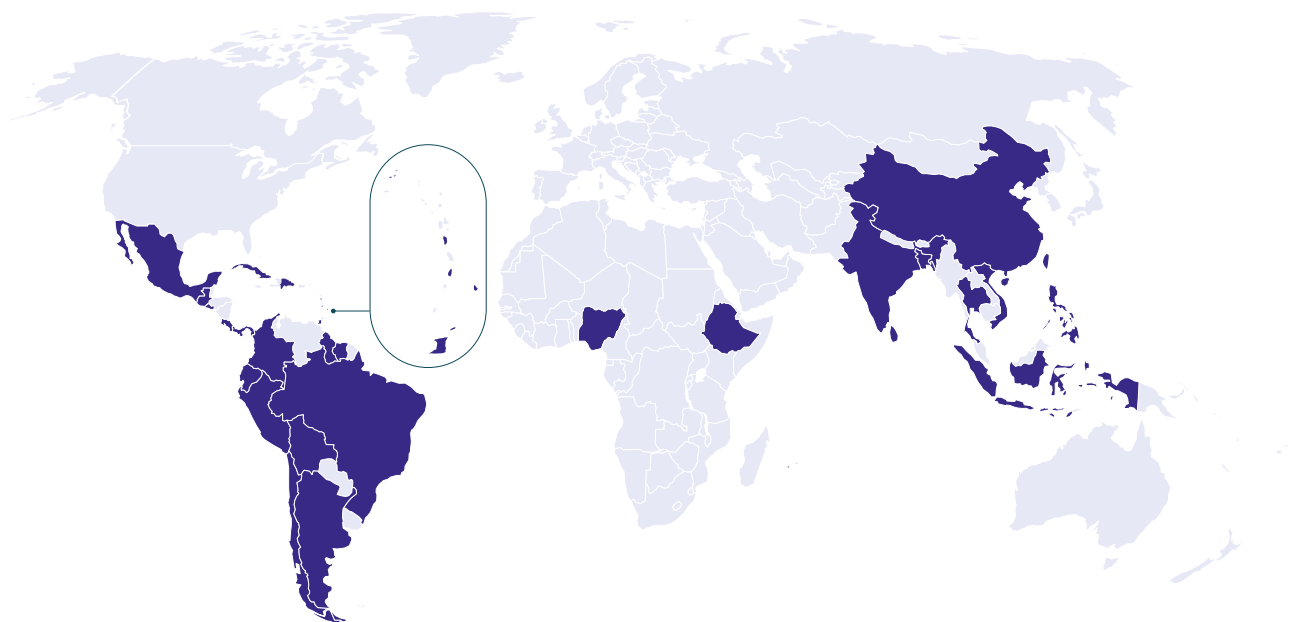
Speed

We are motivated by the challenges of today.

Scale

We catalyze nationwide, regional, and global improvements to support policies and interventions that result in sustained progress.

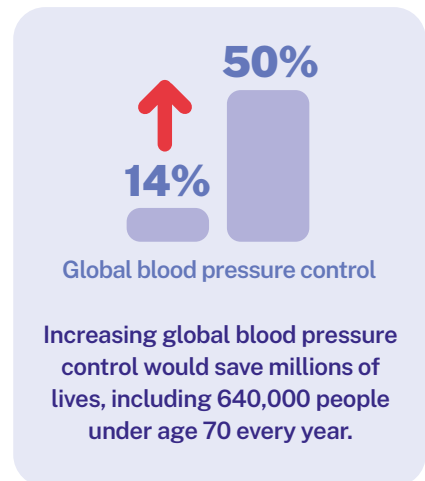We work on hypertension care in 32 countries, and counting.

Hypertension control

Resolve to Save Lives partners with global, national and local partners to support their efforts to scale up proven blood pressure control strategies including the World Health Organization's HEARTS technical package.

Since January 2018, RTSL-supported programs have been launched in 32 countries, enrolling more than 19 million people with hypertension.

50%

14%

Global blood pressure control

Increasing global blood pressure control would save millions of lives, including 640,000 people under age 70 every year.
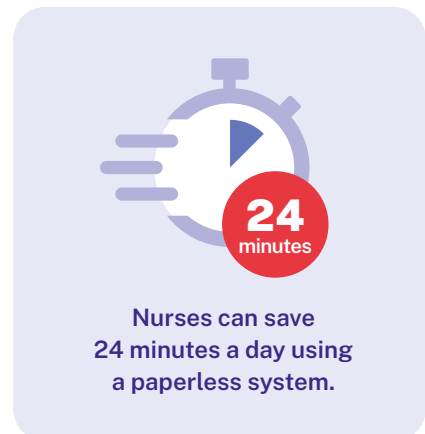
Digital systems

We created Simple, an open-source tool that has been used in more than 5,000 facilities to manage more than 4 million patients with hypertension and diabetes in India, Bangladesh, Sri Lanka and Ethiopia.

These countries have done an excellent job at lowering blood pressures and a strong data system is partly responsible.

Based on metadata from more than 1 million patient visits per month, healthcare workers took only 13 seconds to record follow-up information and only slightly over a minute to register a new patient.

A time-and-motion study documented saving 24 minutes every day for nurses who went paperless with the system. And managers can create program reports with two or three clicks or taps, compared with two or three hours with paper records.

We have also used DHIS2 to support healthcare workers to improve care of patients with hypertension in Nigeria.

24 minutes

Nurses can save 24 minutes a day using a paperless system.

Contact us

Please contact us if you want to learn more about effective digital systems for managing hypertension or other health conditions. Include the subject "Digital Tool Playbook."

✉ Email us at info@resolvetosavelives.org or

🖱 Fill out our contact form

Hypertension control resources
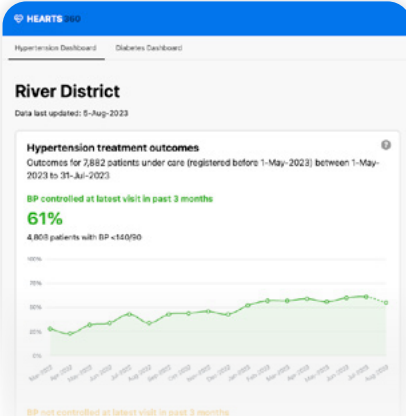
→ Quick start guide to implementing a national hypertension program

→ Six step guide to scaling up a hypertension program

→ HEARTS360 hypertension and diabetes dashboard

→ FAQ for clinicians treating hypertension

→ Guideline for the pharmacological treatment of hypertension in adults (WHO)

→ Blood pressure measurement checklist

→ How to Choose an Automated Blood Pressure Monitor

→ Hypertension control: An annotated bibliography (US CDC)

→ Hypertension treatment protocol: Punjab, India

→ HEARTS Technical Package (WHO)

Six Step Guide >

Quick Start Guide >

HEARTS360 >

EXECUTIVE SUMMARY

A digital tool can improve program efficiency and patient outcomes.

Treating hypertension at scale could save millions of lives each year, but most countries still do not have a large-scale hypertension management program, and many existing programs struggle to operate efficiently.

Incorporating a digital tool — that serves as both a light electronic health records (EHR) repository and a monitoring tool for a hypertension management program — can solve problems created by paper-based record-keeping (or inefficient digital tools) and facilitates rapid process improvements by maximizing program data.

But choosing or designing an effective digital tool can be daunting. This playbook outlines how to design a digital tool that maximizes the effectiveness of a hypertension management program. The principles can be generalized and applied to other programs managing chronic conditions in primary care.

> The principles that make a digital tool effective for a hypertension control program can be generalized and applied to other programs managing chronic conditions in primary care.

How a digital tool can improve your hypertension management program

Specific, tangible benefits from a well-designed digital tool include:

✓ Increasing the efficiency of the program;

✓ Saving health care workers time;

✓ Increasing the program and facility's ability to manage large numbers of patients;

✓ Retaining a higher proportion of patients in care;

✓ Reducing health care worker training time; and

✓ Improving program quality.

User-centered design sets a digital tool up for success

Effective digital tools put the needs of the key user — in this case, the frontline health care worker — at the center. A user-centered design approach can mean the difference between a tool that users adopt widely and one that they reject or use incorrectly — and, therefore, determine its potential to strengthen your hypertension management program.

> **A user-centered design foundation for a digital hypertension management program tool can be established by following four key principles:**
>
> 1   Design for the user, not the stakeholder;
>
> 2   Observe real-world clinical care;
>
> 3   Talk to users; and
>
> 4   User-test your software.

Key features of an effective digital tool

Capture the right data points

A good data collection application is one that's actually used during clinical care at the time of the patient visit.

Capturing only the data that needs to be tracked — the bare minimum of data to drive key indicators — keeps data entry quick and easy, making health care workers more likely to use the tool consistently.

Make it very fast and easy to use

For busy health care workers, data entry must be extremely efficient. Only a fast, user-friendly tool will be used consistently.

Offline functionality, quick patient search, and features that make tracking and contacting overdue patients a lighter lift are some of the most important features for health care workers.

Focus on patient management

Unlike paper-based systems, which are fixed at a facility, a digital tool allows patients to move between facilities while maintaining a single and complete longitudinal record.

Automating administrative tasks that are slow and labor-intensive using paper-based systems — such as sending SMS reminders and compiling reports of overdue patients — makes patient management easier for health care workers and can improve patient retention to care.

Build simple dashboards that show the right indicators

A simple, effective dashboard can help decision makers quickly identify problems and monitor the effects of their interventions. Dashboards should prioritize the indicators that demonstrate progress towards health outcomes.

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SECTION I:

OVERVIEW

Introduction
Digital tools—done right

What is a digital tool and why do you need one?

Case study: Simple

INTRODUCTION

Digital tools—done right

Three out of every four people in the world with hypertension live in low-and middle-income countries (LMICs), but only one in ten patients in these countries has their blood pressure controlled. Today, hypertension kills more people than any other condition—and more than all infectious diseases combined. Although it is the single leading preventable risk factor for cardiovascular disease, progress improving effective treatment globally has been slow.

Chronic noncommunicable diseases (NCDs) such as hypertension require that health systems treat large numbers of patients for long periods of time, with patients often needing treatment for decades. The sheer quantity of patients seeking care from hypertension management programs means that clinicians, officials and administrators must adapt and evolve their programs and record-keeping.

To provide quality patient care quickly, innovative health information systems that allow for continuous, real-time patient and program monitoring have become increasingly critical.
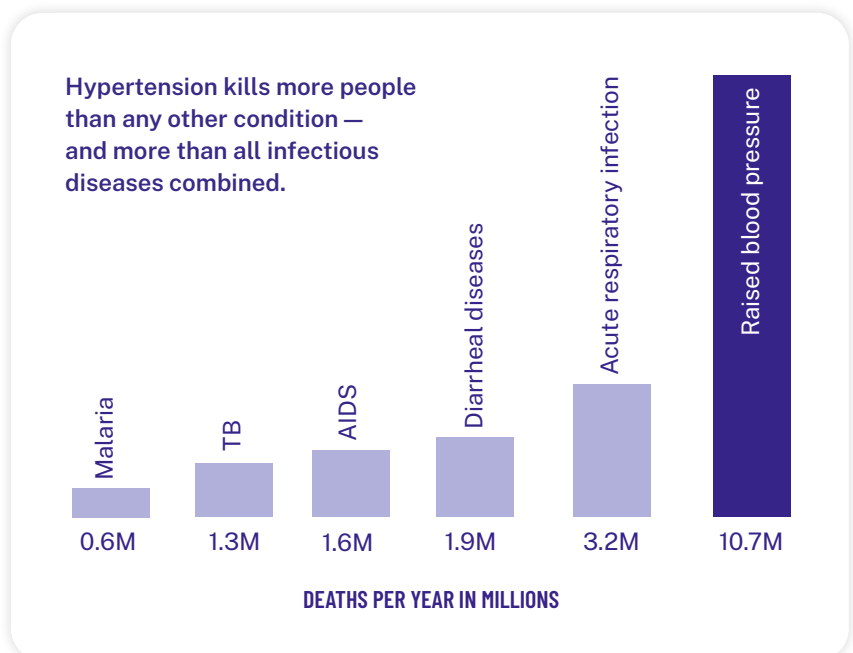
This playbook outlines how to design a digital tool that maximizes the effectiveness of a hypertension management program. The principles can be generalized and applied to other programs managing chronic conditions in primary care.

The strategies in this playbook are based on user-centered design principles and our years of experience creating tools that are fast, easy-to-use, and show the data that helps staff to treat patients better and save more lives.

2x

20mm
systolic blood presure

Every 20mm increase in systolic blood presure from 115/75 doubles vascular mortality at ages 35-69.

Lewington S, et al. Lancet. 2002;360:1903-1913

Hypertension kills more people than any other condition — and more than all infectious diseases combined.

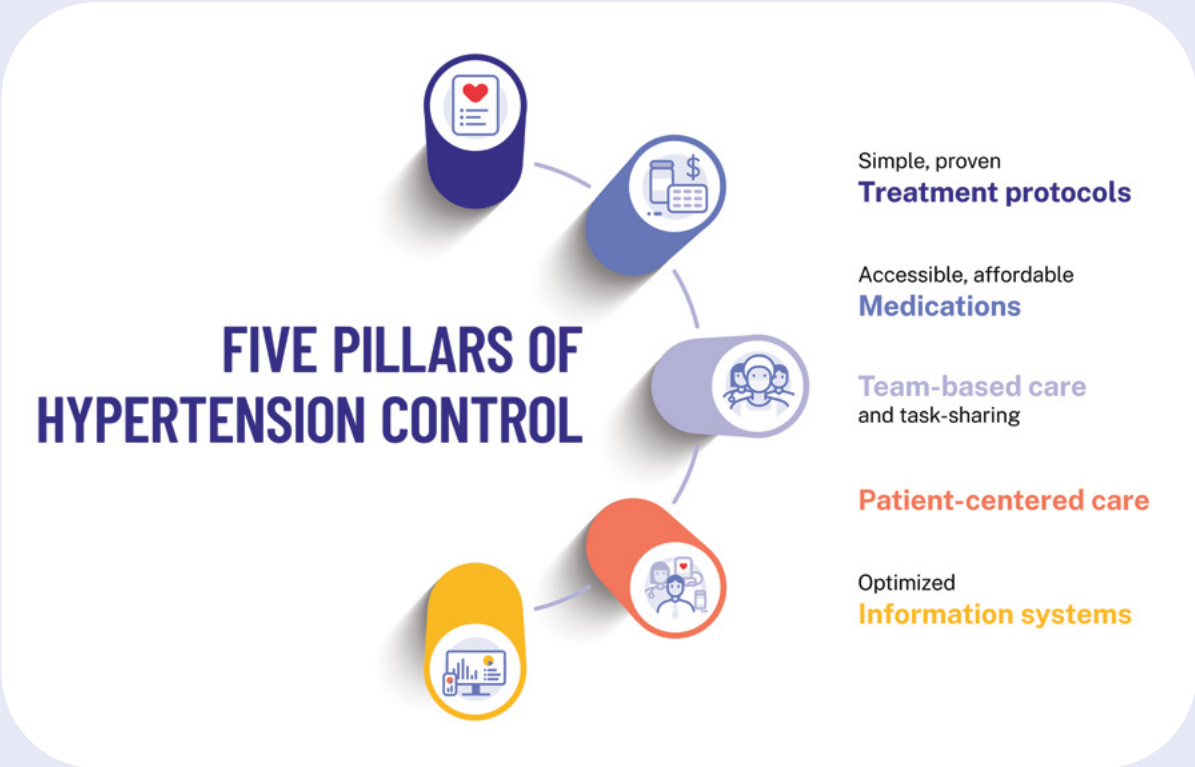| Malaria	TB	AIDS	Diarrheal diseases	Acute respiratory infection	Raised blood pressure
0.6M	1.3M	1.6M	1.9M	3.2M	10.7M

DEATHS PER YEAR IN MILLIONS

The WHO HEARTS technical package

The World Health Organization (WHO) Global HEARTS program works to reduce heart attacks and strokes by supporting governments to improve cardiovascular health with an emphasis on primary health care facilities.

The WHO HEARTS technical package, which has been implemented in more than 31 countries, emphasizes five key strategies.

FIVE PILLARS OF HYPERTENSION CONTROL

Simple, proven
Treatment protocols

Accessible, affordable
Medications

Team-based care
and task-sharing

Patient-centered care

Optimized
Information systems

Resolve to Save Lives prioritizes these same five pillars in its work on cardiovascular disease.Since 2017, WHO and Resolve to Save Lives have partnered with governments and other global and local stakeholders to design, test and scale up national hypertension control programs.

What is a digital tool and why do you need one?

For the purposes of this playbook, we use the term "digital tool" to refer to a system that serves as both a light electronic health records (EHR) repository and a hypertension management program monitoring tool.

A well-designed digital tool for a hypertension management program can dramatically improve patient outcomes by solving problems created by paper-based record-keeping or inefficient digital tools and by facilitating rapid process improvements in care.

Relying on paper-based systems can compromise patient care and create frustrations for health care workers and administrators.

Blood pressure control rates in Bangladesh improved after implementing components of the WHO HEARTS technical package and a digital tool for hypertension control.

Because large-scale hypertension management programs may see hundreds of patients daily, primary care facility staff can spend hours each day retrieving, recording and reporting patient data. Cumbersome data entry onto paper or into digital systems that collect unnecessary information can lead to inaccurate, incomplete and unreliable data, diminishing the value of collecting the data in the first place. Relying on paper also makes it difficult for health care workers to track patients through their treatment journey. A well-designed digital tool, on the other hand, can dramatically improve tracking of key metrics and the ability to spot trends that could improve patient care.


Data entry in a paper-based system can be time-consuming and cumbersome.

Adopting a digital tool into your hypertension management program can:

✓ Increase program efficiency;

✓ save health care workers time;

✓ increase a program and a facility's ability to manage large numbers of patients;

✓ retain a higher proportion of patients in care;

✓ reduce health care worker training time; and

✓ improve program quality.

Although digital technology is promising, not all tools are created equal. Many tools are designed for the wrong audience or to accomplish the wrong task, creating frustration or additional inefficiencies for health care workers and program managers. This playbook is a guide to help you build the best possible tool for your hypertension management program. While this playbook focuses on a hypertension management program, a well-designed digital tool can enable efficiencies listed above for any program that involves ongoing care for chronic conditions.

A well-designed digital tool can enable efficiencies for any program that involves ongoing care for chronic conditions.


CONDITION
Hypertension ✓
Diabetes
CoPD
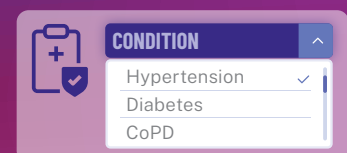
CASE STUDY: SIMPLE

🩸 **Simple**
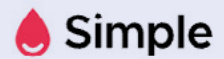
A free, fast, open-source electronic health record that makes it faster and easier for providers to track patients' blood pressure and medications

The evidence and recommendations in this playbook are based primarily on experiences developing and implementing the Simple app, a user-friendly mobile application for hypertension and diabetes management that Resolve to Save Lives developed alongside health care workers and with the support of partners implementing HEARTS programs.

Launched October 2018 as part of the India Hypertension Control Initiative, Simple has since expanded to Bangladesh, Ethiopia and Sri Lanka. As of January 2024, the app has been used in 5,357 public health facilities to manage 4,452,610 patients with hypertension and diabetes.
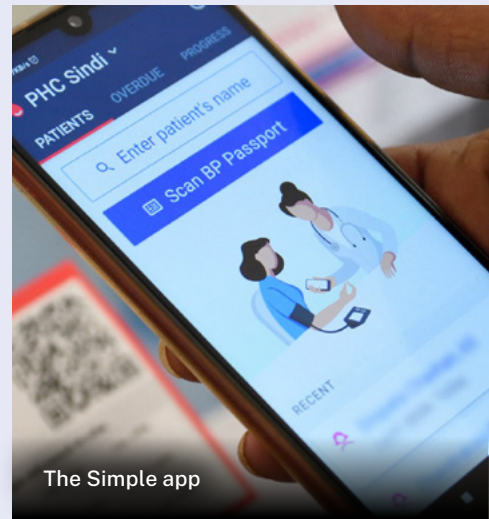
The Simple app

Using the Simple Android app, health care workers easily manage blood pressure and blood sugar measures, record medications and schedule follow-up visits. A web-based Simple dashboard gives health system managers the feedback they need to improve hypertension management across facilities. Patients can install a smartphone app to chart their own progress and receive reminders to take their medications.
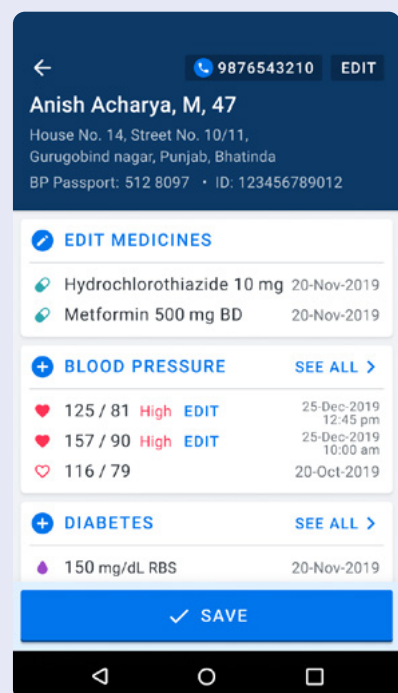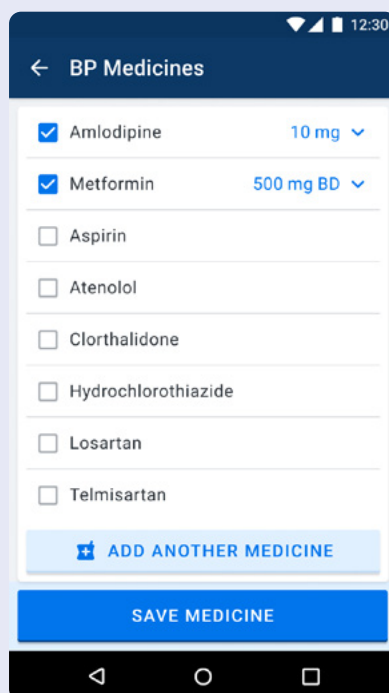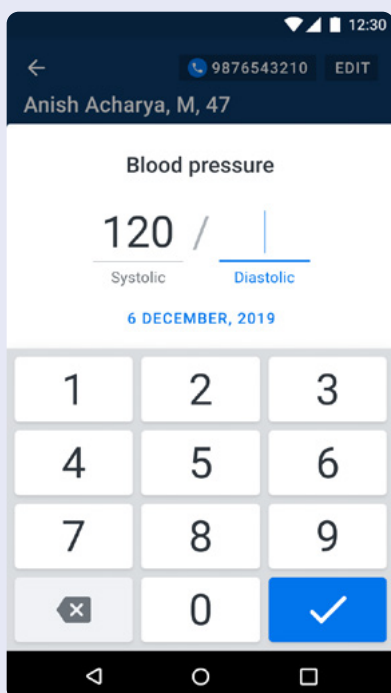
Simple makes routine data entry fast and frees health care workers and managers to focus on improving patient care.

In many countries, a typical follow-up visit for hypertension lasts only 2-4 minutes. Every precious second that a health care worker spends doing data entry takes away from clinical care.

- Based on metadata from more than 1 million patient visits per month, health care workers using Simple took only 13 seconds to record follow-up information and only slightly over a minute to register a new patient.

- A recent study found that nurses who used Simple instead of a paper system saved 24 minutes every day.[1]

- With Simple, Managers can create program reports with two or three clicks or taps, a process that can take several hours with paper records.

In working with many health systems, the Simple team tried many things and tested many options. Simple succeeds where most digital systems do not because it is designed for real-world conditions in busy health facilities, with frequent input from health care workers along the way.

USER EXPERIENCE FEEDBACK

Community health worker with over a year of experience using Simple

"What works best is its ease of use. I was able to learn and familiarize myself with the entire interface in less than two hours. Now I have a full overview of all my patients in the palm of my hand—I know which patients are returning for follow-up, whether they need a reminder or have missed a visit, whether they need a medicine refill.

The dashboard also alerts us to impending medicine stock outs. Based on our experience, we are also encouraged to give user feedback which is incorporated to further improve user friendliness of the interface."

Observing health care workers using the Simple app

Who this playbook is for

This playbook was created for anyone who is involved in designing, monitoring or implementing a hypertension management program. The general principles and guidelines can be generalized for any longitudinal primary health care program.

Government officials and health program implementers/administrators responsible for primary health care programs: The playbook is a guide to building an effective tool for a hypertension hypertension — or any other longitudinal primary care — program.

Experts that design and build digital tools to support primary health care services: The playbook describes methodologies, constructs and benchmarks to follow while building a digital tool.
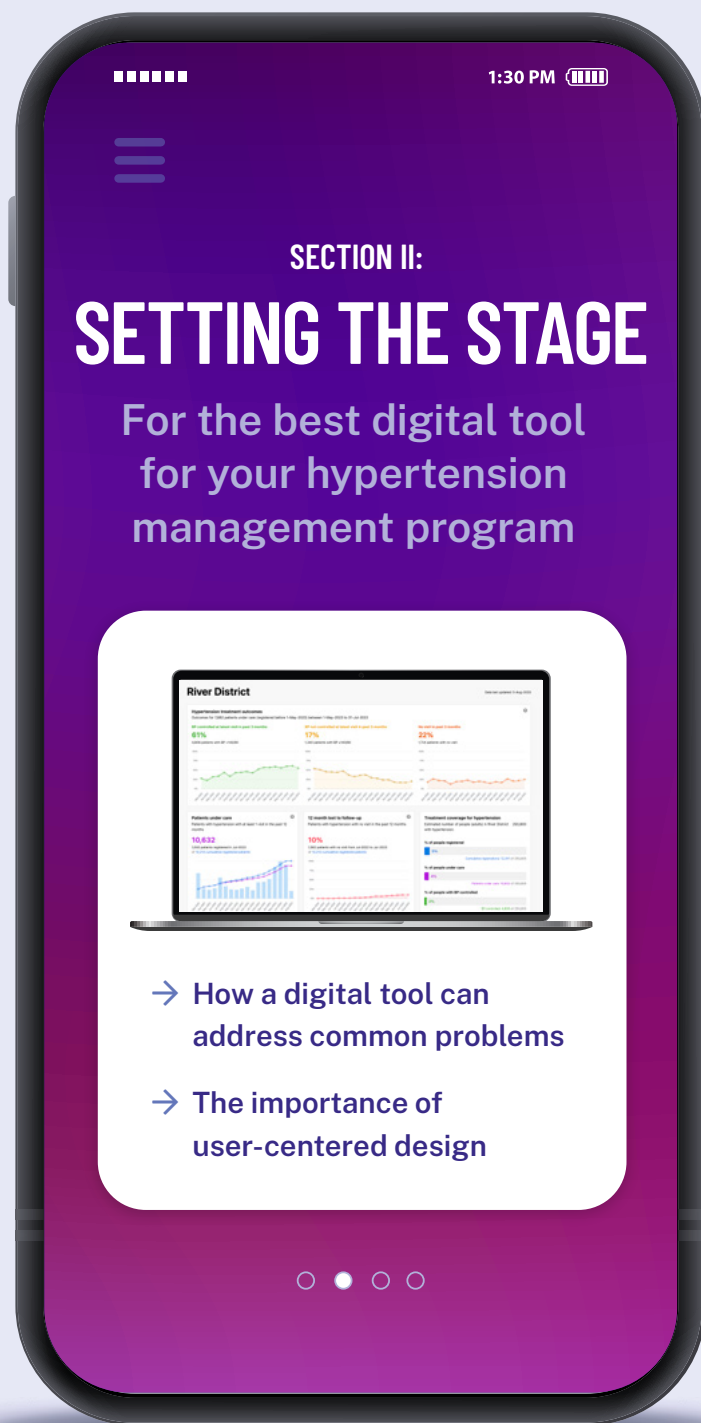
Partners and donors working in primary health care: The playbook provides a guide to effective digital interventions to support and implement. We strongly recommend adopting user-centered design principles for all digital tools being deployed in health facilities.

If your digital health tool is built on DHIS2, OpenMRS or similar platforms, or if you are thinking of building a tool on these platforms, the playbook provides guidelines on efficiently configuring your tool for a hypertension program.

How to use the playbook

This playbook consists of two main sections and four appendices; different sections will be useful for different audiences.

	Section 1	Section 2	Appendix 1	Appendix 2	Appendix 3	Appendix 4
Topics	Common problems that a digital tool can help solve; methodology for building an effective tool	Detailed rec-ommendations on key features for a functional hypertension tool	Description of the requisite environment for rolling out any digital tool	Steps for different stakeholders to build and roll out a digital tool for a hypertension management program	Indicative performance indicators that can map existing digital tools and serve as benchmarks	Key data points and indicators to help build a digital tool
Recommended for	All readers, but especially program implementors and policy makers	All readers involved in hypertension care, including design experts	Government officials and partners and donors	All readers	All readers	Experts that design and build tools

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SECTION II:

SETTING THE STAGE

For the best digital tool for your hypertension management program

→ How a digital tool can address common problems

→ The importance of user-centered design

HOW A DIGITAL INFORMATION SYSTEM CAN ADDRESS COMMON PROBLEMS

An effective digital tool can improve patient outcomes while solving problems that result from paper-based record keeping. Benefits you can expect to see upon integrating a digital tool into your hypertension management program include:

## Accurately measuring what matters—outcomes

The most important metric for measuring the success of hypertension care is the number of patients with their blood pressure under control.

Having this data at their fingertips allows health care workers and administrators to understand the outcomes of the care they provide. However, in a paper-based system, calculating blood pressure control rates can be cumbersome and compiling data across patient health records often requires manual counting and computation. The added effort can lead to errors, particularly as the program scales and more patients join.

With a digital tool, outcome tracking can be automated, populating an easy-to-understand dashboard that decision-makers can use to monitor the blood pressure (BP) control percentage regularly. This allows officials and health care workers to see the impact of their work and make course corrections more quickly when needed. (With paper-based systems—and especially those that only collect process metrics—health care workers seldom have the chance to view their impact.)

To accurately measure blood pressure control rate, a program needs to measure and record BPs at every follow-up visit for every hypertensive patient. A digital tool is the only effective way of keeping a track of all BPs measured for a large population, longitudinally.
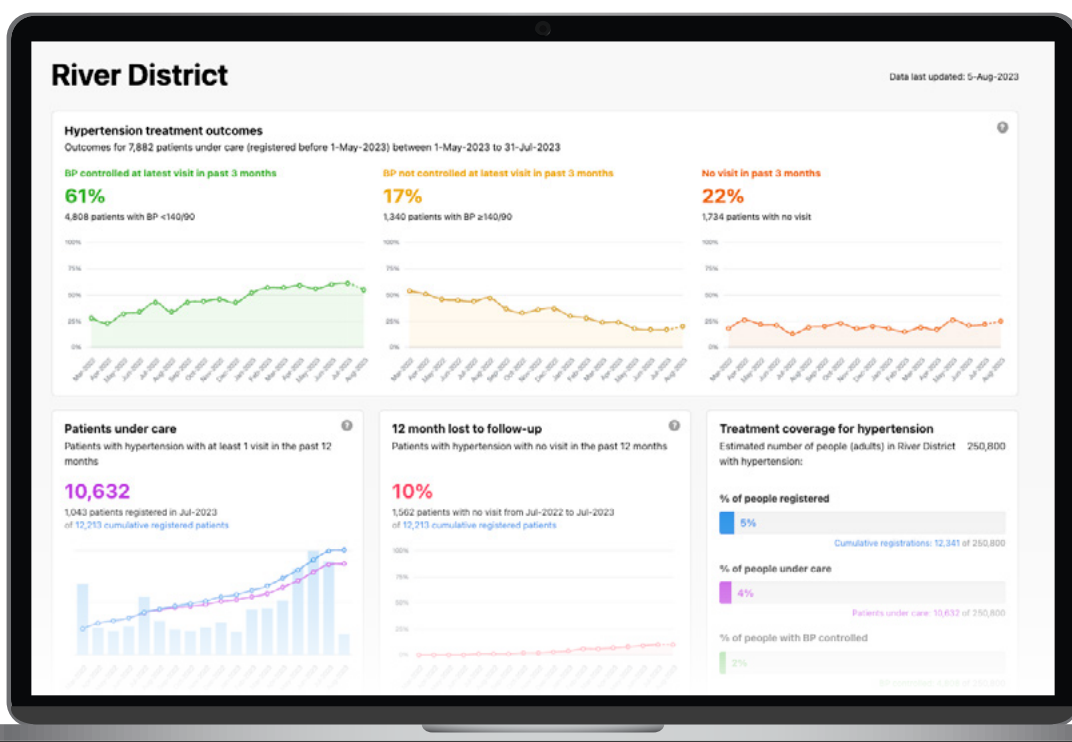
Hypertension program dashboard example

Reducing staff time spent on data entry and other tasks

In many hypertension care programs, health care workers are overworked and overwhelmed due to the sheer volume of patients, every second of data entry takes away from clinical care.

Adding to burden is the amount of data that health care workers are often asked to collect for each patient. Collecting more data does not necessarily mean that health care workers or administrators have a better understanding of how their program is working; many times, this data is never used, or is not actionable.

Health workers have limited time with each patient—less than three minutes—and every second is precious.

By limiting the amount of data collected, and making the rest easy to input in a user-friendly interface, a well-designed digital tool can drastically reduce the amount of time that health care workers spend on data entry.

With the right digital tool, it can take one minute to enroll a new patient and less than 20 seconds to record each follow up visit. This increased efficiency makes it more likely that health care workers will record BPs at every follow up visit (making it possible to accurately measure the blood pressure control rate and other key indicators.)

3 min
average patient visit

20 sec
data entry

With the right digital tool, it can take one minute to enroll a new patient and less than 20 seconds to record each follow up visit.

Patients waiting at the "NCD Corner" at an Upazila Health Complex in Bangladesh, where health care workers might record data for 250 patients in a single day.

Improving patient retention

Keeping patients coming back for regular care poses a major challenge for hypertension control programs. In some countries, 30-60% of patients miss their scheduled visits each month. Paper systems make it more difficult to identify patients who have dropped off and to remind patients about upcoming visits.

A well-designed digital tool can support patient retention by facilitating the process of following up with patients who have missed appointments.

A digital tool can automatically create easy-to-use line lists of overdue patients, send SMS reminders to all patients before their scheduled visit and provide an easy mechanism for health workers to contact patients. (Other strategies for retaining patients in care — such as providing care close to the patient's home or using 3- and 6-month medication refills for stable patients — are beyond the scope of this playbook.)

In some countries, 30-60% of patients miss their scheduled visits each month.

Reducing time needed for training

NCD clinics and primary health care facilities often suffer from high staff turnover — especially among the junior staff often tasked with taking blood pressures and recording hypertension data. Staffing shortages can also mean that health care workers are reassigned frequently.

A well-designed digital tool can require less time for training than a paper-based system and can make it easier to accurately record a patient visit for new staff members, or those who need to step in but are less familiar with the recording system. Easy-to-train tools also make it possible for a health care workers to train others (e.g., a departing or reassigned health care worker may train his or her replacement), eliminating the need for time-consuming and expensive offsite/in-person trainings.

>2 hours

The time needed to train new staff on a digital tool can be less than two hours.

# Improving quality continuously with accurate and timely data

Using paper-based systems also makes it difficult to analyze and visually display data. Programs that use paper-based systems rely on tedious manual aggregation and calculation — weekly or monthly — to track key indicators. This process often involves combing through multiple registers and is prone to errors.

A well-designed digital tool reduces data collection errors and provides near-real time updates.

This accurate, frequently refreshed data feeds an automated dashboard that displays trends in the most important indicators in a clear, easy to understand format for program administrators.

The dashboard's data visualizations can surface problems with program implementation quickly. When administrators take actions to address a problem, changes can be reflected in the data in just days or weeks, quick feedback that allows for agile troubleshooting. These feedback loops can only be effective — and sustained — if the data system is kept as simple as possible.

Feedback loops driving program improvement
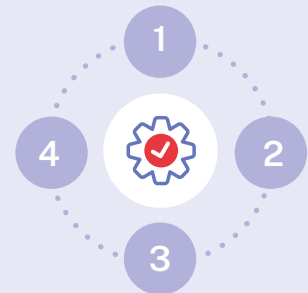
1. **Accurate program data**
2. **Simple dashboard updated in real time**
3. **Identify issues and implement quality improvement measures**
4. **Changes reflected in program data**

THE IMPORTANCE OF USER-CENTERED DESIGN

Putting needs of the primary user — in this case, the frontline health care worker — first in the design process is what separates widely adopted tools that succeed in optimizing hypertension programs from those that are inefficient or ineffective.

In a hypertension management program, there are two types of users:

Health care workers are the primary user. They take BP or blood glucose readings, records medication prescribed by the doctor, and ensure that the patient returns for follow-up visits. As they complete these tasks, they are also responsible for consistently and accurately entering data into the tool. For the tool to be successful, these health care workers must make using it part of their workflow — all day, every day. If health care workers don't want to use the tool or are unable to quickly enter visits while seeing patients in real-time, it won't work.

Health administrators and policy makers who use the tool's dashboards to monitor progress and identify ways to improve the program are important, but secondary, users. Dashboards can only support decision making if the data that populates them is entered accurately by health care workers. Designing for the health care worker allows administrators and policymakers to get the information they need.

A tool designed with the primary user at the center will not only improve data quality, but also reduce time spent on data entry, improving health care workers' efficiency and job satisfaction.

> Designing for the health care worker allows administrators and policymakers to get the information they need.

Nurses and other non-physician health care workers are the primary users of a digital tool.

How to center your primary user in tool design

Designing your tool with user-centered design principles means involving health care workers directly at every stage in development and implementation: asking them what they want, observing them using your tool in the clinic, and optimizing the software for them. Here's how:

1   Design for the user, not the stakeholder

You might think, "I respect health care workers, so of course my software is user-centered!"

Consider how you've typically seen health care workers use digital tools with patients:

- In a hospital, a patient sits across the table from a health care worker. The patient needs quality care and empathy, but the health care worker spends half of a four-minute visit looking at a screen and asking a series of formulaic questions about the patient's history of smoking, home living conditions and family history of heart disease — all questions deemed "important" for the hypertension management program by cardiologists in the Federal Ministry of Health.

- ✕ This is the result of "stakeholder driven design": the tool prioritizes a group of stakeholders' desire for data over the convenience and feasibility of using the tool given the time constraints of typical encounters in a clinic.

It's important to involve nurses and community health workers in decision-making meetings with other stakeholders. That way, everyone is thinking about the consequences of their choices on the end users of the software.

2   Observe real-world clinical care

The best way to do user-centered design is to regularly observe health care workers in their work environment.

- Watch the way they work, pay attention to their challenges and watch how patients navigate the hospital or clinic.

- Pay special attention to the other tasks that users are doing simultaneously — health care workers are rarely *only* using a digital tool. Juggling data entry and other tasks is difficult. Are there opportunities to reduce the workload of health care workers by helping them work more efficiently?

A software engineer observes clinic staff at work.

Read more about being a good observer.

Learn More >

③ Talk to users

It seems obvious, but talking directly to your users is valuable! We don't mean talking to stakeholders who know your health care workers and their patients. We mean talking to the health care workers themselves — the peopl who will use your software all day, every day.

- Ask health care workers open-ended questions like "Why do you record data that way?" or "What's hardest about your job?" and listen to their answers.

- Ask them what they like and what needs to be improved.

- Ask how they would change the tool to benefit them.

- You can also do co-creation exercises to design a feature with users.

User testing mockups

Read more about how co-creation works

Learn More >
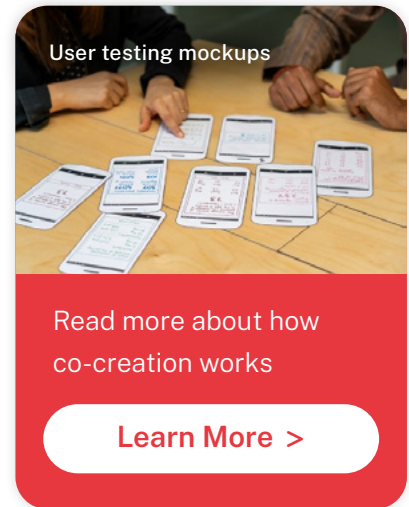
LESSONS FROM SIMPLE 💧

Focus on user research

In developing the Simple app, we've talked directly to users at least once per month, testing our prototypes and software with hundreds of health care workers. Even if you can't conduct that level of research, every conversation will help you build a better tool.

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④ User test your software

User testing is one of the most common — and important — user-centered design strategies. Watch people using your software and have them talk out loud. Watch for opportunities to make your software easier and faster to use, then watch as people try to use your enhancements.

The Simple app in use
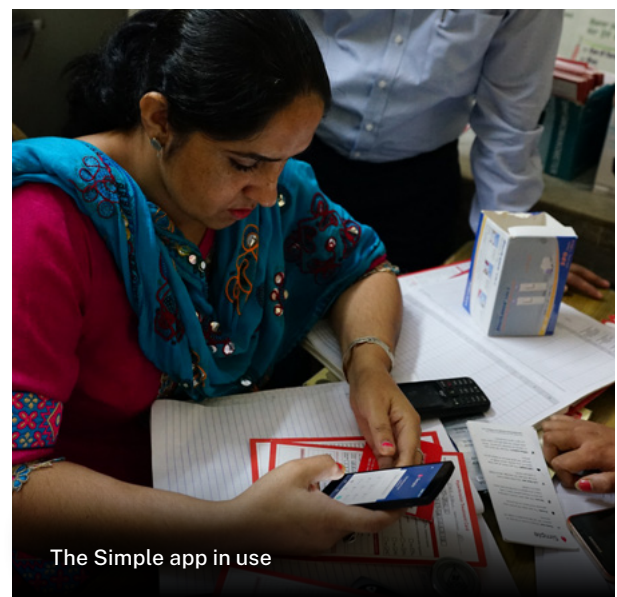
Getting the most out of user testing

Test early with prototypes.

Prototypes are preliminary versions or models of products that can be created easily to validate and test functionality and user experience. It's more valuable to test prototypes of new ideas with users than to wait until you're 'finished' to validate your software. New ideas can be tested easily in the field with high-fidelity prototypes (made in tools like Figma, Protopie, Invision, etc).

Choose your users carefully.

Ideally, pick a consistent set of users to test with, and look for patterns of feedback. It's helpful to see a single user have an issue, but what's really valuable is to test with five people and observe four of them having the same issue. If your users all share key attributes (e.g., they're all nurses who've worked in NCD clinics for more than two years and are all familiar with Android) the patterns will be more reliable.

Observe users.

Spend at least an hour watching each user with your tool, including their interactions with patients. A user might search for a "Register patient" button for three minutes and then say out loud, "Oh, that was obvious! The button was there all along but I just didn't see it." A comment like this suggests that the button was not obvious enough.

Try not to ask too many guided questions such as "Did you like the new feature?" What matters is not if they "liked" the feature, but if it was easy to use and solved a pain point.

Iterate after testing.

Don't fall into the trap of confusing user testing with a validation of your ideas — the goal is to learn how to improve your tool. Be ready to make significant changes to your software or throw away an idea if user feedback is negative.

Conduct quantitative analyses.

Mixing quantitative and qualitative data is powerful. When the tool is being used at scale, it is helpful to track metrics including:

- How long does it take a median user to register a patient?

- How many follow-up visits are recorded monthly?

- How many users login monthly (monthly active users)?

It's worth the investment to instrument your software with data collection tools such as Mixpanel, Datadog, or Google Analytics to automate answers to these types of questions.

Resources for user testing your software

These guides give you practical ideas that you can use right away:

→ Michael Margolis from Google Ventures shows you how to do "Quick & dirty user research" in this excellent short video tutorial.

→ UNICEF guide to Human Centered Design 4 Health. Pay particular attention to the "Prototype & Feedback", "Rapid Inquiry" and "Synthesis" sections.

→ A Cheatsheet for User Interview and Follow Ups Questions by Stéphanie Walter is a very practical guide to asking open-ended questions.

→ Just Enough Research by Erika Hall is a thin, easy-to-read practical guide on user research.

→ Validating Product Ideas Through Lean User Research by Tomer Sharon.

Storyboard review

SECTION III:

KEY FEATURES

of an Effective Digital Tool

Feature 1

Capture the right data points

Feature 2

Very fast and easy to use

Feature 3

Focus on patient management

Feature 4

Simple dashboards that show the right indicators

Through our work building and implementing digital tools for hypertension programs, we've identified four features shared by the best tools.

The features and recommendations we make about them have been informed by years of learning from users — watching them work, talking and listening to them, and understanding their needs and roles in the larger system. In this section, we'll share why you should prioritize each feature, how it relates to a user-centered design approach, and how to avoid common pitfalls based on the mistakes we've made along the way.

FEATURE 1: CAPTURE THE RIGHT DATA POINTS

Why this matters

- A good data collection application is one that's actually used during clinical care at the time of the patient visit.

- This reduces data entry workload (vs. recording on paper and later inputting into the electronic system) and decreases the likelihood that data will be inaccurate, incomplete or lost.

- For health care workers to use a data collection application during clinical care, data entry needs to be very efficient!

- Every time a user needs to type and enter data, the clock is ticking. A good data entry system should require less than 15% of a patient's visit time — that's less than 20 seconds for a typical three-minute patient follow-up visit.

- Capturing only the data that needs to be tracked — the bare minimum of data to drive key indicators — keeps data entry quick and easy, making health care workers more likely to use the tool consistently.

For health care workers to use a data collection application during clinical care, data entry needs to be very efficient!

Putting principles into practice

Once enrolled in a hypertension management program, the average patient's journey is straightforward — they are prescribed medication for a set number of days and are instructed to return to the facility to have their blood pressure checked and medication titrated at the end of the period. This cycle continues for the rest of the patient's life.

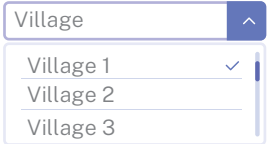**Data capture can be broadly divided into two instances:**

1 initial enrollment and

2 follow-up visits.*

*(*Note: data points under follow-up visit may also be collected immediately after initial enrollment, if the patient's blood pressure is being recorded and medication is given.)*

✅ Data to gather during initial enrollment

Data point	How to collect	Other notes
Patient name	Can be either "Full name" or separate "First name" "Last name." Full Name First Name Last Name	There are good reasons to use a single field but many systems (e.g., DHIS2) perform searches more accurately if first names and last names are separated.
Sex	Use radio buttons instead of dropdowns, if possible; they're faster to select. ⦿ Male ◯ Female	
Date of birth (DOB) or age	Many patients don't know their DOB, so allowing for "Age" is important. Age For entering DOB, don't use the calendar function on a mobile device or desktop UI. It is much more cumbersome for users to navigate a calendar than to type a numerical date like 17 12 1978. DD/MM/YYY	When users enter "Age", you'll likely store the data as today, X years ago. Ideally, include a flag in your data that DOB is estimated so you don't accidentally display DOB as 2-Jun-1973 in the user interface (obviously not the patient's real birthday).
Mobile phone		Primarily used for community follow-up and SMS reminders for overdue patients. Also used for patient search and to identify the correct patient. It's tempting to require this, but many patients either don't remember their number, don't have one, or change numbers frequently. This will slow health care workers down, or they'll enter filler like 000 000 0000 or transpose numbers.

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Data point	How to collect	Other notes
Home address	Consider normalizing villages as a dropdown or type-to-complete so it's possible to create village-specific follow-up lists for community health workers. Village ▾ Village 1 ✓ Village 2 Village 3 Consider pre-filling the district and state/province with the same region as the health facility. Many patients live nearby and it will save users time to record patients if this is pre-filled but editable.	Primarily used to identify the correct patient. Also often used for home follow-up for community health care workers.
Patient ID		If patients regularly carry a consistent ID (national ID card, insurance number, drivers license, etc.,) consider collecting it from day one, if you can legally and ethically do so. Primarily used for very quick, high- confidence patient search. Necessary for any future interoperability with other digital systems. See "Patient IDs" and "Cheap, scannable ID cards".
Basic cardiovascular disease history		A doctor needs to ask a patient about their history to diagnose and treat effectively—but your data system doesn't need to be burdened with the answer to every question.
History of heart attack?	Yes/No ○ Yes ● No	We originally asked if a patient had a heart attack "in the last three years," but health care workers were often unsure what to enter, so we simplified it.
History of stroke?	Yes/No ○ Yes ● No	Patients who have had a heart attack or stroke in the past may be prescribed different medications, and are also at higher risk, making them higher priority for follow-up.
History of kidney disease?	Yes/No ○ Yes ● No	May affect choice of medications and frequency of blood tests.
Diagnosed with diabetes?	Yes/No ○ Yes ● No	Increases risk and may affect medications given and target blood pressure.
Consent	Yes/No ○ Yes ● No Ask the health care worker if they have gained appropriate consent from the patient to record their data into the hypertension management program.	

✅ Data to gather during follow-up visits

Data point	How to collect	Other notes
Blood pressure measure	(Optional, enter only if taken)* Systolic and diastolic BP	Use common language for health care workers (e.g., you don't need to say "mmHg" in the text labels since all BPs are measured that way). Systems that upload information from the blood pressure device wirelessly and screen-capture programs that convert a photograph of the blood pressure device into numerical entry require more bandwidth, are slower and often have glitches.
Blood sugar measure	(Optional, enter only if taken)* Collect the type (RBS, PPBS, FBS, HbA1c) and then the measure.	You may need to allow for measures as mg/dL and mmoL if facilities have different glucometers.
Current anti-hypertensive, diabetes, and cardiovascular medications	Create a pick list of common drugs and their most common dosages.	Medications can get complicated if you try to re-create a digital prescription system. For instance, you'll need to collect drug, dosage, frequency, time of day, etc. There are also enormous variations of drug names and possible options. Simple has a pick list of about 8-12 common medications with common dosages also preset in the pick list. Note: Instead of replacing the paper prescription, this is simply a record of drugs handed or prescribed to the patient.
Date of encounter	Default to "today" and allow the user to choose a different date if appropriate.	Changing dates is very useful for backdating data for patients with paper records or if patient recording is not always done during the patient's visit.
Date of next visit	Default to "28 days" if patients are expected to return in one month, which is common in hypertension protocols.	With this information, you can send reminders to patients, call patients who missed visits, and determine whether patients who are returning in two or three months are current-to-care.

*It is important to not assume that every patient will get a BP measure and a blood sugar measure at every visit. Facilities often run out of glucometer strips or the BP monitor is non-functional. If you require that users enter measures, they may enter dummy data, muddying your results.

Pitfalls to avoid

It is common to want to replicate older systems (whether paper-based or older digital systems), but to build a digital system that works, focus on eliminating nonessential data that makes the digital application slower and more cumbersome to use.

⚠️ Asking for too much data

Every time a user needs to type and enter data, the clock is ticking. The best way to make an application fast is to ask for less. If more than a few fields are required, you're asking for too much. Keep in mind that if users don't have the data, they will enter "garbage data" in required fields — and they'll be slower.

Data points to omit

✕ **Treatment supporter:** In some places, a relative or friend helps patients make their appointments. Although adding "Name" and "Mobile number" for a treatment supporter can offer an alternate contact for encouraging the patient to return to care, it requires at least five seconds of data entry for every new patient; consider whether it is worth the investment. For programs we work with in India, Bangladesh, Sri Lanka, and Ethiopia, it was not.

✕ **Previously on treatment for hypertension or diabetes?** If this is required in your program, consider asking, "Was the patient previously diagnosed with hypertension?" during registration.

✕ **Tobacco, alcohol, and other risk factors:** Many health programs require recording risk factors, but collecting this data and using it to segment patients by risk profile is very time-consuming and adds complexity for health care workers. We think it's more efficient to simply treat every patient with hypertension, no matter their risk profile. We do not collect any risk factor data other than basic cardiovascular disease history (see above).

✕ **BMI:** BMI has limited benefit for treating hypertension and requires health care workers to take and record height and weight at every patient visit. Not only is this time-consuming, in practice, many facilities don't have scales or working measurement devices.

✕ **Lab tests:** In certain situations, lab tests are very important for patient safety and prescribing correctly (e.g. serum creatinine to check kidney function when patients start certain medications). But most lab tests don't need to be recorded in your digital system. A lab result isn't critical for the patient's longitudinal record; it's primarily used for making clinical decisions immediately after it's done. Lab reports generally work well on paper, and digitizing them is harder than it may seem. Some lab systems have their own digital records which can be accessed if needed.

⚠️ Including risk monitoring in your digital tool before building an efficient hypertension management program

Some hypertension management programs monitor risk factors, which requires time-consuming measurements and data entry. But oftentimes, even if these extra measurements are taken, risk-based assessment is not consistently performed. For a new hypertension management program focused on treatment, risk doesn't particularly matter in practice; all patients with high BP need to lower their BP. Not having to measure and enter risk factors can make the tool less complex and lessen the overall work for health care workers. Adding data fields for risk in the digital tool early on in a program's roll out can lead to a cumbersome tool with incomplete data entry and inaccurate data on key indicators; it may also impede adoption of the digital tool.

- ✓ We recommend considering a risk-based assessment only when the hypertension management program is running efficiently.

- ✓ Then, it's key that the risk-based assessment be consistently performed in facilities and that adding it to the tool does not slow the digital tool and interfere with the user's ability to enter data in real time.

⚠️ Including screening as a part of regular patient flow

Adding individual level screening data with diagnosis is tempting, but the linkage is not very helpful. Collecting and using the screening data at a population level is resource-intensive, even digitally. Adding individual screening data is a common way to accidentally contaminate your data with undiagnosed individuals or people who appear to have blood pressure controlled but don't actually have hypertension, and it's a huge burden on health care workers, who must record an enormous number of people in their community who don't have hypertension.

- ✓ Before including screening in the digital tool, we recommend achieving a high level of hypertension control by focusing on follow-up care for diagnosed patients.

- ✓ Then, we recommend recording the number of individuals screened in the aggregate, but not breaking that number down by demographic factors. You don't need to record the personal information of every screened individual, only those who are being treated for hypertension.

LESSONS FROM SIMPLE 💧

Group visit data into an "encounter"

Not doing so initially was a technical mistake that cost us many engineering hours.

There are many ways to store patient data in a database. When a user recorded a patient's blood pressure, blood sugar and medications, and created a future appointment, we added those data to several different tables: Blood pressures, Medications, Appointments, etc. This became a processing nightmare when we wanted to look across patient visits for patterns because we had to piece together each 'visit' across multiple tables.

Modern standards like Fast Healthcare Interoperability Resources (FHIR) create a single "encounter" for each day that a patient visits a facility. So all BP readings, blood glucose readings, medications, appointments, etc. from a single day are stored as a group. Many countries already use tools developed on DHIS2 platform to record programmatic data. If you are developing a hypertension management tool on DHIS2, you likely want to store all data from a single day as a single "Event" (what DHIS2 calls an encounter). Using this model will prevent headaches down the road.

LESSONS FROM SIMPLE 💧

Don't import legacy data

In many places, hypertension management programs start with paper records before transitioning to digital systems. We were tempted to import legacy patient data when implementing Simple; it felt respectful to health care workers who had invested many hours in paper data entry and to their patients whose records would be retained.

We have done imports in several locations and learned some hard lessons. There are a few big challenges to importing legacy data:

- **It's a lot of work.** Arranging data entry operators (and having them sign NDAs) is a lot of work. If there are more than 5,000 patient records, this is a momentous task.

- **Timing is important.** Ideally, there is only a small time gap between importing data and starting to use the digital system. If significant time has elapsed between the data entry operator collecting data and when the digital system is implemented, you will end up with big gaps in patient data. It's difficult to manage this process.

- **Data imports are messy**. Importing patient data into your database is challenging and will require a very large amount of data cleaning work from your engineering team. Cleaning the data so dates and patients' names are entered correctly is difficult, and there are always errors.

✓ We recommend that you do not import data. Instead, for the first few months after the program launches, have your users register patients into the digital system and enter a single back-dated 'encounter' (e.g., a blood pressure reading) from the oldest record on their paper record. This will give you almost the same benefit of importing data, with less work, and you'll have a clean start to your program.

Paper health records with legacy data

FEATURE 2: VERY FAST AND EASY TO USE

Why this matters

- Speed is king — health care workers have little time to spare. If the tool is fast and user-friendly, health care workers will use it. If it's slow, health care workers will be frustrated and the time you spent designing and implementing it may be wasted.

- Research on use of digital health applications indicates that applications "must be advantageous over alternative tools, relatively easy to navigate, and aligned with users' needs, skills, and resources." Making your digital tool both speedy and simple to use is one way to ensure that.

- Offline functionality and quick patient search can mean the difference between a beloved tool and one that's quickly abandoned.

- Optimized patient search can also make tracking and contacting overdue patients a lighter lift for health care workers.

> If the tool is fast and user-friendly, health care workers will use it.

Putting the principles into practice

✅ Make sure the tool works offline

The biggest benefit to offline-first is speed.

Every screen that takes more than 0.2 seconds to load causes lag. Offline-first apps don't need to ping the internet at each request, so performance is much faster. Even when the internet is available, we recommend an offline-first strategy, where health care workers use the app offline and data synchronizes later.

Offline-first digital tools also require fewer resources (e.g., electricity, internet), ensuring that they work as well in remote areas as in urban centers.
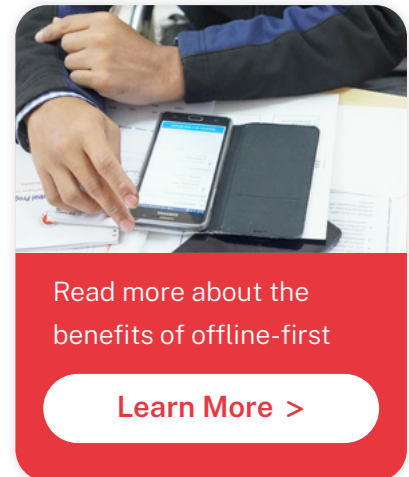
Read more about the benefits of offline-first

Learn More >

✅ Make patient search faster

Identifying the correct patient is the first thing the health care worker will use the tool for in every instance. Finding the correct patient quickly and accurately is one of your biggest challenges. There is no single way to create a perfect search and we recommend incorporating several strategies at the same time:

Patient IDs (QR codes)

A scannable ID makes patient look-up much faster. All modern smartphones and many tablets have cameras that can scan QR codes and, in our experience, they are worth the investment considering the large time-savings and the reliability of finding the correct patient.

- If your region does not yet have a standard National Health ID, consider a cost-effective interim solution like a scannable QR code ID for each patient. There are several approaches to take, but we think the cheapest and most robust is to centrally print large quantities of IDs with random, unique ID numbers.

- If you use large ID numbers (Simple uses UUIDs which are 32 alphanumeric characters), an algorithm can create a short version of the ID that can be hand-entered by a health care worker when the scanning function of their scanning device isn't working. For example, Simple's IDs have an easy-to-read 7-digit hash of the UUID.

- Even if there is a national health ID, unless the patient is either carrying their ID card or someone at the health facility knows them personally, there needs to be some way to know which ID goes with which patient.

- Having a document or card that the patient carries with a QR code is the fastest mechanism we've seen for linking a patient with their UUID or National Health ID.
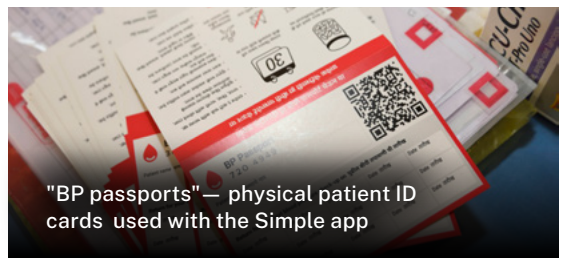
"BP passports" — physical patient ID cards used with the Simple app
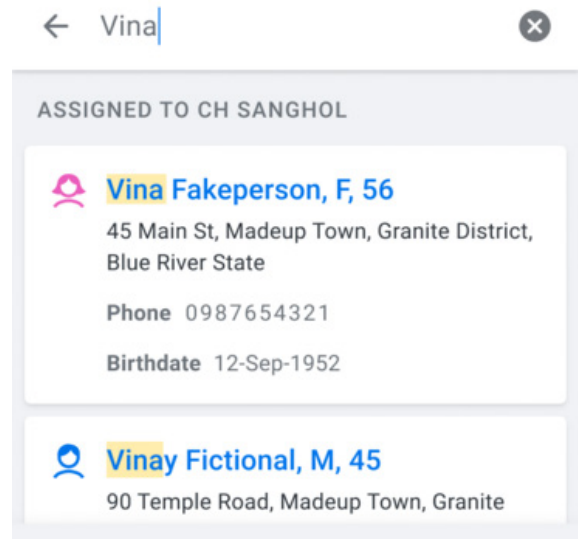
No matter what, you need multiple ways to look up the right patient; patients will frequently forget their ID cards at home.

Single multi-use search field

With the best apps (e.g., Spotify, Chrome), the user enters a search term and the app searches across multiple data sources. Ideally, let users search by PATIENT NAME, MOBILE PHONE, PATIENT ID, and VILLAGE NAME, all with a single search input.

- **Fuzzy search:** Names are spelled differently by different people. For instance, "Dhruv" might also be spelled "Dhuruv." A fuzzy-logic search is necessary to capture such patients, but needs to comply with all relevant confidentiality requirements.

← Vina

ASSIGNED TO CH SANGHOL

Vina Fakeperson, F, 56
45 Main St, Madeup Town, Granite District, Blue River State
Phone 0987654321
Birthdate 12-Sep-1952

Vinay Fictional, M, 45
90 Temple Road, Madeup Town, Granite

Example search results from the Simple app

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LESSONS FROM SIMPLE 💧

Use cheap, scannable ID cards

When we were developing Simple, we printed hundreds of thousands of patient cards with QR codes that represent UUIDs (very large random numbers) that we called BP Passports. We found this was the best way to make the app fast for follow-up visits. When we switched from using name and phone number to a QR code, we sped patient searches by as much as 20 seconds per encounter.

→ Health care workers handed each patient a fresh card at registration and associated it with the patient's profile in the software by scanning the card. When the patient returned for a follow-up visit, the user scanned the card again and was immediately able to find the patient's profile.

→ When a patient lost their card, which inevitably happens, the health care worker gave them a replacement card. Each patient could have many QR codes but only one UUID. The cards did not have any private patient data embedded in the QR code, so they were relatively safe if lost. This solution turned out to be cheap, robust and highly functional.

Patients liked having a card with their information and a "passport" to their care. We also printed QR stickers to be used on other patient-carried records.
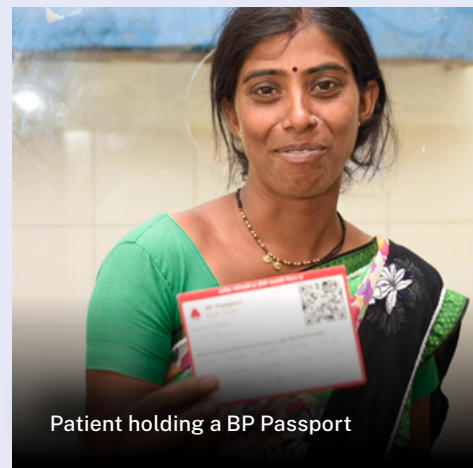
Patient holding a BP Passport

Pitfalls to avoid

⚠️ Restrictive access control

It's very common for software to limit what actions different types of users can take. For instance, only users identified as "Doctors" can change the diagnosis for a patient. This seems like a good idea, but in practice, doctors are often too busy to use the software, resulting in big gaps in your data.

We recommend letting your primary users — health care workers — do most actions, including updating diagnoses and recording prescriptions.

This will save time (for both health care workers and doctors), and allow them to capture more complete, accurate data. Think of your data entry tool as a simple record of the patient's visit. "Diagnosis" is a record of what the doctor said; "Medications" are a record of what pills the patient was sent home with (often not a literal prescription), etc. When a health care worker or volunteer does the data entry, they're simply recording what's written on the outpatient slip or what the doctor is telling them to.

Health care worker inputting data

FEATURE 3: FOCUS ON PATIENT MANAGEMENT

Why this matters

- A digital tool that makes patient management easier for health care workers can improve the quality of care provided and result in more patients returning to care — an important challenge for programs that manage chronic conditions such as hypertension.

- Unlike paper-based systems, which are fixed at a facility, a digital tool can allow a patient to move between facilities while maintaining a single, complete longitudinal record.

- Automating tasks that are slow and labor-intensive using paper-based systems, such as appointment reminders and reports of overdue patients, supports consistent outreach to patients.

- Issues including privacy and interoperability remain important; some trade-offs may be necessary to optimize patient management.

A digital tool that makes patient management easier for health care workers can improve the quality of care provided and result in more patients returning to care.

Putting the principles into practice

✅ Patient look-up across clinics

A patient might suffer from a critical illness and visit a tertiary hospital, where they incidentally receive a hypertension diagnosis, then visit their local village primary hospital for follow-ups, and later move across town and visit a new hospital. A typical paper register system is confined to a single hospital, usually the registering facility; if a patient seeks care anywhere else, they start over with a new record. Ideally, a digital system is location-agnostic — if a patient visits any facility using the digital tool, their BP data is recorded and their record is updated.
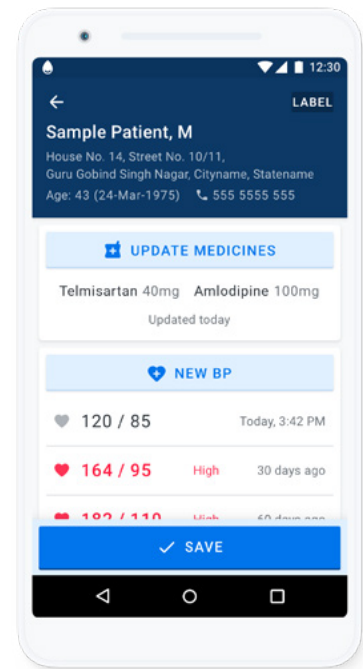
✅ Privacy vs. access

Ensuring easy searchability is key to a fast, functional application.

Because patients move around, permitting users to search and manage patients across nearby facilities makes it easier to maintain a single, consistent longitudinal record for a patient. But without sufficient security, opening access too far risks exposing patient data. Inevitably, there is a tradeoff between access and privacy.

There are many approaches to this issue. It is essential to be compliant with all local laws and regulations and ensure patient privacy, even in places where laws may leave some patients vulnerable.

LESSONS FROM SIMPLE 💧

We made offline-access to patient data available to all facilities within a nearby geographic region (the sub regions of a district). For patients carrying a BP passport (or searchable UUID, see previous section) associated with their profile, health care workers can look up the patient from anywhere within the state.

✅ Interoperability

Interoperability with other health information systems is desirable — it is required to generate a longitudinal record across programs, for example — but it rarely achieved in full.

We recommend prioritizing managing patients with hypertension, not a theoretical connection between systems, and focusing on the essentials: ensure that your digital system collects data in a standardized and documented format, so that essential patient data can be transitioned to another system if needed, and that summary data can be presented as part of a national dashboard in the manner preferred by the country.

The FHIR standard is becoming the world's standard for sharing health data; this might make sense for your tool. OpenSRP, for instance, is built from the ground-up on FHIR.

LESSONS FROM SIMPLE 🌢

In Bangladesh and Ethiopia, data collected by health care workers in the Simple app is provided in monthly and quarterly aggregate numbers and graphs to the national reporting system, which is on the DHIS2 platform in both countries.

Presentation of DHIS2 dashboard to the government in Bangaldesh

✅ Managing overdue patients

Features that help health care workers to retain patients in care are worth including in your tool, including:

- **Overdue calling lists:** A list of overdue patients with an easy-to-use phone call function can facilitate outreach by health care workers. The tool can anonymize the call so that health care workers don't reveal their phone number to patients. In our experience, more than 25% of patients who receive a call will return for a follow up visit within two weeks.

- **Home visit lists**: In places with robust community health worker programs, home follow-ups can be very effective, and an effective digital tool should create home follow-up patient lists. Consider using preset lists of "Villages" in the patient enrollment form, making it easier to group patients by village in the future. Community health workers are often assigned to villages, so identifying which overdue patients reside in a specific village is very useful.

- **SMS to overdue patients:** We recommend that a digital tool automatically send SMS reminders to overdue patients, which works to reduce missed visits.

LESSONS FROM SIMPLE 💧

Send SMS reminders

We send millions of reminders every month to patients; our experience suggests that you can expect about a 4-6% decrease in missed visits by messaging patients after they're three days overdue for a visit. This is a modest benefit, but at scale can return many patients to care with a relatively low-cost intervention that requires no extra work for health care workers.

> **Mahfuz**, please visit **UHC Golapganj** tomorrow for a free BP measure and medicines.

Example SMS reminder
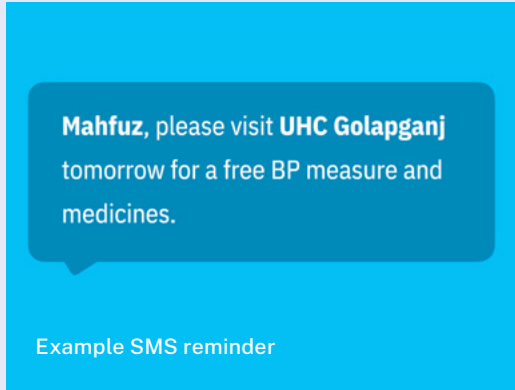
Customization: Ideally, send SMS reminders with variables so you can insert helpful information like Patient Name, Hospital, and Appointment Date.

- An example message we send: "You are three days late for your BP. Visit {facility_name} as soon as possible for your BP %{patient_name}. Your doctor wishes for your good health."

Frequency: In the areas where we have worked, sending messages three days after a patient's appointment is more cost-effective and gets good results.

- We tested sending messages one day prior to appointments, day of the appointment, three days after the appointment. The difference in patient return rates is modest. We also tested sending multiple reminders to each patient. Sending three messages to a patient is slightly more effective at returning patients to care, but we didn't think it was worth the added cost.

Language: In many countries, the patient population speaks many different languages. Some health programs add a field during patient registration for "Language" so patient communications can be customized. We did not want to burden users with more data entry for every patient, so we generalized on a per-area basis to send all messages in a region in the same language.

Whatsapp vs SMS: We did a large-scale head-to-head comparison of Whatsapp vs. SMS across more than a dozen states in India in 2021-2022. We expected Whatsapp to win the battle — anecdotally, many Indians get a high volume of SMS spam messages — but found that SMS was >0.5% more effective at returning patients to care. Other contexts might be different.

SMS providers: There are third party SMS service providers that function as a single gateway to deliver SMS or Whatsapp messages. But costs mount quickly at scale. We started with a large international company but switched to local providers in India and Bangladesh as the program grew to send more than 2 million messages each month.

✅ Clinical decision support

Clinical decision support in a hypertension control program is fairly basic: The most common is encouraging doctors to titrate medications according to the treatment protocol, avoiding treatment inertia (i.e., when returning patients with uncontrolled blood pressure are not advanced to a more intensive medication regimen).

We recommend showing a basic message when a high BP is entered during a follow-up visit that encourages users to consider intensifying treatment. This is not a magic solution; when we included this feature in the Simple app, it did not significantly increase the doctors following the treatment protocol by itself. However, when combined with extra training and supervision by program staff, it can sometimes be effective.
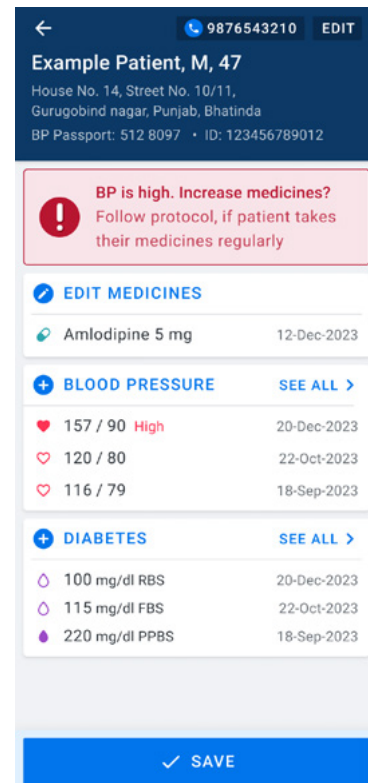
✅ Feedback loops to show progress to health care workers

Health care workers are often frustrated that although they spend many hours collecting patient data, after they send it off to their supervisors, they never see it again. We have observed that showing health care workers the impact of their work can motivate them to focus more on patient management.

We recommend creating simple charts in your software for health care workers to see the key metrics tracked. In particular:

✓ How many patients are enrolled (monthly and cumulative)

✓ Percentage of patients with BP controlled (line chart with rolling monthly outcomes)

✓ Percentage patients with no follow-up in >3 months (line chart with rolling monthly outcomes)

Pitfalls to Avoid

LESSONS FROM SIMPLE 💧

Avoid "assigning" patients to their registration facility

When we started Simple, all patients were assigned to their registration facility; a patient enrolled at a tertiary hospital (e.g. a large District Hospital) and that facility was responsible for their care.

As large facilities enroll thousands of patients, it became a burden to be responsible for large patient populations. Patients should be treated for chronic diseases like hypertension or diabetes at small, local clinics, which are easier to reach and have more time for each patient.

Eventually we added a function to track registrations and "assigned" patients separately. This introduces a lot of complexity to your system but it's worth it. Patients can be registered at the tertiary hospital, but the user can "re-assign" the patient to a local community clinic close to the patient's house. The tertiary hospital gets credit for registering many patients, but now the community clinic is responsible for the patient's on-going care.

⚠️ Providing dedicated tablets to CHW

It's common for health programs to buy tablets, which becomes a huge capital cost and a large maintenance and operational challenge. Who replaces broken screens? Who is responsible for the device? Do you need to remotely manage updates? In many places, health care workers have capable Android devices in their pockets. A personal device is more likely than a program-provided tablet to be charged, have an up-to-date operating system, connect with the internet at least periodically and be with the health care worker at all times.

LESSONS FROM SIMPLE 💧

Use health care workers' personal devices

We have deployed both Simple and DHIS2 to more than 40,000 health care workers on their personal devices. This strategy may not be appropriate in all locations (check local laws and survey health care workers) but it may be a key to scaling your hypertension management program quickly and robustly. Of course, ensure data is protected by encryption on-device and that you can remotely revoke access when users are no longer part of the program.

FEATURE 4: SIMPLE DASHBOARDS THAT SHOW THE RIGHT INDICATORS

Why this matters

- Building a simple, effective dashboard can allow decision makers to quickly identify problems and monitor the effects of their interventions.

- Often, dashboards focus too much on process indicators, which are not the best way to understand how well a program is performing or to improve its performance.

- While some process indicators are useful, dashboards should prioritize the indicators that demonstrate progress towards health outcomes.

With a simple, automatically updated dashboard, decision makers can quickly identify problems with program implementation and monitor the effects of their interventions. The key is to focus on a small number of key indicators.
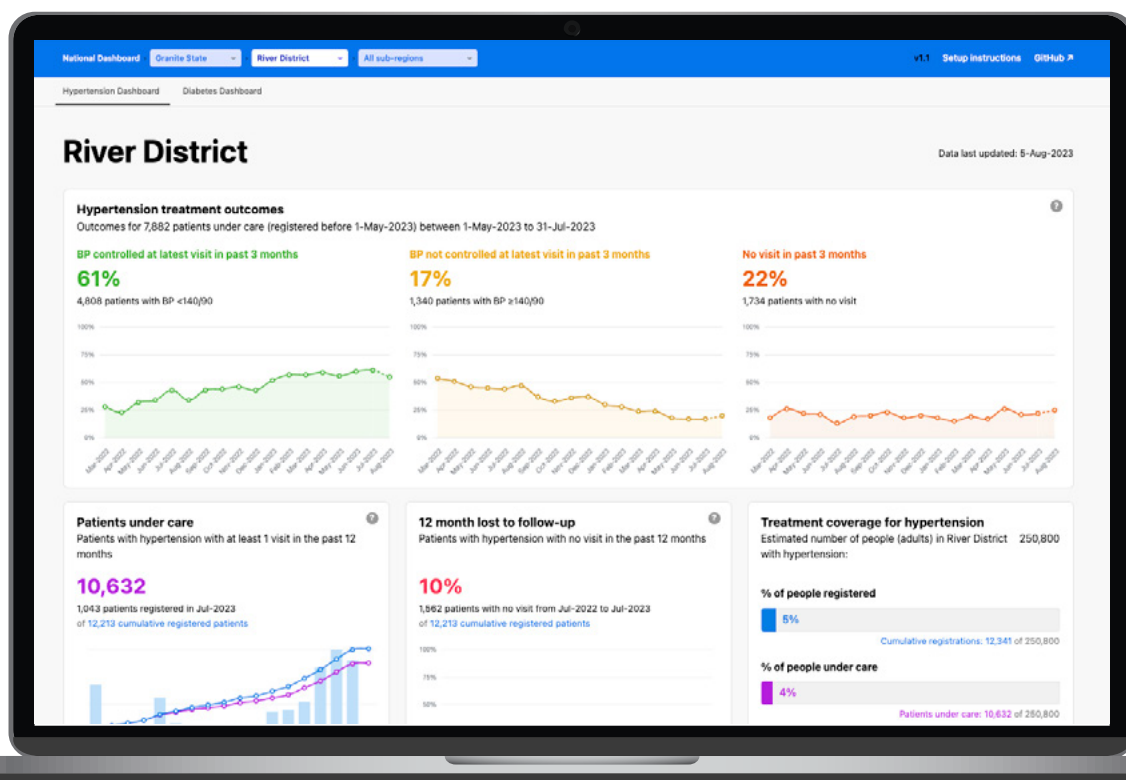
Putting the principles into practice

A dashboard is a visual representation of key information and metrics. Its primary purpose is to drive quality improvement, making it the heart of your hypertension control program.

A great dashboard should:

- Be easily accessible to program managers and government officials,

- Be updated at least daily, and

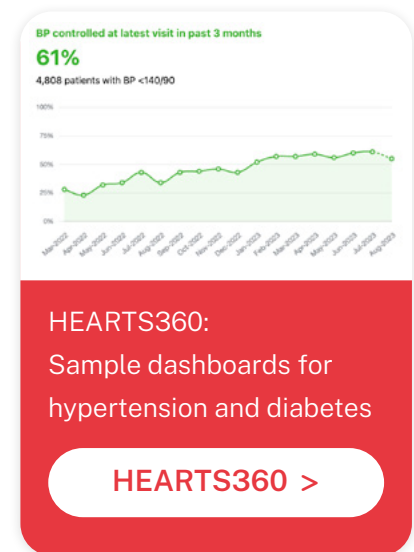- Give an easy-to-understand high-level view of the current performance of the program.

HEARTS360:
Sample dashboards for hypertension and diabetes

HEARTS360 >

A dashboard should allow a user to see if the program is effective and if resources are available for it to function smoothly. A dashboard should not be complicated; the key is to focus on a small number of key indicators.

The key metrics for a hypertension management program fall into four categories:

✅ **Core Indicators** show if the program is having the intended impact (outcome) of saving lives.

✅ **Program metrics** track the reach and the outputs of the programmatic interventions.

✅ **Process metrics** track the adherence to standard operating procedures. This can be especially useful when troubleshooting problems identified by the core indicators; for example, is an intervention intended to solve a problem being implemented correctly?

✅ **Resource metrics** track the availability of consumable resources, which need to be procured periodically for the program to function, e.g., availability of medication.

Core indicators

Three key indicators show the current status all patients in a hypertension program: those who are healthier and those who have been lost-to-follow-up.

CORE INDICATOR 1: BP controlled

How many patients returned recently with a controlled blood pressure reading?

BP controlled at latest visit in past 3 months

61%

4,808 patients with BP <140/90

Why it's essential

BP controlled reflects the overall health of a hypertension control program. Because having BP controlled across the diagnosed population is the primary goal of any hypertension program, it is the most important hypertension control indicator.

Formula

Numerator: Number of patients registered before the last three months with a BP measure <140/90 at the last visit in the last three months

Denominator: Number of patients under care in the program registered before the past three months (deleted and dead excluded*)

Notes

This—not the number of patients enrolled— should be the first graph in your dashboard.

Patients registered in the last three months are excluded—almost all new patients have high blood pressure (which is why they enrolled in the program).

CORE INDICATOR 2: BP not controlled

How many patients returned recently with an uncontrolled blood pressure reading?

BP not controlled at latest visit in past 3 months

17%

1,340 patients with BP ≥140/90

Why it's essential

It's great that these patients are returning to care, but the program hasn't controlled their blood pressure yet.

This indicator can identify when patients' care isn't being escalated to protocol or when there are drug stock-outs.

Formula

Numerator: Number of patients registered before the last three months with a BP measure ≥140/90 at the last visit in the last three months

Denominator: Number of patients under care in the program registered before the past three months (deleted and dead excluded*).

CORE INDICATOR 3: Missed visits

How many patients haven't visited for a BP measurement in the last three months?

No visit in past 3 months

22%

1,734 patients with no visit

Why it's essential

This number reflects how well facilities are retaining patients in care.

Formula

Numerator: Number of patients registered before the last three months with no BP measure in the last three months

Denominator: Number of patients under care in the program registered before the past three months (deleted and dead excluded*)

Notes

This can also be called "three-month lost to follow-up."

*Note: You may choose to exclude patients who are "12-month lost to follow-up" from the denominator. If you do so, ensure that you separately graph the 12-month lost to follow-up indicator so it's clear what percentage of patients are actually under care and what percentage of patients have been lost to the hypertension management program.

Program indicators

PROGRAM INDICATOR 1: Patients under care

How many patients are currently being treated in your program/facility?

10,632

1,043 patients registered in Jul-2023
of 12,213 cumulative registered patients
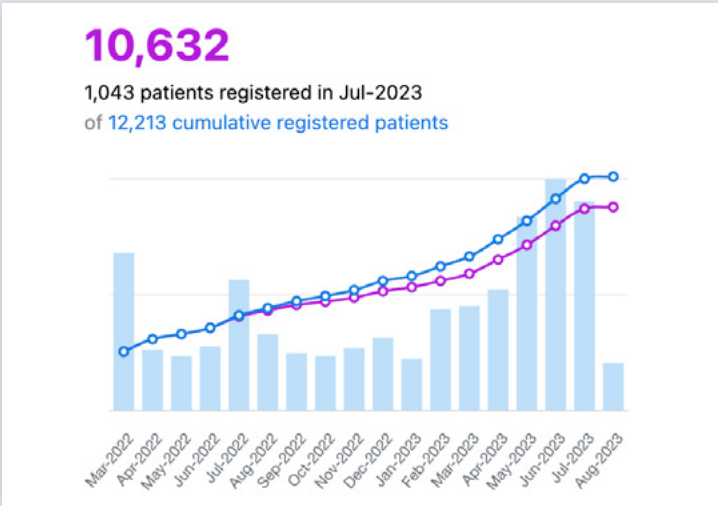
Why it can be useful

The program can only help patients control their hypertension if the patients remain in care.

Formula

Patients under care: Total number of patients with at least one visit in the last 12 months (deleted and dead excluded)

Cumulative registered patients: Total number of patients ever enrolled in the hypertension management program (deleted and dead excluded)

Notes

We included transferred-out patients since health systems managers were concerned that health care workers would use transferred-out patients to reduce their workload.

PROGRAM INDICATOR 2: 12-month lost-to-follow-up

How many patients have dropped out of the program?

10%

1,562 patients with no visit from Jul-2022 to Jul-2023
of 12,213 cumulative registered patients
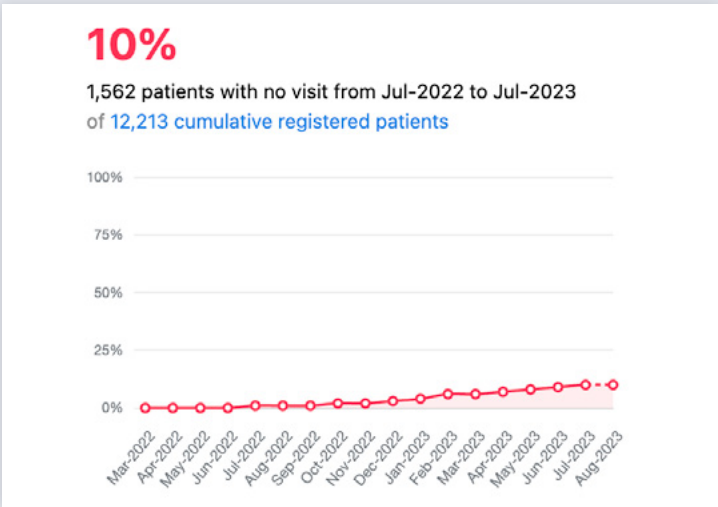
Why it can be useful

It's useful to differentiate between "patients under care" and those who are 12-month lost to follow-up. It may be extremely difficult to bring back patients who have not visited a facility in the last 12 months.

Formula

Numerator: Number of patients with no visit in the last 12 months

Denominator: Total number of patients ever enrolled in the hypertension management program program (deleted and dead excluded)

Notes

Keeping patients in care is challenging. It is common for more than 20% of patients to be lost to follow-up after 12 months.

PROGRAM INDICATOR 3: Treatment coverage for hypertension

What percentage of people with hypertension in the community are enrolled in the program?

Treatment coverage for hypertension

Estimated number of people (adults) in River District with hypertension: 250,800

% of people registered

| 5% |

Cumulative registrations: **12,341** of 250,800

% of people under care

| 4% |

Patients under care: **10,632** of 250,800

% of people with BP controlled

| 2% |

BP controlled: **4,808** of 250,800
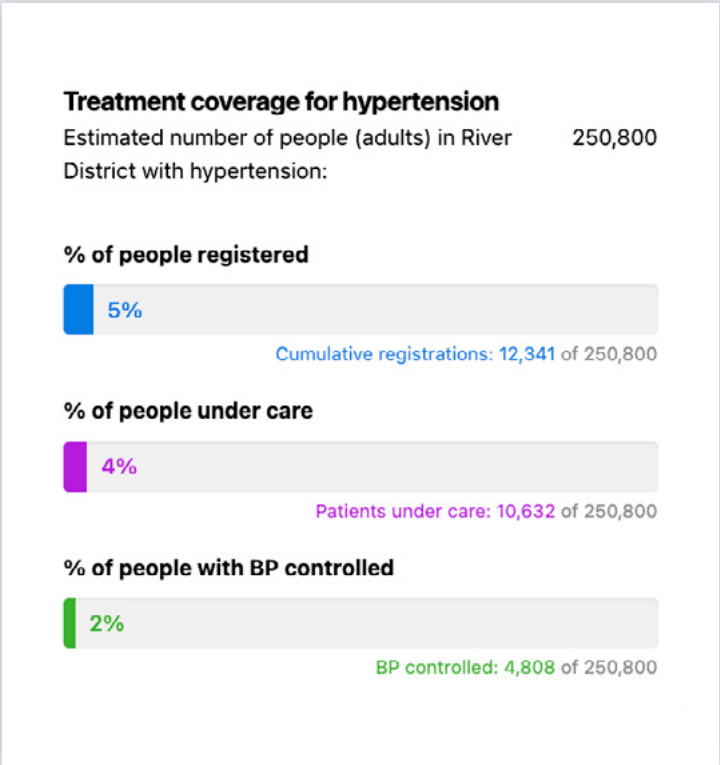
Why it can be useful

This indicator is the single most important way to estimate program impact.

It isn't a required metric, especially early on, but it's helpful as you scale and begin to focus on better coverage of the hypertensive population.

Formula

Base—estimated number of adults: Usually derived from community surveys (e.g., WHO STEPS survey) and can be updated annually or even less frequently in a data system

% of people registered: Number of patients in the region registered in the hypertension control program

% of people under care: Number of patients in the region registered in the hypertension control program who have visited a facility at least once in the past 12 months

% of people with BP controlled: Number of patients in the region registered in the hypertension control program who have their BP controlled in the past three months

Notes

This requires reliable survey data about the population of each region/district.

PROGRAM INDICATOR 4: Facility-based opportunistic screening

The approximate percentage of visitors to a health facility screened for hypertension in a month

23%

6,900 individuals screened for hypertension in Jul-2023
of ~30,000 estimated OPD patients >18 years
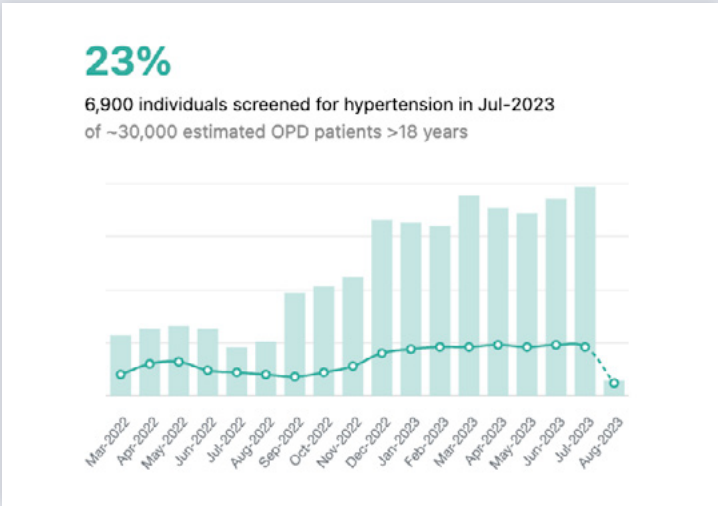
Why it can be useful

Screening visitors to a health facility is a "low-hanging fruit" as it allows for screening a population without having to conduct camps or house-to-house screening campaigns.

Formula

Total number of visitors screened for hypertension in the month

Notes

In many health systems, the number of screened patients and the approximate number of adult patients visiting the facility are only recorded on paper and are reported monthly in aggregate.

PROGRAM INDICATOR 5: Cohort reports

How do patients enrolled in one quarter do on the core indicators (BP controlled, BP not controlled, missed visits) in the following quarter?

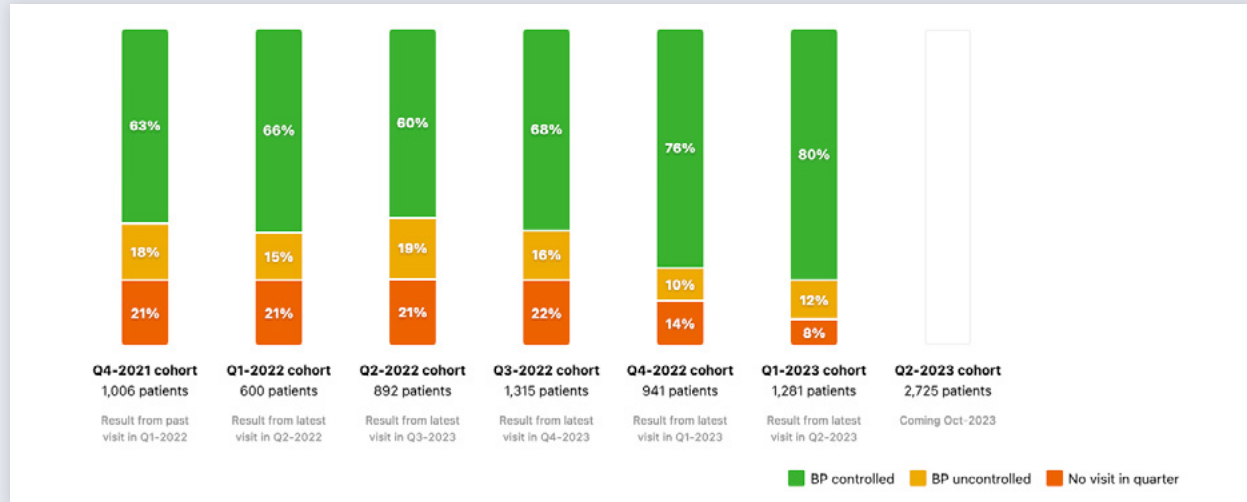|	Q4-2021 cohort	Q1-2022 cohort	Q2-2022 cohort	Q3-2022 cohort	Q4-2022 cohort	Q1-2023 cohort	Q2-2023 cohort
BP controlled	63%	66%	60%	68%	76%	80%	
BP uncontrolled	18%	15%	19%	16%	10%	12%	
No visit in quarter	21%	21%	21%	22%	14%	8%	
Patients	1,006 patients	600 patients	892 patients	1,315 patients	941 patients	1,281 patients	2,725 patients
	Result from past visit in Q1-2022	Result from latest visit in Q2-2022	Result from latest visit in Q3-2023	Result from latest visit in Q4-2023	Result from latest visit in Q1-2023	Result from latest visit in Q2-2023	Coming Oct-2023

Legend: ■ BP controlled ■ BP uncontrolled ■ No visit in quarter

Why it can be useful

Cohort reports track effectiveness at managing newly enrolled patients. The idea is that strengthening the first two quarters of each patient's treatment will make the program more successful in the long-term.

Formulas

BP controlled

Numerator: Number of patients with a BP <140/90 at their last visit in the quarter after the quarter when they were registered

Denominator: Number of patients assigned to a facility where the patient is hypertensive, is not deleted, is not dead, and was registered during a quarter

BP not controlled

Numerator: Number of patients with a BP ≥140/90 at their last visit in the quarter after the quarter when they were registered

Denominator: Number of patients assigned to a facility where the patient is hypertensive, is not deleted, is not dead, and was registered during a quarter

Missed visits

Numerator: Number of patients with no visit in the quarter after the quarter when they were registered

Denominator: Number of patients assigned to a facility where the patient is hypertensive, is not deleted, is not dead, and was registered during a quarter

Visited but no BP taken

Numerator: Number of patients with no BP taken but at least one of the following in the quarter after registration: an appointment scheduled, their drugs refilled, or a blood sugar taken

Denominator: Number of patients assigned to a facility where the patient is hypertensive, is not deleted, is not dead, and was registered during a quarter

Notes

For example, if there are 10,000 patients enrolled in Jan/Feb/Mar, we look at those same patients to see the result of their most recent visit in Apr/May/Jun.

Perhaps there were 3000 visits with BP controlled, 2000 visited with uncontrolled BP and 5000 with no visit. You would see that BP controlled is quite low (30%), those visiting with uncontrolled BP is fairly normal (20%) and many patients are being lost to care (50%). If you focused on patient retention efforts, you would hopefully see a decrease in missed visits and an increase in BP control afterwards.

Process indicators

Aside from outcome indicators, efficient implementation of a hypertension program requires program managers to know which specific tasks health care workers are completing.

This can help optimize health care workers' time, experiment and build a better system.

Some key process indicators are:

- **Follow-up visits recorded per month**
  How many of the total "Patients under care" had a BP measure each month?

- **Contacting overdue patients**
  If your tool has a function to call overdue patients, it's helpful to show how many patients were contacted by heath care workers each month.

- **Medication titration**
  This allows us to see where standard treatment protocols (a key part of the HEARTS approach, see page 10) are being followed and the impact they have in reducing uncontrolled blood pressure. In our experience, many doctors are hesitant to adopt a standard treatment protocol. In some programs, as many as 95% of patients who return for follow up uncontrolled BP do not have their medications intensified according to the treatment protocol. There are legitimate reasons not to titrate medicines (e.g., patients who didn't take their medication the morning of the visit) but very low titration rates are a sign that doctors are reluctant to escalate treatment to protocol, which results in a higher percentage of uncontrolled patients.

  Tracking medication titration rates is an advanced metric, but it can be done simply. Look for all visits where the patient has BP >140/90 and no change was made to the anti-hypertensive medications.

   Formula:

    – **Numerator: Those patients with no change to BP medications**

    – **Denominator: All patients that had a visit with BP ≥140 or ≥90 in a month**

Resource indicators

Drug stock monitoring

Drug stock-outs are a major challenge in many countries. In countries that don't already have an inventory management platform, a simple monthly drug stock reporting system that tracks inventory of only anti-hypertensive and diabetes medicines can be a useful feature for a digital tool.

The DHIS2 software supports forms suitable for drug stock monitoring. For Simple, we built a custom form system to collect the following data. Similar reporting mechanisms can be built in other tools.

1 Stock-in-hand for each anti-hypertensive drug/dose combination

2 Stock received during the month for each drug/dose combination

3 Stock transferred to smaller facilities (optional)

This basic data allows the dashboard to report both the current stock-in-hand and consumption of medications during the month. A basic algorithm that takes into account the number of patients enrolled at a facility can also estimate "patient days" of medications in each facility, which helps identify facilities that need action before a stock-out happens.

RESOURCE INDICATOR: Antihypertensive drug stock

What percentage of facilities have more than 30 days of hypertension protocol drugs in stock?

Anti-hypertensive drug stock
Facilities with >30 days of hypertension protocol drugs in stock

- Step 1 drugs — 94% in Jul-2023
- Step 2 drugs — 64% in Jul-2023
- Step 3 drugs — 90% in Jul-2023

Why it can be useful

Availability of drugs often drives a patient's adherence to a prescribed medication regimen. Active monitoring of drug stock is key to ensuring that patients can access the medication they need.

Formula

Numerator: Facilities with >30 days protocol drugs in stock

Denominator: All facilities in the hypertension management program

Notes

Please contact us if you'd like to learn more about our very basic drug stock tracking system.

Pitfalls to avoid

⚠️ Making the dashboards hard to access

Many public health dashboards collect wonderful data, but no one actually uses them. To drive quality improvement, data needs to be used frequently by decision makers. Offering multiple ways to view dashboards makes them more likely to be used.

- **Email or WhatsApp reports**

  Your dashboard is likely yet another place that a decision maker has to go to find data. Unless it's very important to them, they won't log in. Consider automatically emailing or Whatsapping reports to decision makers every month so key data goes right to their inbox. Even a teaser with one or two indicators with a link to the full dashboard can be very effective.

- **Simplify access**

  Generally, try to make it as easy as possible for decision makers to login to your system. Single sign-on (SSO) or an easy-to-remember URL can be important.

- **Create printable reports**

  Many leaders are used to seeing printed reports. Invest in print stylesheets or PDF downloads of your key data. We regret not putting more focus into great printable reports with the most important indicators that can be distributed to decision makers monthly or quarterly.

⚠️ Making different dashboards for facilities at different levels

Dashboards are useful for an individual facility, in subdistricts, districts, states and at the national level. Often the indicators and dashboards created at each of these levels are different, with each level choosing to focus on different indicators.

✓ We recommend keeping your dashboards more or less identical at each level to reduce complexity, making it easier for decision-makers to interpret dashboards at all levels.

LESSONS FROM SIMPLE 💧

Don't include 12-month loss to follow up (LTFU) in key indicators by default

During the first few years Simple's deployment, we included all patients in the denominator of the key indicators like BP control percentage and missed visit percentage; we didn't exclude 12-month LTFU patients. At the beginning, this doesn't really matter; most patients are under care and you can also argue that a facility is responsible for all patients, even those that are lost to follow-up.

After a few years, the 12-month LTFU patients become a heavy weight on the program. It's a large amount of effort to encourage these patients to return and if the LTFU rate reaches 20% (common in our experience), it becomes very hard to move the needle on BP controlled percentage. Exclude the 12-month LTFU patients from the key indicators by default.

CONCLUSION

Digital tools can act as enablers for public health care programs.

If designed well, they promote operational efficiency, reduce program monitoring costs and help health care workers see their impact.

While this playbook focuses on hypertension management, the four key principles mentioned in the playbook and summarized below can be applied while designing any chronic disease management tool.
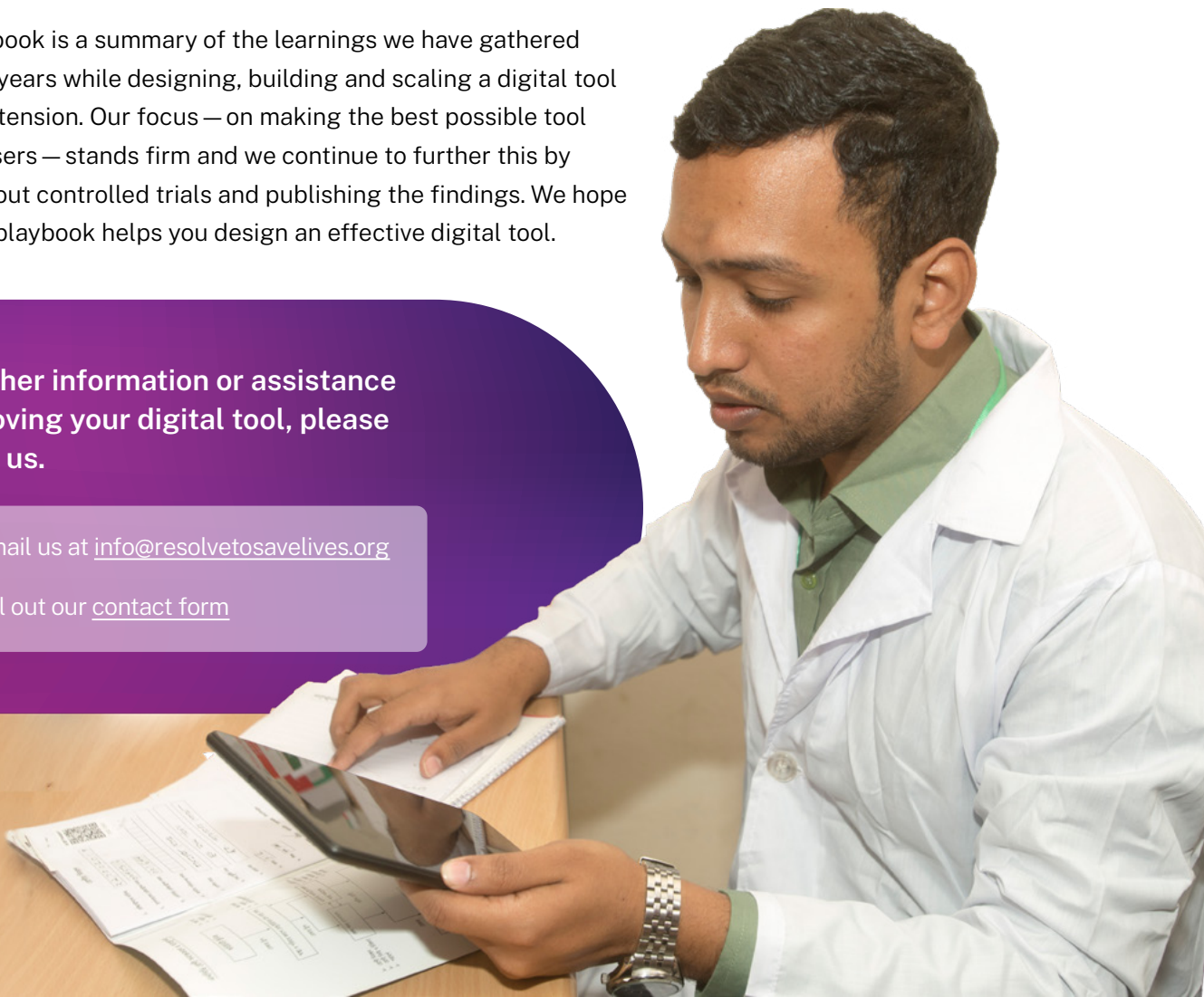
1   **Capturing the right data points:** Digital tools should capture only essential data during patient visits to reduce workload and minimize inaccuracies.

2   **Very fast and easy to use:** The tool must be fast and easy to use for health care workers to prevent frustration and wasted time.

3   **Focus on patient management:** Simplifying patient management is crucial for chronic conditions, ensuring that patients receive the necessary attention.

4   **Simple dashboards that show the right indicators:** The tool should provide simple, prioritized dashboards to help decision-makers monitor health outcomes and interventions effectively

The playbook is a summary of the learnings we have gathered over five years while designing, building and scaling a digital tool for hypertension. Our focus — on making the best possible tool for our users — stands firm and we continue to further this by carrying out controlled trials and publishing the findings. We hope that this playbook helps you design an effective digital tool.

For further information or assistance in improving your digital tool, please contact us.

✉ Email us at info@resolvetosavelives.org

🖥 Fill out our contact form

1:30 PM

APPENDICES

Appendix 1

**APPENDIX 1:
CREATING AN ENABLING ENVIRONMENT
FOR YOUR DIGITAL TOOL**

A digital health tool can only function well if the broader hypertension management program is nimble enough to experiment and accommodate the insights provided by the digital tool.

To ensure a smooth rollout and sustainable implementation of the digital tool, it is critical to align various factors:

- **Established programmatic operating procedures:** Implementing a multi-faceted change in a health care system is difficult. Transition to digital tools is greatly enabled if there are clear and established standard operating procedures (such as patient flow, drug titration, role of health workers) already in place

- **Workforce capacity:** Personnel need to be trained to use a digital tool. Planning for large-scale upskilling to build digital capacity amongst community health workers and personnel in public health programs is recommended at a system level.

- **Aligning with public health insurance systems:** Incentive alignment, which is often driven by clarity in public finances, is key to long term financial sustainability of the program. Digital tools provide a quick, seamless pathway for enabling incentive-based payouts. The alignment of the digital tool with the insurance system is key to the long term sustainability of both the program and the tool.

- Digital policy and governance: Clearly defined digital policy allows a digital tool to be built without any second guesses or measures to ensure data privacy, security and confidentiality. Further a clearly defined governance framework, which outlines the roles and responsibilities of various stakeholders, enables smooth interactions and decisions.

Read more >

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CREATING AN ENABLING ENVIRONMENT
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- **Digital policy and governance:** Clearly defined digital policy allows a digital tool to be built without any second guesses on measures to ensure data privacy, security, and confidentiality. Further, a clearly defined governance framework — which outlines the roles and responsibilities of various stakeholders, including data custodians, data processors, and data users — is crucial in building redressal mechanisms as part of a digital health program.

When a digital tool has been widely adopted, its sustainability often hinges on the government's commitment: to ongoing capacity building and budgetary allocations to maintain, manage and improve the tool.

Build a tool that fits the digital health ecosystem

A digital health ecosystem can be loosely defined as the network of digital solutions that are used to support and improve health care. This network can include electronic health records (EHRs), telemedicine platforms, mobile health apps, wearable devices, health information exchanges (HIEs), and more. These technologies allow for the collection, storage and sharing of health information, as well as the delivery of health care services. This ecosystem is guided by the policies and standards which define the boundaries within which these tools and systems operate.

A country may be planning a digital health ecosystem or may have one in place. It is important that new digital tools that are introduced integrate into the ecosystem and add to patient care cohesively. A hypertension program management tool builds the longitudinal health record of a patient in hypertension only. In the long run, it needs to be part of a larger super-application or ecosystem of applications deployed in a health care center, to build a longitudinal health record of a patient across all their visits to health care facilities. For the hypertension management tool to work cohesively, and integrate into the ecosystem, it must follow the standards set by the digital health ecosystem.

APPENDIX 2: OPERATIONAL GUIDE FOR BUILDING AND ROLLING OUT A DIGITAL TOOL

The tables below break the process of developing, piloting and scaling digital tools into key activities.

These key activities are further divided into suggested sub-activities to be taken up by the various departments in a government or the ministry of health of a country or a region.

While the activities indicated can be delegated to external agencies, we strongly recommend government oversight and ownership.

Pre-product development phase

Activity	NCD or hypertension division	Technology agency	Central or state government
Establishing baseline information and communication technology (ICT)/ digital tools	• Provide requirements for a baseline hypertension management program monitoring system	• Contextualize the ICT requirements to the region	
Assessment of availability of data networks and electricity			• Assess available ICT infrastructure by region with a focus on chosen pilot sites
Assessment of availability of devices	• Provide requirements for a baseline hypertension management program monitoring system	• Contextualize the device requirements to the region • Provide list of existing devices being used for other programs	• Assess availability of devices • Publish a gap analysis
Building/ provision of required infrastructure/ devices	• Identify existing resources that can be used for rollout of digital tool		• Allocate budget and procure or provide required ICT infrastructure and devices
Capacity building for use of digital devices		• Conduct trainings to use and maintain provided digital tools	
Establishing clear policy guidelines on digital health tools			• Publish guideline documents/ policies on: 1 Data capture 2 Data use 3 Metrics to be collected and monitored

	• Establish long-term goals and resources required for the project/ program		• Commit to providing required support and direction to the project/ program
Create a long-term strategy and vision for the project			

Product development phase

Activity	NCD or hypertension division	Technology agency	Central or state government
Establishing a project management unit (PMU)	• Provide outline of PMU resource requirements to manage the hypertension digital tool	• Onboard resources as per the requirements and form the PMU	• Allocate budgets and onboard a PMU to manage the digital tool
Discussing requirements and engaging stakeholders	• Engage stakeholders to develop and finalize digital tool and related program requirements with the government		• Convene meetings with relevant government departments and officials • Select relevant IT agencies to participate
Functional and process alignment	• Clearly delineate functional and process alignments required for digital tool pilot		• Review and provide required sign offs • Align program teams and processes to adapt the digital tool
Designing and prototyping tool		• Design and prototype the hypertension digital tool	
Conducting user studies	• Facilitate user studies	• Test the prototypes in real settings with health care workers to gather observations on what works	
Developing technology solutions		• Develop digital tool • Conduct user acceptance testing of the developed solution	• Enable user acceptance testing • Provide sign-off for developed solution
Infrastructure for application hosting and data management		• Provide necessary hardware and associated system software for installation of the digital tool • Install/integrate the digital tool at the hosting site/ cloud provided by the government • Provide hosting support including data center space/cloud-based hosting, etc.	• Provide necessary approvals and procurement of hosting infrastructure

Establishing SMS capability as part of the digital tool		• Provide the SMS Gateway for the SMS capability • Support integration of the digital tool with a local SMS gateway	• Fund any SMS communication costs • Provide all relevant procurement approvals
Financing recurring technology costs		• Provide an overview of recurring costs to run the digital service	• Make long-term budgetary allocations for all associated costs
Testing for interoperability with other digital tools used by the state	• Support development of application programming interface (API)/consumption of APIs with other state solutions	• Facilitate the integration process and support development of APIs/ consumption of APIs	• Provide necessary approvals for application integration
Testing and installation	• Support installation of application	• Facilitate installation/ pre loading of the digital tool onto devices • Support fixing application bugs	
Training for health care workers	• Build a training plan • Conduct a training-of-trainers (ToT) program for government trainers • Carry out training as per agreed training plan	• Provide oversight for all trainings	• Provide relevant infrastructure for training • Allocate budgets for continued training/ ToT programs

Pilot phase

Activity	NCD or hypertension division	Technology agency	Central or state government

Establishing pilot success criteria	• Advise on:
	
	  1 Pilot duration
	
	  2 Programmatic support required
	
	  3 Monitoring and evaluation mechanisms
	
	  4 Success metrics
			• Ratify, publish and socialize success metrics

Selection of pilot sites/ region	• Identify pilot sites for rollout		• Approve pilot sites, send letters/ notifications to prepare for pilot

Capacity building for health care officials	• Provide training to health care officials to monitor the digital program via dashboards and data received via integrations with HIS systems		• Co-create training program for health care officials • Identify and convene the relevant officials
Rollout	• Support rollout of the tool in pilot districts	• Provide oversight via Nodal Officers for rollout in the respective districts	• Mobilize state team for supporting the rollout in the selected districts and subsequently for full-scale rollout
Establishing help desk/ support system	• Provide collateral for supporting the use of the digital tools e.g. training materials, checklist, user manuals, etc.	• Support capacity building of technical help desk that will support the digital tool in future	• Approve funding/staffing required to set up help desk for technical support
Assessment of pilot	• Support evaluation of the effectiveness and adoption of the tool, based on success criteria established earlier	• Provide data related to adoption and usage of the tool	• Evaluate the data/analysis and develop the plan for full state rollout • Publish report on learnings from the pilot

Change management (paper to digital)

Activity	NCD or hypertension division	Technology agency	Central or state government
Assessing of existing paper-based reporting system	• Map existing processes and data collected during patient visits • Map paper-based reporting mechanisms		
Planning for transition to digital	• Prepare a phased plan for transition to exclusive use the digital tool for recording patient visits		• Approve plans for transition
Developing protocols for Inactive patients on paper records	• Develop protocols for scenarios such as inactive patients in accordance with regulations		• Approve protocols
Product development for transition		• Build access control mechanisms for data and dashboards • Build data pipelines for reporting to other programs/ national dashboards	

Aligning programmatic processes	• Reconfigure processes and standard operating procedures for digital-only data entry		• Approve new standard operating procedures
Piloting and monitoring process of transition	• Enable the pilot of transition to digital	• Track key metrics (such as data entry while care is being given)	
Establishing standard operating procedures for training and help desk services for transition	• Provide collaterals for supporting transitions, including standard operating procedures for identified processes	• Support capacity building of helpdesk for procedural changes	• Approve funding/ staffing required to set up transition help desk
Evaluation and dissemination of learnings	• Conduct interviews to assess transition and sustainability of processes		• Evaluate the sustainability of transition • Mandate use of digital tool only • Publish best practices for transition to digital tool

Scale-up

Activity	NCD or hypertension division	Technology agency	Central or state government
Planning for scale-up	• Make a phased plan for scale up and identify gaps (infrastructure, personnel, and resources)	• Stress test the application for handling projected number of concurrent users • Develop a disaster recovery plan • Standardize tech architecture and infrastructure to support scale up • Define service level obectives (SLOs) for addressing tech grievances	• Convene required authorities for scale up • Provide additional resources required for deployment of the digital tool
Infrastructure provisioning for hosting and data storage		• Provide requisite infrastructure and support required for scale up	
Increasing capacity of centralized services	• Identify required services (trainers, collaterals, data packs, etc,) for each phase		
Streamlining program budget	• Provide a budget for each phase of scale up	• Support budget development	• Approve budget

Establishing monitoring and evaluation metrics and team	• Increase capacity of the Project Management Unit (PMU) to monitor roll out of the scale up	• Build dashboard to monitor scale up metrics	
Establishing governance structures			• Set parameters for governance of the digital tool, including data governance • Define periodicity of reports to be submitted to ensure security and privacy • Establish protocols to redress grievances for digital tool (e.g., data loss, security breach)

Maintenance and improvement

Activity	NCD or hypertension division	Technology agency	Central or state government
Establishing long term product roadmap	• Establish standard operating procedures for rolling out new features on ground • Build a product roadmap in consultation with the larger ecosystem	• Establish standard operating procedures for building new features (e.g.,: version control)	• Convene relevant stakeholders to ideate and decide on the long term roadmap for digital tool
Establishing permanent teams for management	• Based on roadmap, provide personnel requirements for managing digital tool	• Based on roadmap, provide personnel requirements for managing digital tool	• Allocate budget for teams to maintain digital tool
Alignment on long term ownership and maintenance of the application	• Establish clear ownership of digital tool with reporting and escalation matrix	• Establish a dedicated team to address bugs and other issues	
Building a learning system	• Plan for regular trainings on dashboard use • Collect insights from facilities on learnings from digital tool		
Continuous improvement	• Build mechanisms for implementers to provide continuous feedback • Build mechanisms for small pilots/ A-B testing before introducing new features	• Build mechanisms for user feedback	• Build mechanisms to disseminate learnings

APPENDIX 3:
PERFORMANCE STANDARDS FOR YOUR DIGITAL TOOL

Platform/app efficiency

Key parameters	Performance standard/threshold
Data entry for the first patient visit	<90 seconds
Pull-up of a patient's details during follow-up visits	<5 seconds
Data entry for follow-up visits	<20 seconds

Essential functionalities

Key parameters	Performance standard/threshold
Patient look-up and data entry	Ability to look up a patient without internet (Offline first model)
Easy registration	Ability to register patient in any facility (no limits in place), enable QR code-based registration
Rules for non-plausible BPs	Don't allow entry if SBP < 70 or > 300 or DBP <40 or > 180
Easy to learn for health care workers	Health care workers are fully able to use app with less than 90 minutes of training.
Prioritized list of overdue patients allowing follow-up calls and list download	Generate lists accurately in-app (as well as in downloadable excel/pdf), enabling calls or text messages with no more than two taps per patient
Downloadable patient line lists that include recent BP and medication details	Generate lists accurately in-app (as well as in downloadable excel/pdf), enabling calls or text messages with no more than two taps per patient
Local language accessibility	Fully translated user interface and help documentation into languages used in states/regions of program focus
Patient IDs that enable accurate look-up and transfer between facilities	Link to National Health ID, and use of unique identifier linkable to National Health ID for locations and patients who do not yet have a national health ID
Assigning and reassigning patients to a facility	Ability to assign patients to facility closer to their home irrespective of the place of registration
Reminders to patients	Automated SMS/Whatsapp reminders can be sent to patients in local languages
Generation of over overdue patient list and ability to call patients	Secure, anonymized calling to overdue patients through application

Analytics & dashboard

Key parameters	Performance standard/threshold
Dashboard to display essential IHCI program metrics (refer to the table below)	All key metrics displayed in graphically appealing format with downloadable option of any machine-readable format
Efficient data sync with dashboard to make current data available	Able to generate data on any day with up-to-date information from latest sync

Scalability and adherence to national standards

Key parameters	Performance standard/threshold
Ability to scale to cover a large number of patients	Ability to handle >1,000,000 patients (or more, depending on population)
Volume of patients manageable at each facility (in offline-first mode)	> 1,000 patients/facility (or more, depending on facility's catchment)
Privacy	As per national regulations
Interoperability	Follows Fast Healthcare Interoperability Resources (FHIR) guidelines and has adopted national registries (does not ensure interoperability)
Security	As per national regulations

APPENDIX 4:
READY REFERENCE SHEETS

Ready reference sheet 1: Data points to collect

S.No	Type of visit	Data Label	Data Type	Requirement
1	Enrollment	Patient name	Varchar	Required
2		Sex	List - radio button	Required
3		Age / date of birth	Num	Required
4		Home address	Varchar, dropdowns	Required
5		Patient ID	Varchar	Required
6		Basic CVD history	Boolean - radio buttons	Required
7	Follow up	Blood pressure measure	Num	Optional
8		Blood sugar measure	Num	Optional
9		Medications	Pick list	Required
10		Date of encounter	Date (default today)	Required
11		Date of next visit	Date	Required

Ready reference sheet 2: Indicators for a simple, effective dashboard

S.No	Type of Indicator	Indicator	Metric tracked
1	Core	BP controlled	Number of patients with controlled hypertension/ Total number of patients diagnosed with hypertension
2		BP not controlled	Number of patients with uncontrolled hypertension/ Total number of patients diagnosed with hypertension
3		Missed visits	Number of patients with no BP measurements in the last 3 months/Total number of patients
4	Registrations	Cumulative registration	Total patients ever enrolled
5		Monthly registrations	Total patients enrolled in each calendar month
6		Percent of estimated hypertension patients enrolled	Total patients enrolled/Estimated hypertension patients

7	Cohort reports		BP controlled at the last visit in the quarter
8			BP not controlled at the last visit in the quarter
9			Visited but no BP taken
10			Missed visits - patients with no visit in the last quarter
11			Total number of patients assigned to a facility
12	Other indicators	12-month lost-to-follow-up (LTFU)	Patients with no visit in the last 12 months/Total number of patients
13		Patients under care	Cumulative registrations - 12 months LTFU - Patients who died
14	Process indicators	Follow-up visits recorded per month	Number of patients who had their BP measured every month compared to total patients
15		Overdue patients contacted	Number of patients contacted for follow up visits each month
16		Medical titration	Patients with no change in medications/All patients with uncontrolled hypertension in a month
17	Drug stock monitoring		Stock in hand of each drug/dose combination
18			Stock received during the month for drug/dose combination
19			Stock transferred to smaller facilities