ELECTRONIC MEDICAL RECORDS IN AFRICAN OR RESOURCE-CONSTRAINED SETTINGS

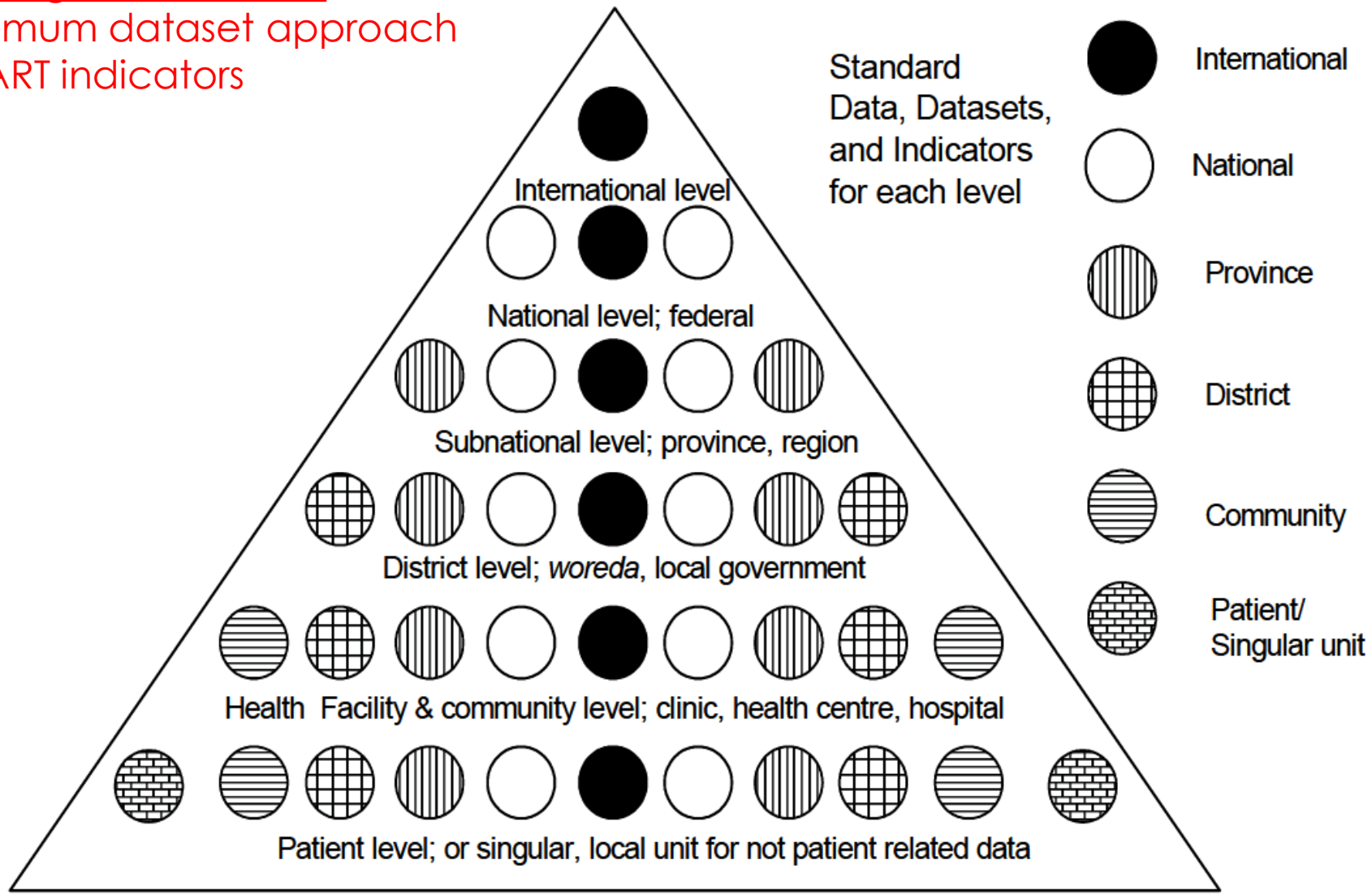
Andrew Boulle
Western Cape Department of Health, South Africa
School of Public Health and Family Medicine, University of Cape Town

AfroPHC workshop, November 2021

Evolution of health information systems

ØØØØØ 00000 00000 00000
ØØ000 00000 00000 00000
00000 00000 00000 00000
00000 00000 00000 00000
00000 00000 00000 00000

Aggregate indicators
Minimum dataset approach
SMART indicators

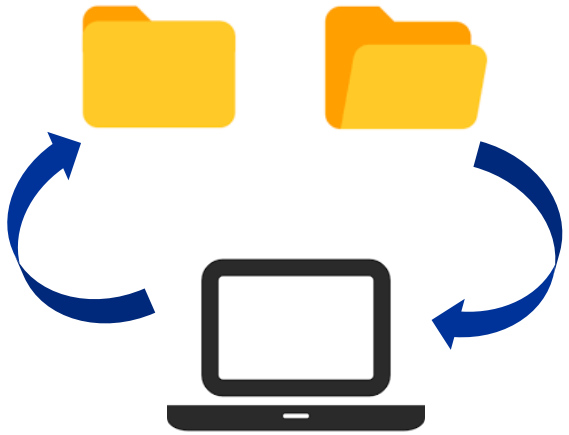


Evolution of health information systems

ØØØØØ 00000 00000 00000
ØØ000 00000 00000 00000
00000 00000 00000 00000
00000 00000 00000 00000
00000 00000 00000 00000

Aggregate indicators
Minimum dataset approach
SMART indicators

Early digitisation
(administrative data biased)
- Patient registration
- High throughput systems
  - Lab, pharmacy
- *Electronic registers*
- *Hospital d/c summaries*

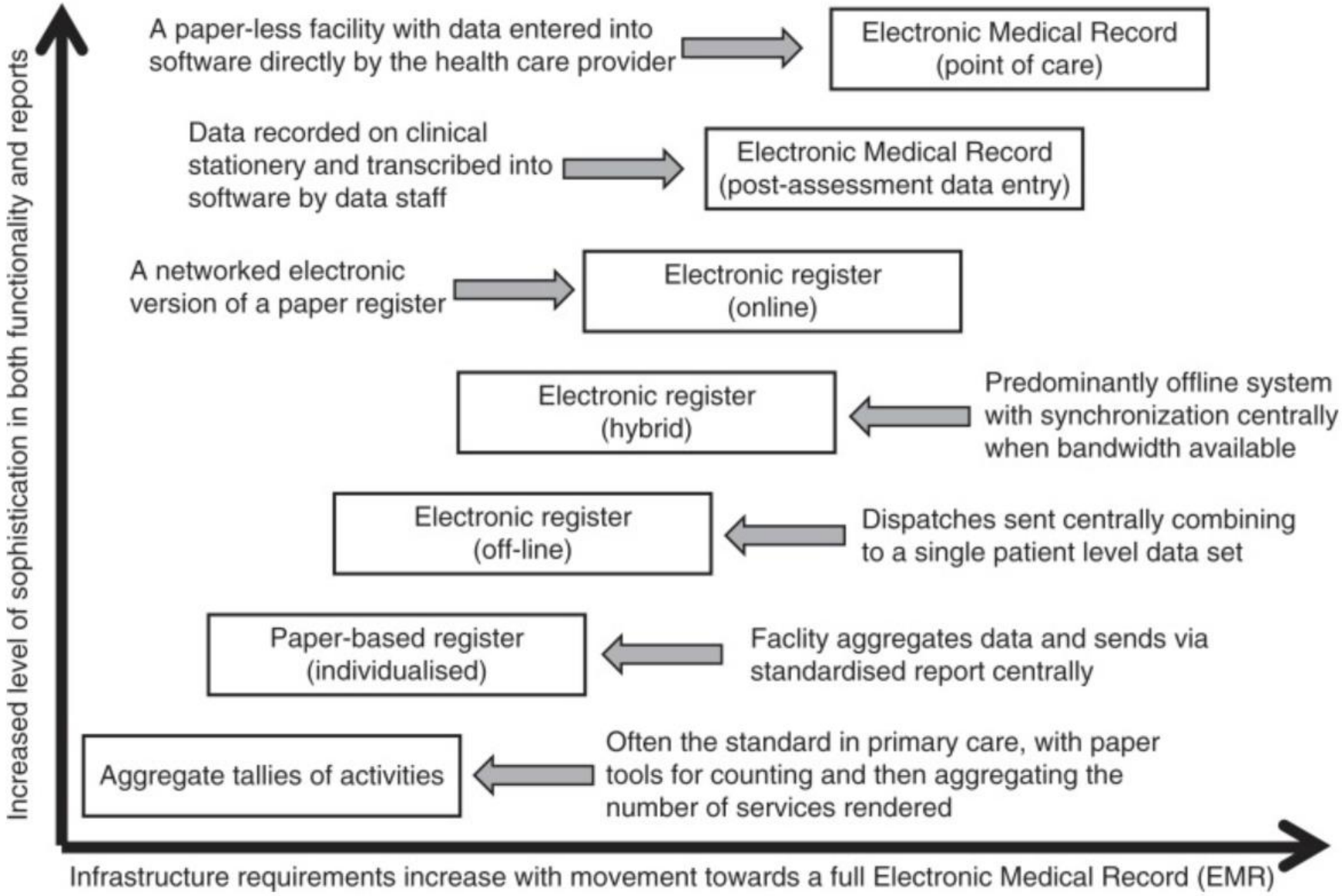


EMRs
- Single-sign-on
- Integrated or seamless best of breed systems
- Decision support
- etc

Second generation routine health information systems

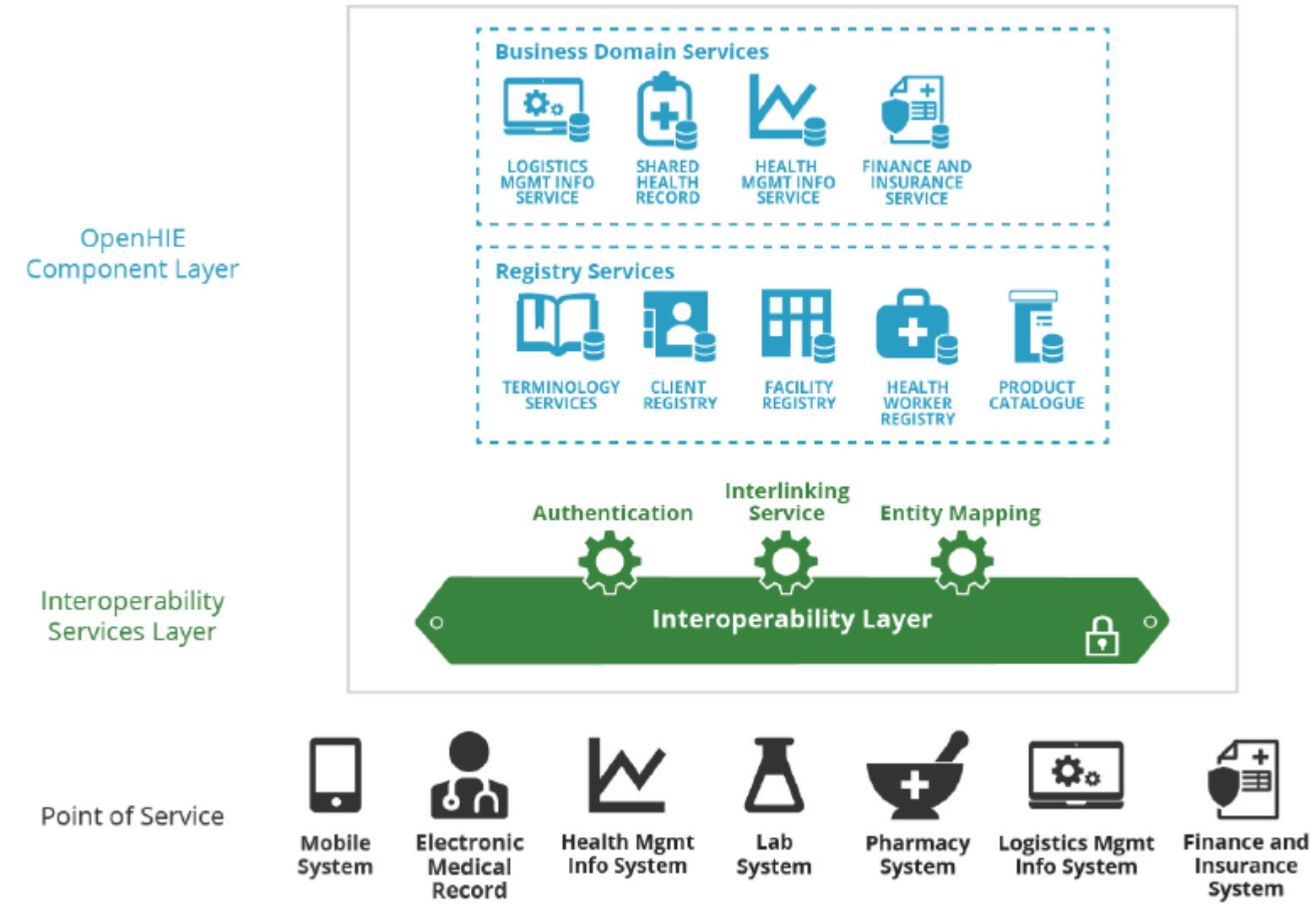
1st generation routine HIS	2nd generation routine HIS
District Health Management Information System	Personal health records and health intelligence
Aggregate data and indicators	Person-level data, and indicators aggregated from unit data
Minimum dataset approach and information pyramid, rigorous interrogation of indicator selection	Person-centric administrative and clinical data required for delivering care
Dedicated data collection tools for tallying elements unrelated to patient care	Data collection embedded in clinical records
DHIS (aggregate data system) the primary management tool	Consolidated data environment for person level data with health data science capacity to derive value

Evolution of electronic medical records in high burden African settings



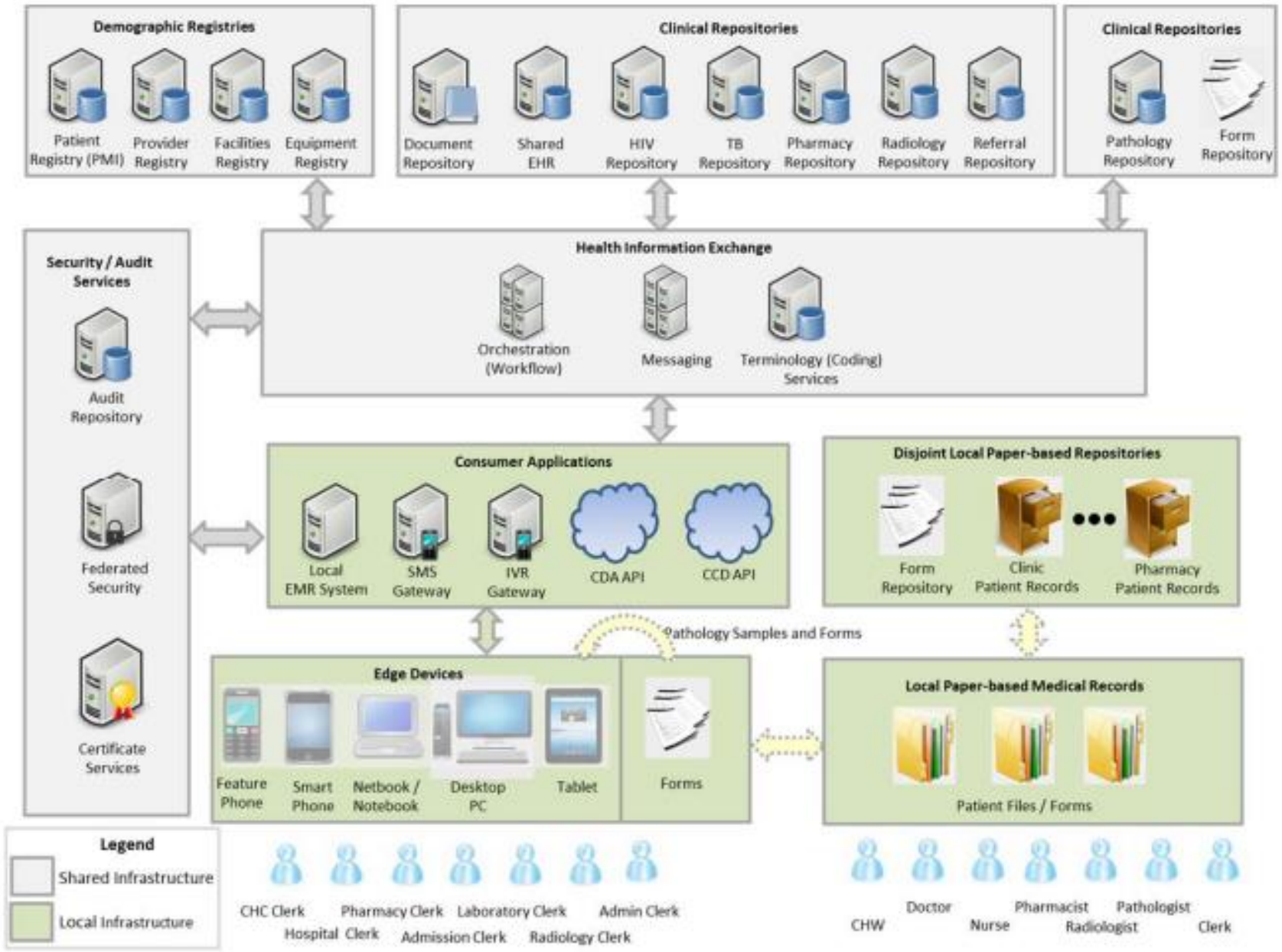
Osler, J Int AIDS Soc. 2014; 17(1): 18908.

The registry or health information exchange model



OpenHIE 2020-05-28; CC BY 4.0

South African Health Normative Standards Framework as an HIE model

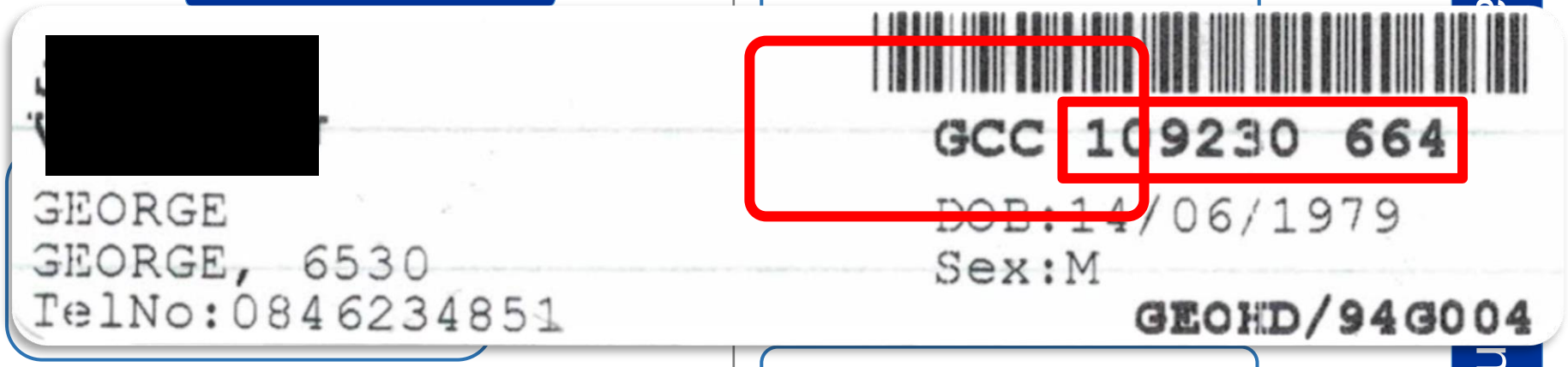


Western Cape context: Unique health ID and maturing administrative systems

Hospital system
(Present in 53/54 hospitals, including all in metropolitan area)

Patient Master Index (PMI)

Clinical systems
recording electronic data against shared registration number (PMI)



E-first
E-fast
E-last

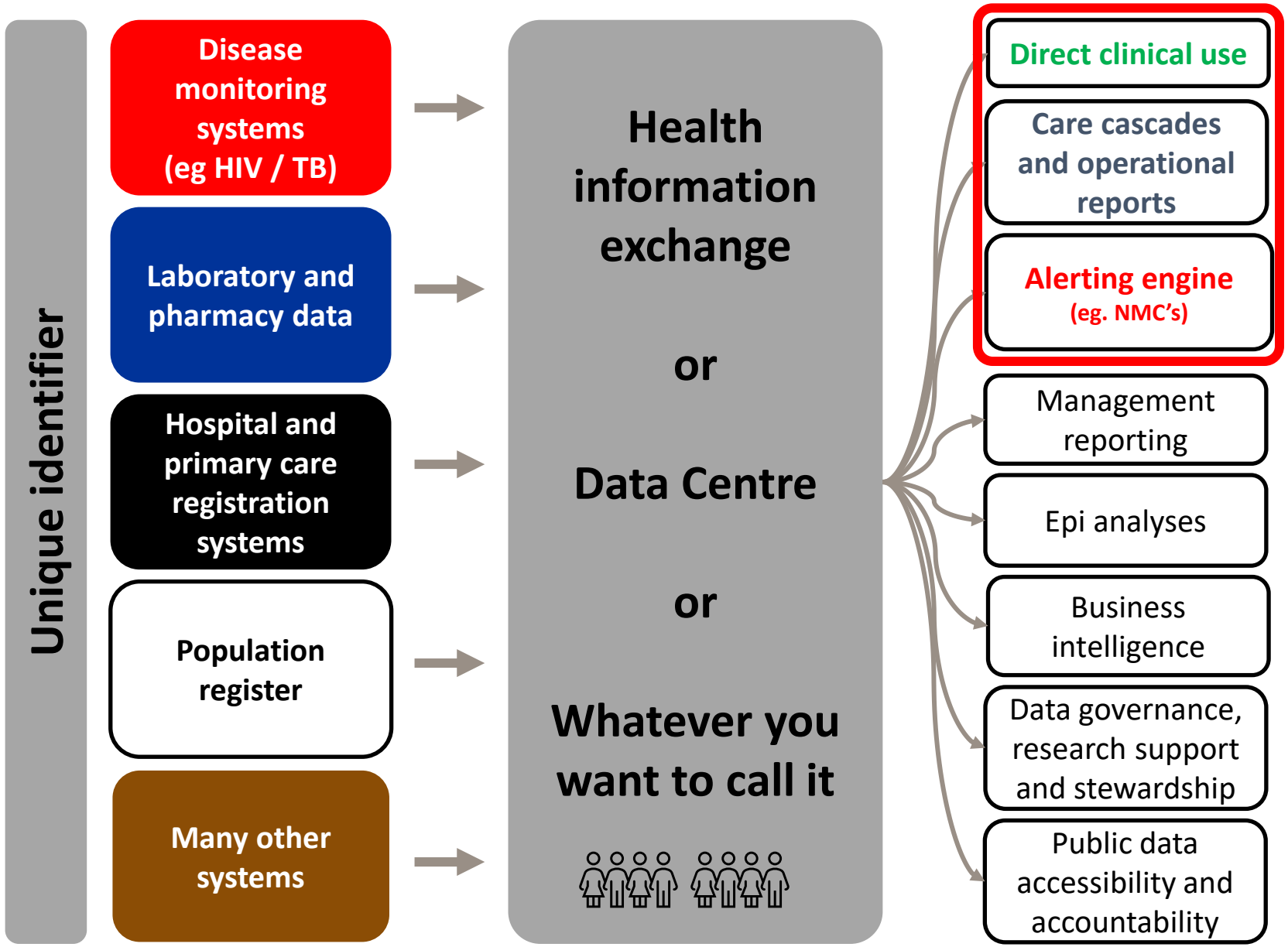
E-ventually

Clinical audit tools
PMI Perinatal (PPIP)
PMI Child Health (CHIP)

Mortality and birth surveillance
PMI Province-wide mortality surveillance system for all deaths and stillbirths
PMI Province-wide birth registration system

Health Exchange

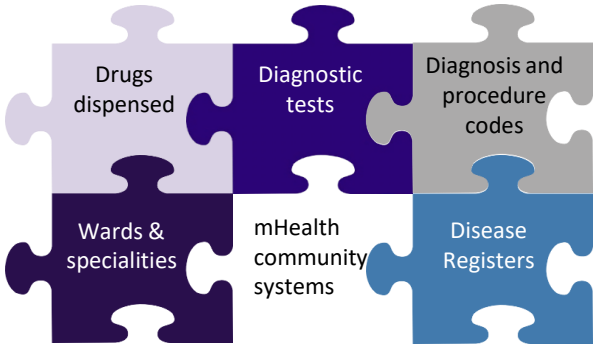
Western Cape Provincial Health Data Centre



Boulle, IJPDS 2019

Phenotype algorithms using all available data

Evidences from multiple sources



Categorised based on specificity to data point of interest

Outcome	Evidence of an outcome for the episode
High confidence	Strong enough evidence to start an episode
Weak-Moderate evidence	Able to start an episode, however more evidence is required to improve
Supporting only	Can only be appended to existing episode but not start one

Patient example for a single pregnancy

Rolled up into a single record per pregnancy

Evidence	Source	Category	Date
Rhesus antibody test performed	Labs	High confidence	2015-01-23
Iron & Folate dispensed	Drugs	Supporting	2015-04-03
Has live birth record	Birth register	Outcome	2015-06-16
Has diagnosis code indicating live birth	Diagnosis codes	Weak-Moderate	2015-06-16

Pregnancy episode

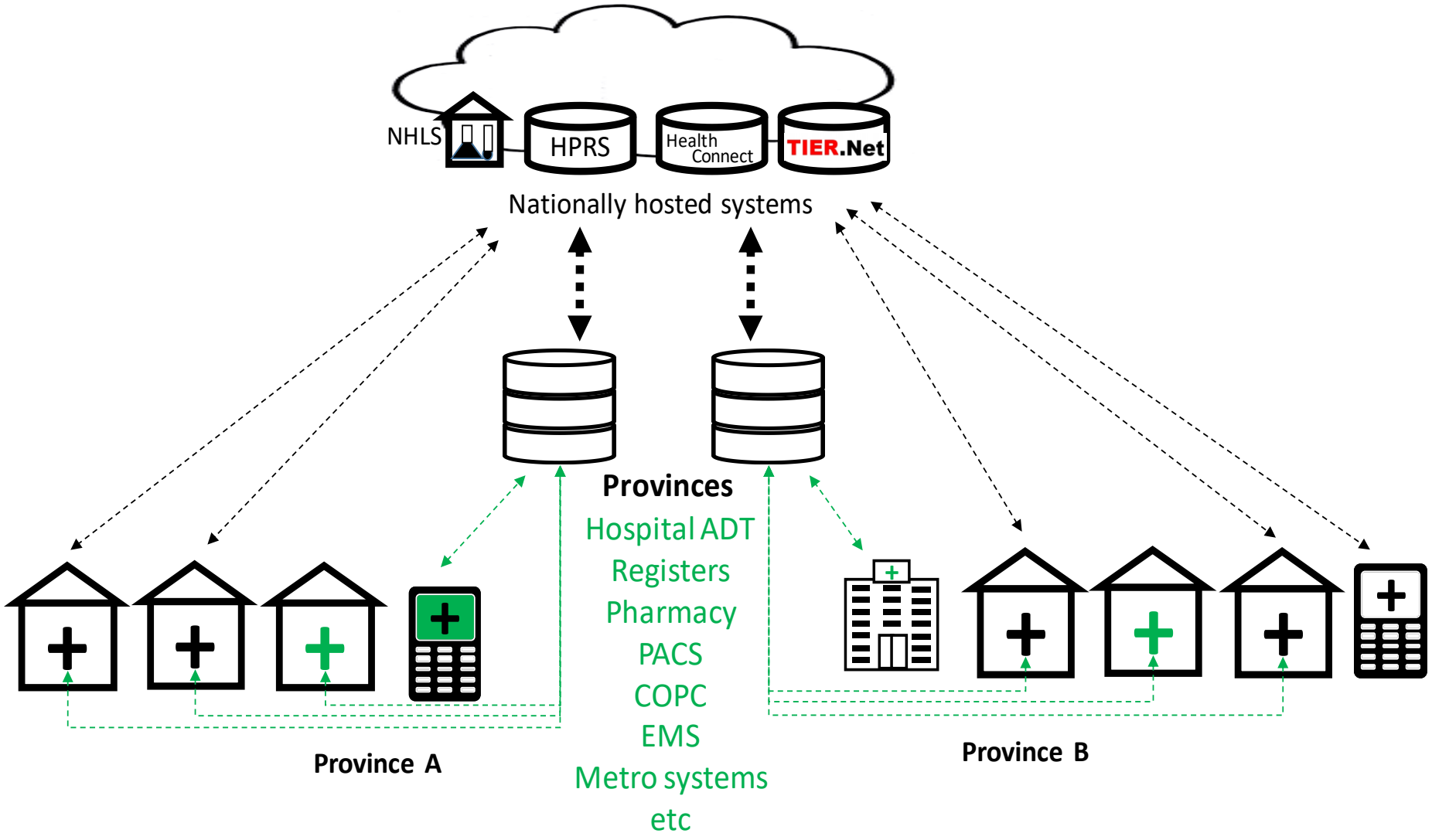
Patient	Preg. number	Start Date	End Date	Last Contact	Evidence list	End date evidence list	Facility	Confidence
xxx	1	2015-01-23	2015-06-16	2015-06-16	Birth Record, Diagnosis code, Rhesus Test, Iron & Folate	Birth Record, Diagnosis code	Hosp A	0.95 → High confidence

Cascade built by combining episodes with attributes, co-morbidities and health observations of interest

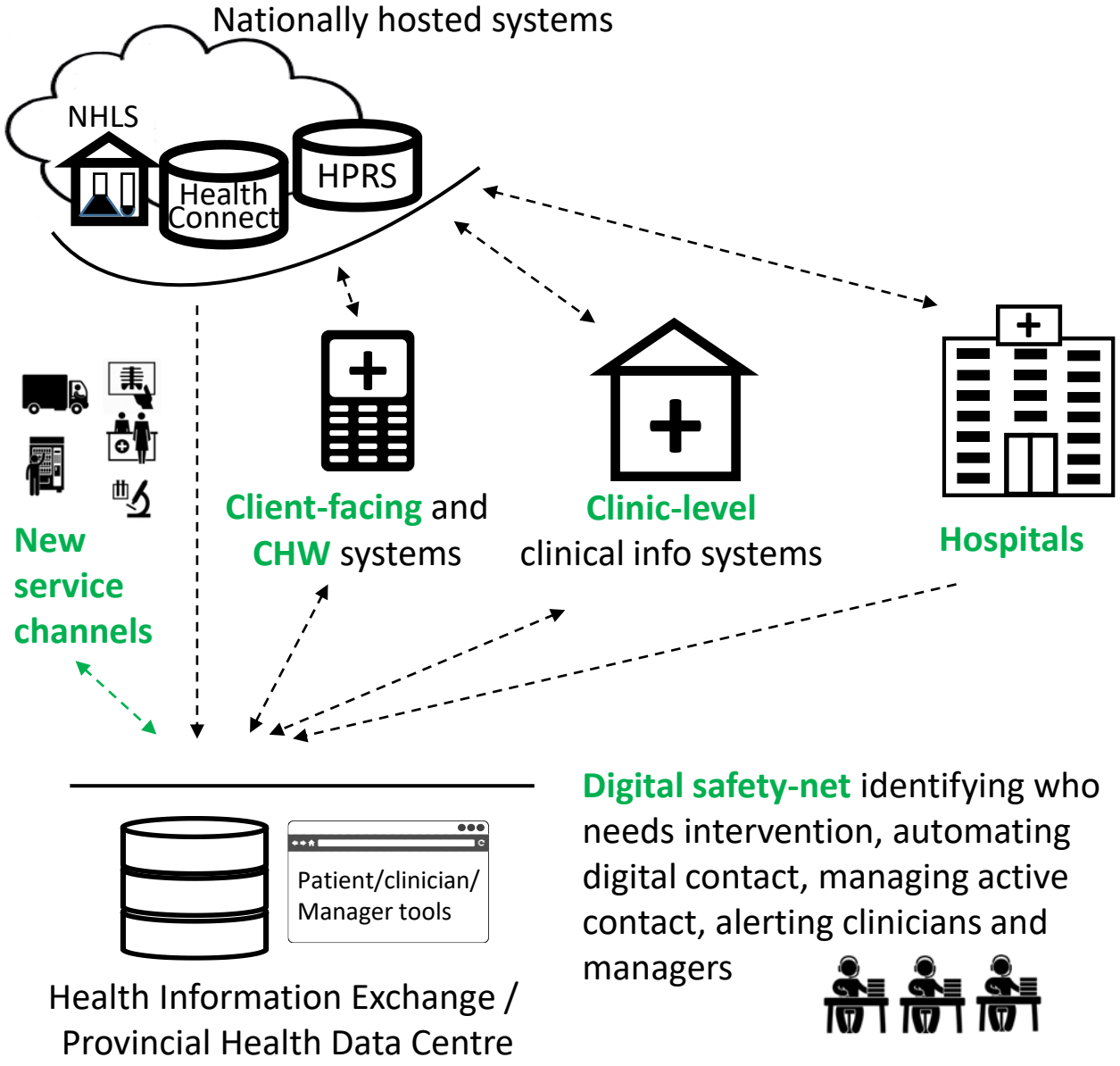
Maternal cascade

First evidence date	Out-come date	Estimated gestational age	Infant Out-come	Delivery method	Birth Wt.	Mother HIV status	Infant HIV status	Con-genital anomaly	Co-morbidities	Evidence list	Facility	Con-fidence
2015-01-23	2015-06-16	40 weeks	Live birth	Vaginal delivery	2800g	On ART (2012)	Negative (2016)	None	Diabetes (2011)	Birth Record, Diagnosis code, Rhesus Test, Iron & Folate	Hosp A	High

Data flow generalisation



Transforming chronic disease care through data consolidation of person-level health data



Interfacing with **patients**, **CHWs**, **clinicians** and **managers**, to improve the quality and continuity of clinical care provision

by

- Using **digital safety-nets** and direct interactions with patients (automated and through a contact centre) to enable new care delivery approaches
- Supporting **new digitally-supported service delivery channels** (eg. logistics hubs, physical or virtual) partnering with industry
- Applying modern data science approaches to **population-wide consolidated data** to intelligently support clinical care, service management and digital patient interactions
- **Leveraging patient autonomy and agency** through client-facing solutions which support adherence, self-management and differentiated care

Population-wide health and health system intelligence

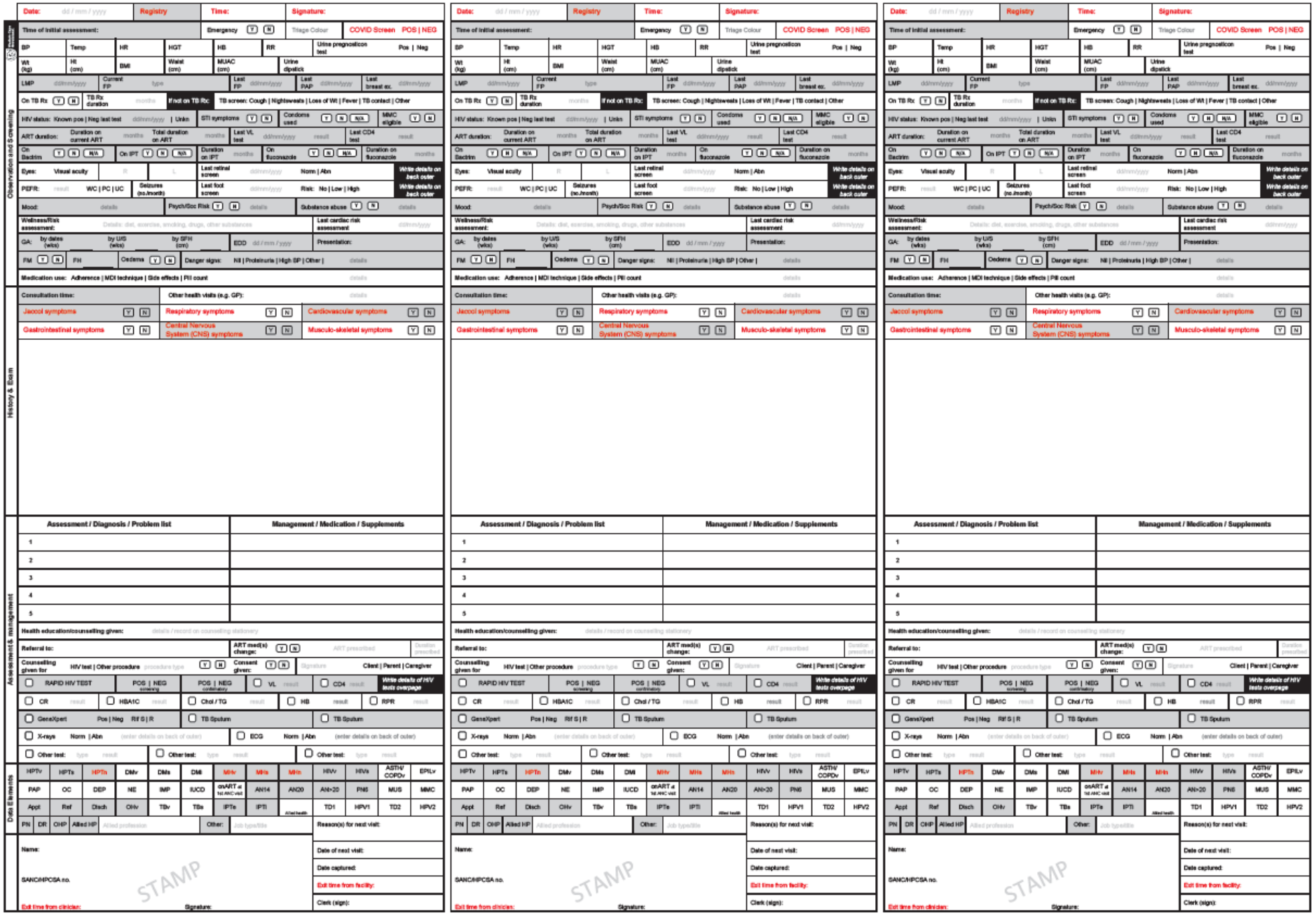
NHLS-National Health Laboratory Service; HPRS-Health Patient Registration System

Where to prioritise?

Client registry / provider registry / facility registry

- These are core underlying systems

Quick wins

- **Hospitals** – electronic discharge summaries
- **Laboratories** - digitise
- **Primary care**
  - Integrated stationery
  - Single digitisation moment - regsitry
  - Initially replicate the integrated stationery with printed outputs
  - Dispensing data in larger facilities – high throughput areas
- **Centrally**
  - Ensure everything routes through the exchange

Integrated clinical stationery