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Information technology and improving patient safety in Singapore hospitals: Turning ideas into action

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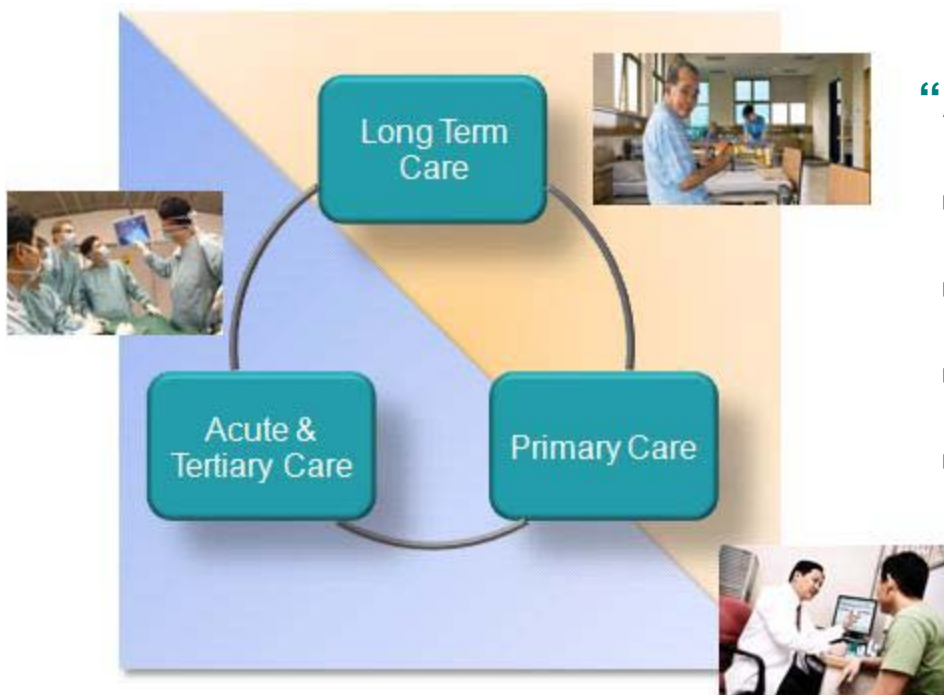
November 2010

Getting ready for the “silver tsunami”

Pressures on Singapore healthcare system set to increase

By 2030 ➤ 1 in 5 Singaporeans will be over 65

By 2050 ➤ Singapore will be among the world’s demographically oldest countries with median age of 54



“A Different Pattern of Healthcare”

- Integrated healthcare delivery system
- Appropriate care from the right site
- Better allocation of resources
- More cost-effective treatment and care in the healthcare continuum

New Directions

We need to do more than building more acute hospitals ...



Khoo Teck Puat Hospital (2010)
550-bedded regional hospital



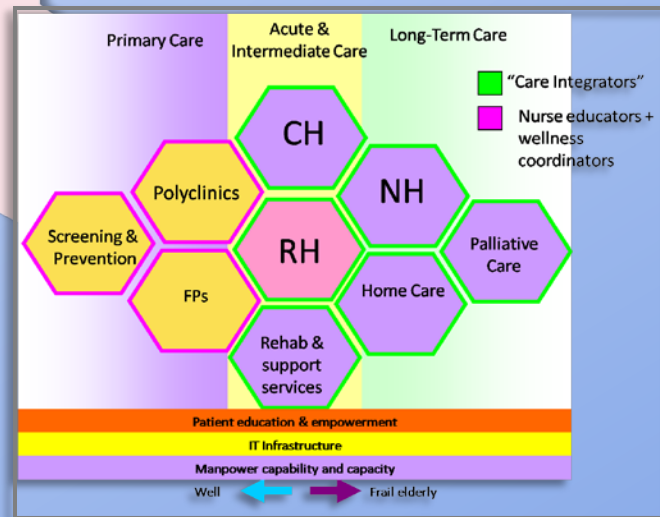
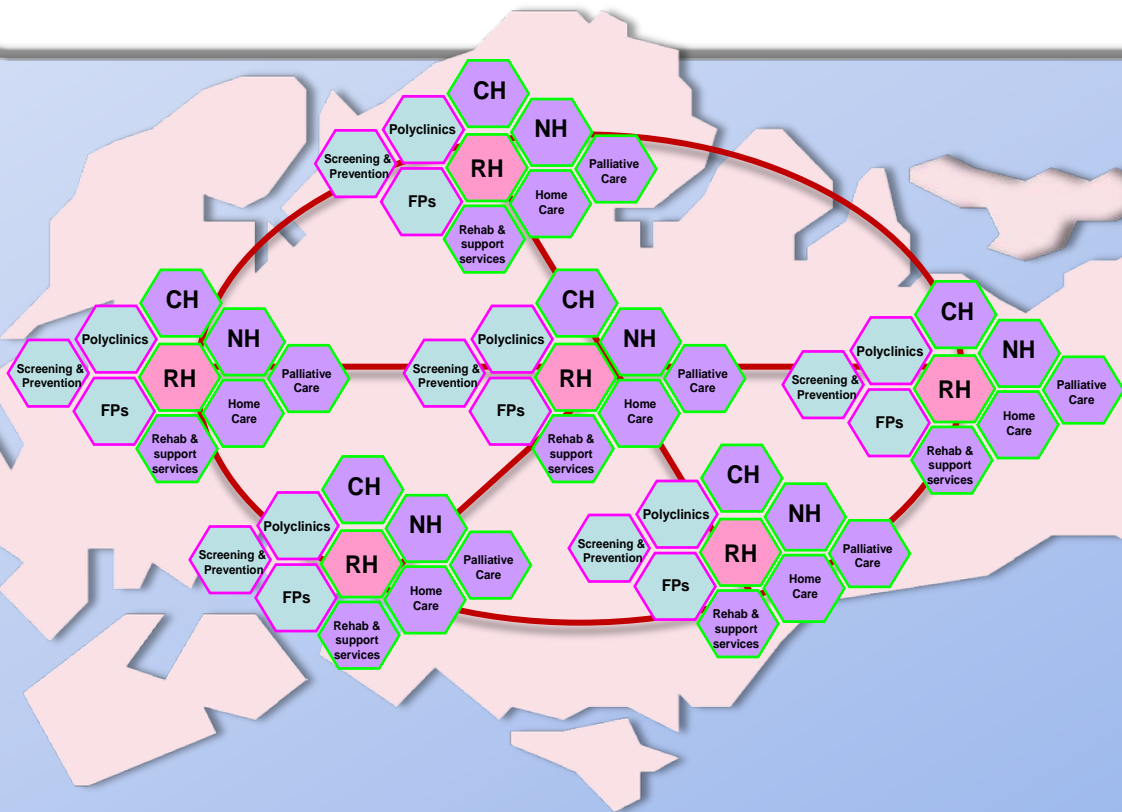
Jurong General Hospital (2014)
700-bedded regional hospital

- Community hospitals, nursing homes ...
- Train and/or recruit healthcare providers ...
- Support informal care givers ...
- Address incentives, disincentives ...
- New responsibilities, accountabilities ...

Healthcare landscape of the future

Strategic vision of patients moving seamlessly across the healthcare system, receiving coordinated patient-centric care at the most appropriate settings.

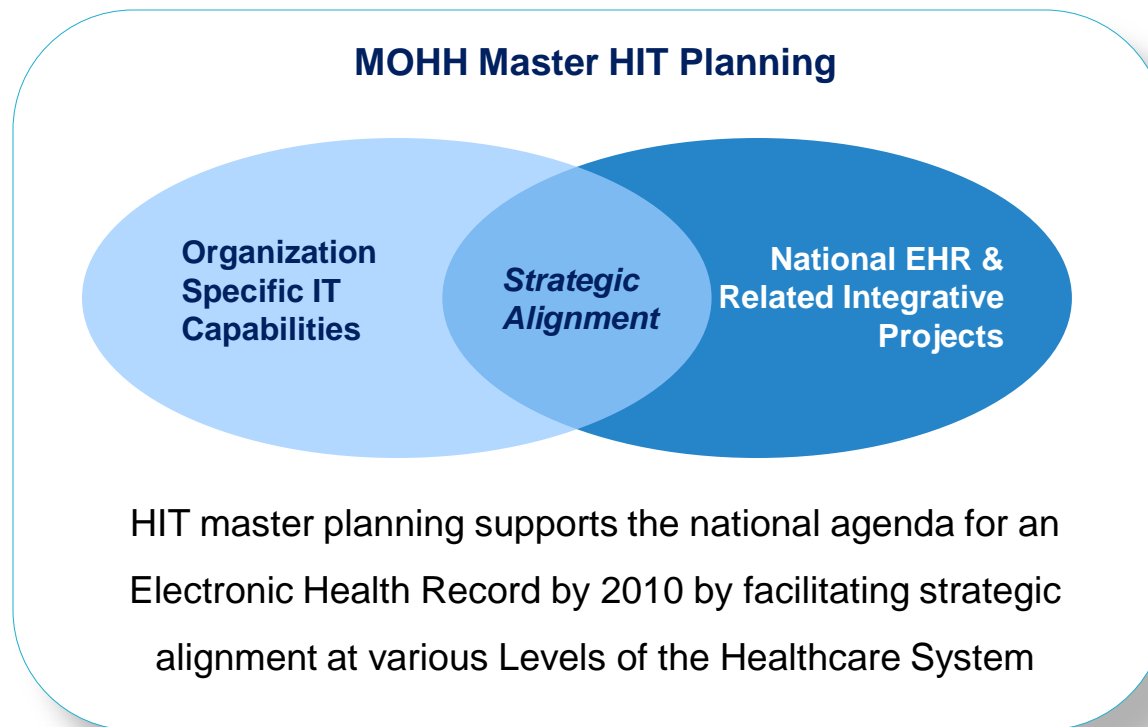
Enabled by the National Electronic Health Record (EHR)



So what about IT?

MOHH Information Systems Division (ISD)

Provides leadership in setting strategic direction for Singapore's national health informatics strategy



Vision of “One Patient, One Record”

The EHR is an integrated healthcare record centered on each person. It extracts and consolidates in one record, all clinically relevant information from their encounters across the healthcare system throughout his/her life.

Secure “real-time” access to patients’ EHR by authorised clinicians and healthcare providers:

- enable greater coordination and informed decision-making,
- resulting in more accurate diagnosis, better treatment and patient-centric integrated care.



The difference between EMR and EHR

EMR

Specific to a facility (institution, private office)

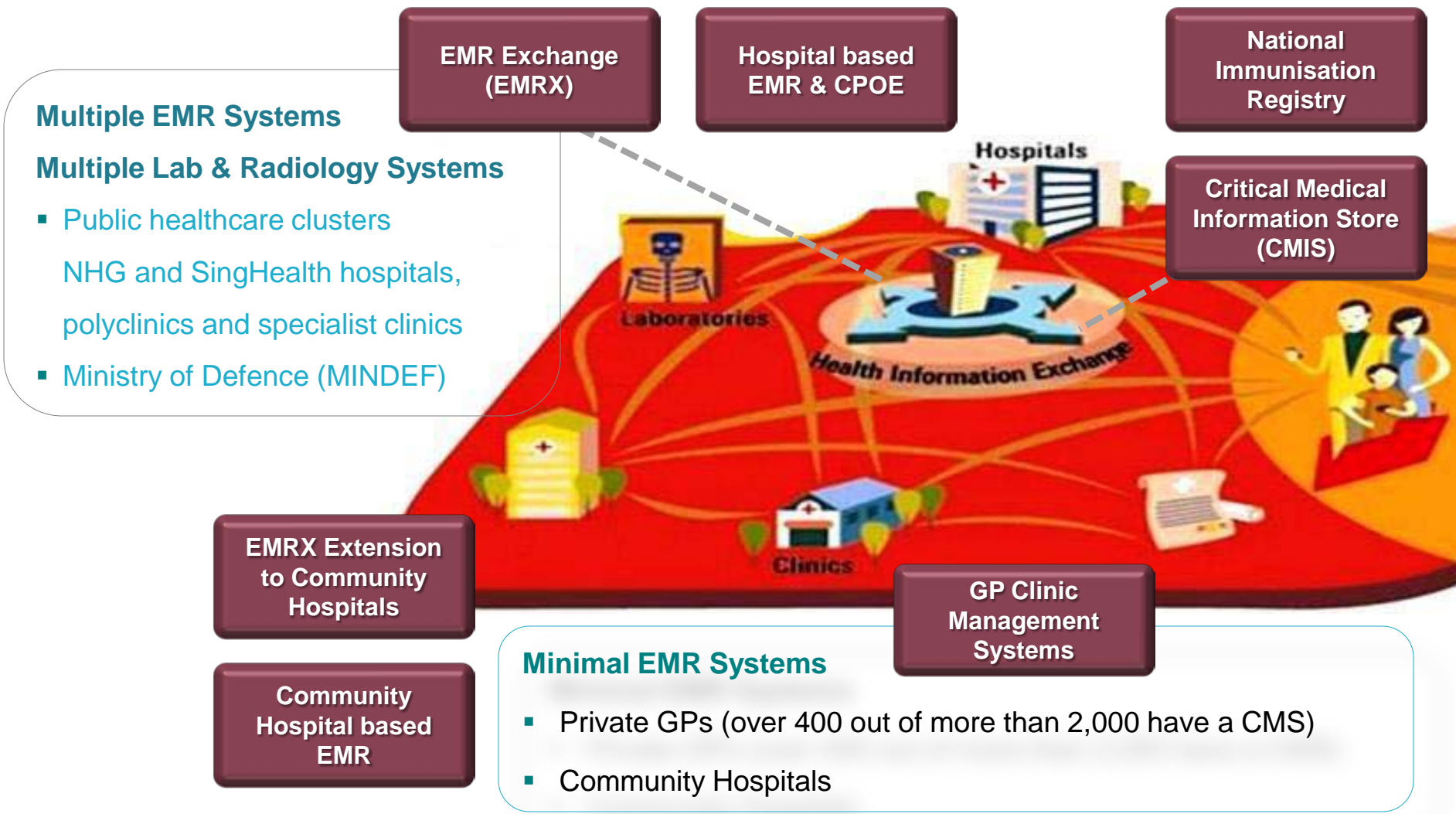
- Equivalent of its paper predecessor:
- includes everything recorded by the organization about a given patient
- Has “depth” but lacks “breadth”

EHR

Specific to an individual

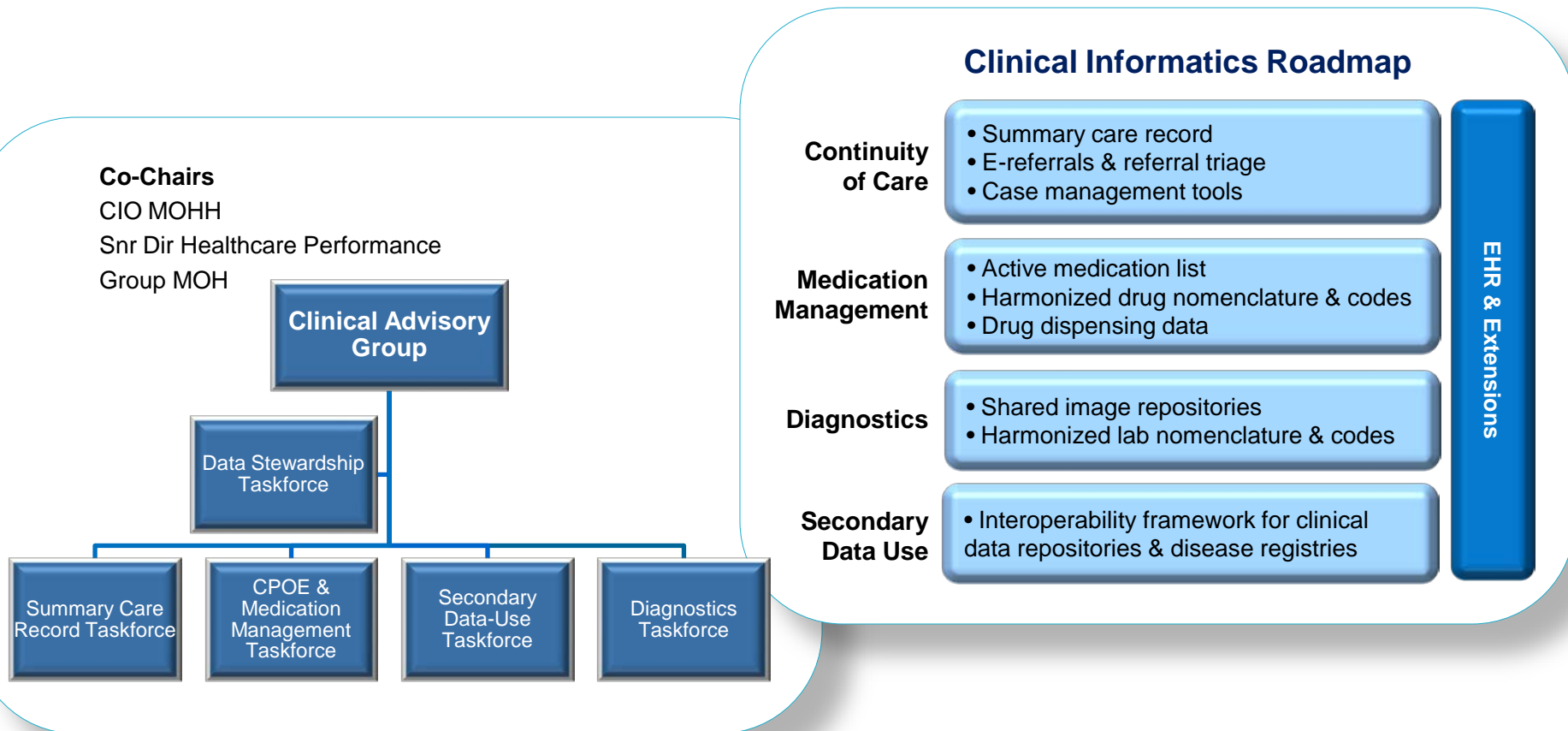
- Captures a key subset of health information from multiple point of service systems
- Available electronically to authorized healthcare providers anytime, anywhere
- Designed to facilitate the sharing of data across the continuum of care, across healthcare delivery organizations and across geographies

Existing eHealth Systems in Singapore



Clinician-defined Clinical Informatics Roadmap

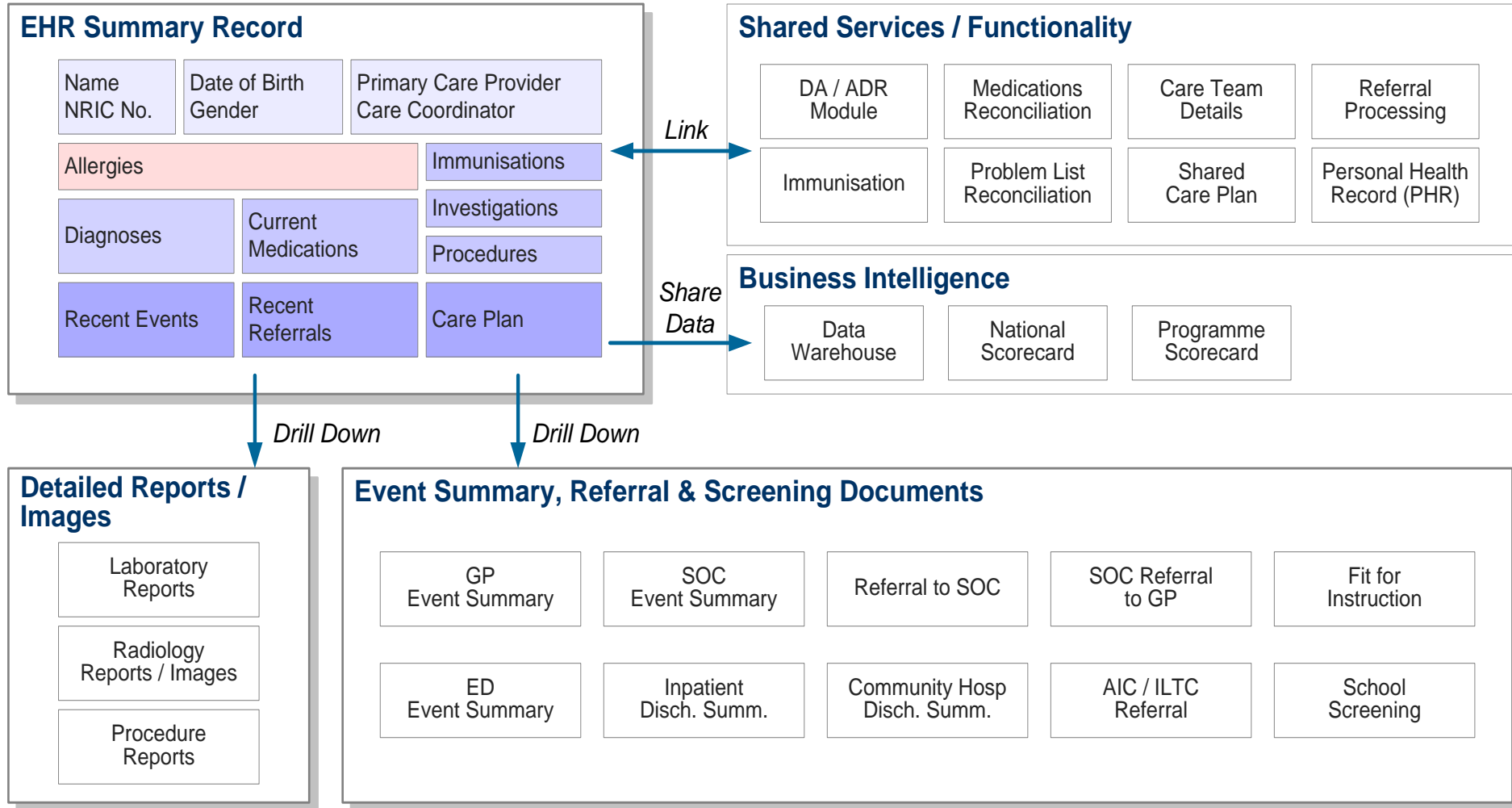
Diverse membership of CAG and taskforces ensure national strategy is representative of broader clinical community interests




What our Clinicians need.....

- Longitudinal summary health care profiles
- Consolidated view of patient's current problems
- Consolidated view of patient's current medications
- Ability to share critical patient information across all providers involved in patients clinical care journey
- Patient information accessible at the point of care – to support clinical decision making.

EHR – Conceptual View



 Applications that are not a part of the EHR solution, but will be integrated with the EHR

Evaluating the Benefits of EHR Investment

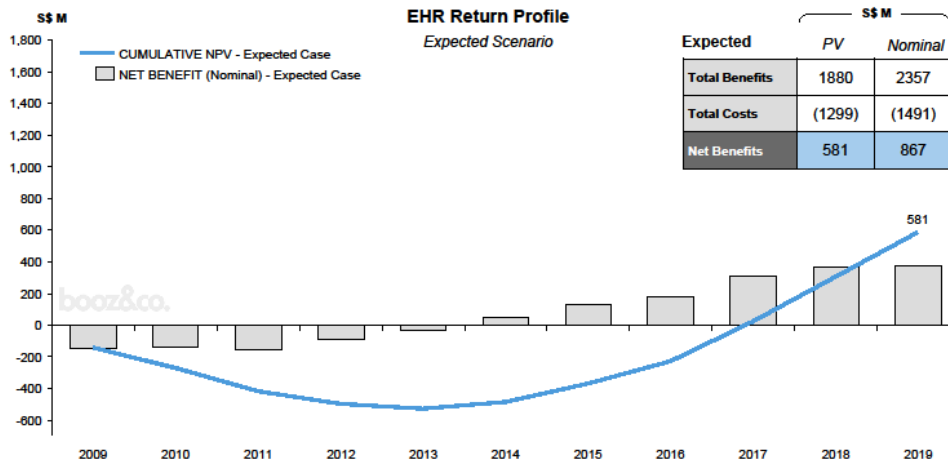
10 Year Investment Strategy

- Identified the investment amount & costs of the EHR
- Determined financial and non-financial benefits
- Quantified the benefits of the investment
- Suggest Implementation strategy

Answering the questions:

- Are we doing the right things?
- Are we doing them the right way?
- Are we getting them done well?
- Are we getting the benefits?

If implemented as assumed, the EHR program will generate an NPV of ~S\$581 M and break even after 7-8 years

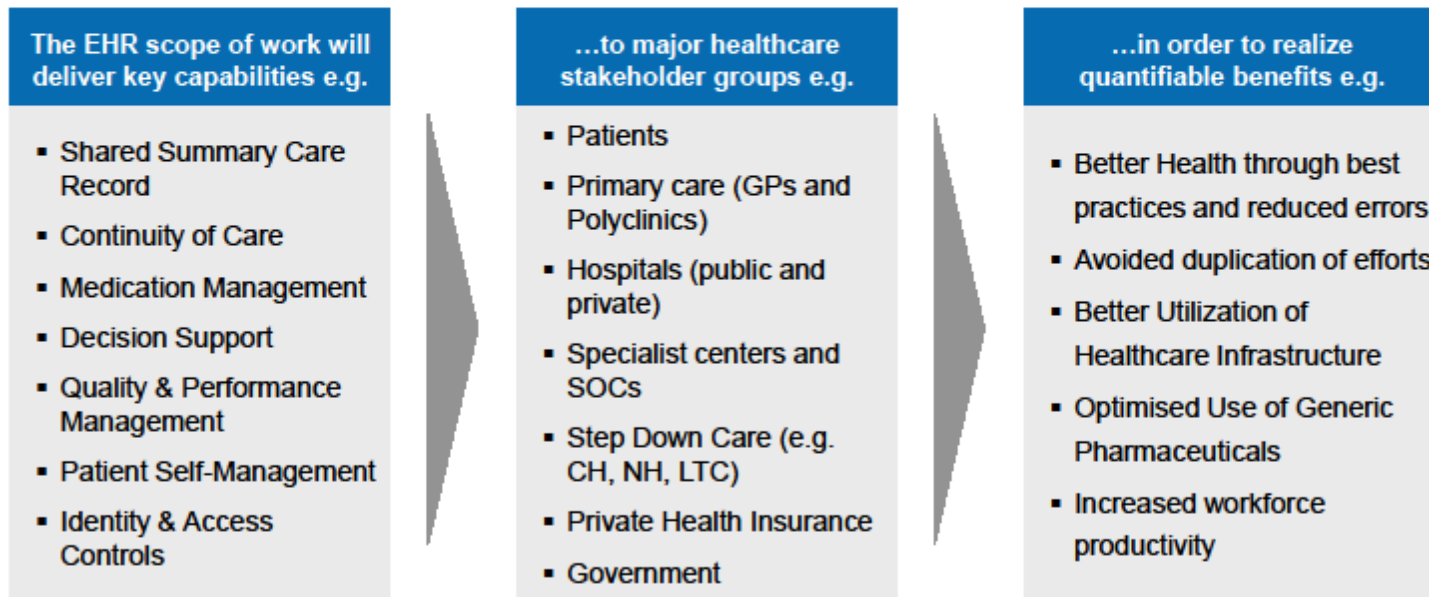


1) Expected scenario assumes 100% of expected benefits are realized; includes cost contingencies of 20%; adoption at expected levels; and health finance reform occurs in 2014
Note: Does not include terminal value

NEHR a Strategic Response

To combat this pressure and improve outcomes, a national EHR initiative was launched to connect key players in the health system

National EHR Initiative Overview



The Evidence: Medication Management & Safety

Ann Acad Med Singapore 2004

Polypharmacy and inappropriate medication use in Singapore nursing homes
Mamun K, Lien CT, Goh-Tan CY, Ang WS.

454 residents involved in study. Polypharmacy and issues with medication use were seen in 266 (58.6%) and 318 (70.0%) residents, respectively.

Most common medication-related problems were the use of medication without proper indication (n = 302), significant potential for adverse drug reactions (n = 281) and drug interactions (n = 141, 30%).

Pharm World Sci. 2003

Koh Y, Fatimah BM, Li SC.

The study population consisted of 347 patients (aged 16-97) on a mean of 7.4 +/- 2.1 medications.

10.8% of the study population had DRPs on admission: 71.9% of which were dominant reasons for admission, and DRPs contributed partly in the remaining cases.

These DRPs were mostly avoidable, and can be broadly classified into non-compliance, adverse drug reactions, require synergistic therapy, inappropriate dose and untreated condition. 52% of these cases were made up of geriatric patients.

The Evidence: Medication Management & Safety

J Emerg Med. 2000

Emergency department patient knowledge of medications

Vilke GM, Marino A, Iskander J, Chan TC

Therapeutic decisions made by Emergency Physicians are often influenced by which prescribed medications are being taken by patients.

Only 48% of patients could recall or produce a list or the actual bottles of all of their medications, 39% knew the times they take their medications, and only 24% knew all the dosages. Although knowledge of medications is often critical for decision making in the ED, a significant number of patients are unable to provide this information.

JAMA 1997

Factors related to errors in medication prescribing.

Lesar TS, Briceland L, Stein DS.

The most common groups of factors associated with errors were those related to knowledge and the application of knowledge regarding drug therapy (209 errors, 30%); knowledge and use of knowledge regarding patient factors that affect drug therapy (203 errors, 29.2%); use of calculations, decimal points, or unit and rate expression factors (122 errors, 17.5%); and nomenclature factors (incorrect drug name, dosage form, or abbreviation) (93 errors, 13.4%).

The Evidence: Medication Management & Safety

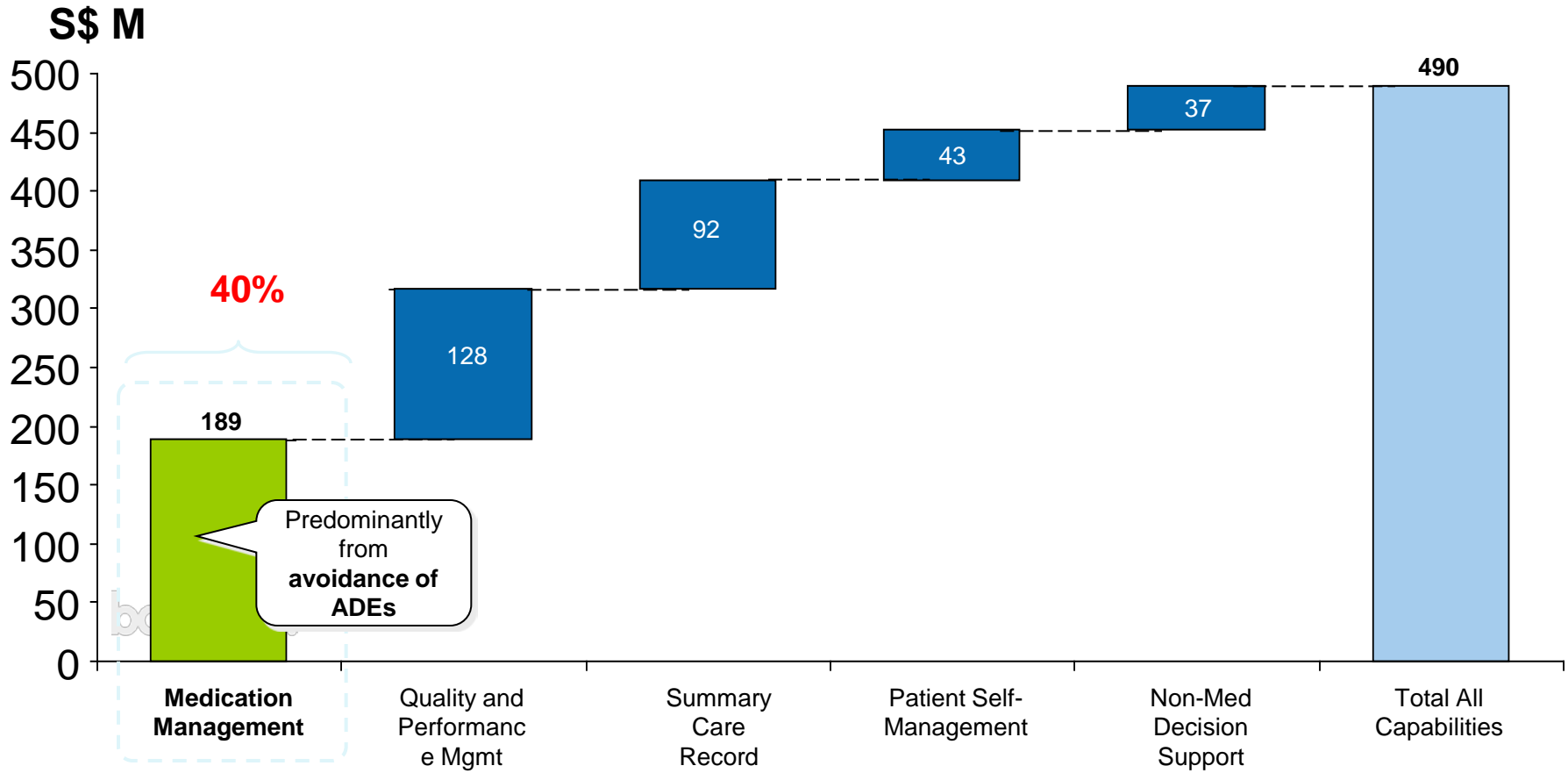
Systems analysis of adverse drug events. ADE Prevention Study Group.

JAMA. 1995 Jul 5;274(1):35-43; Leape LL, Bates DW, et al

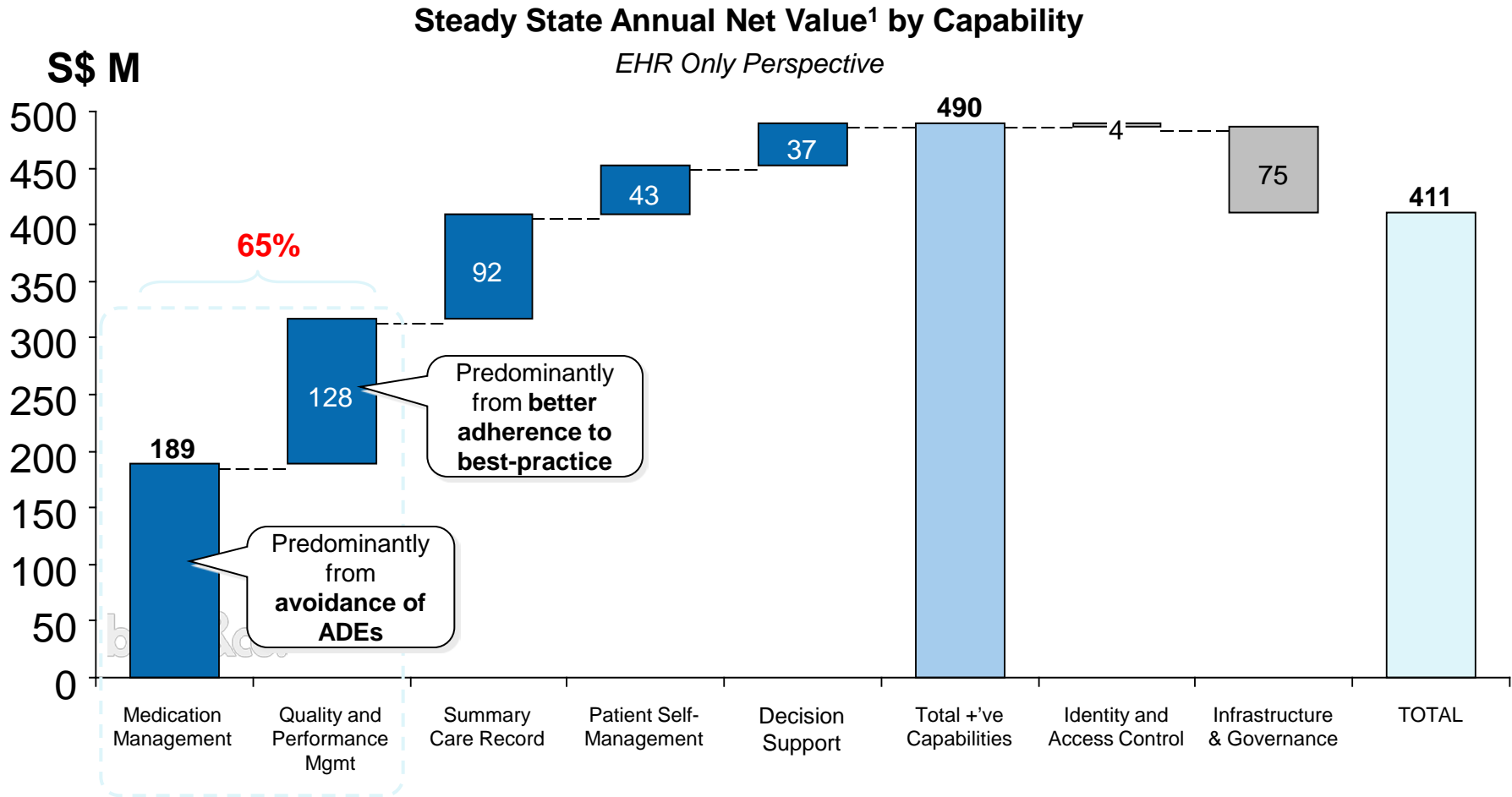
- 334 errors were detected as the causes of 264 preventable ADEs and potential ADEs.
- **Sixteen major systems failures were identified as the underlying causes of the errors.**
- The most common systems failure was in the dissemination of drug knowledge, particularly to physicians, accounting for 29% of the 334 errors.
- Inadequate availability of patient information, such as the results of laboratory tests, was associated with 18% of errors.
- **Seven systems failures accounted for 78% of the errors; all could be improved by better information systems.**

Preliminary analysis suggests that ~40% of ongoing NEHR benefits are a result of better Medication Mgmt.

Steady State Annual Net Value by Capability



NEHR analysis shows that ~65% of ongoing benefits are a result of better Medication Mgmt. and Quality and Performance mgmt.



1) Steady state refers to the value generated once the program has ramped up (i.e., in 2019), Annual net value considers ongoing benefits in 2019 less ongoing costs
 Note: Connected Care and Advanced Capabilities do not accrue any quantitatively sized steady state benefits / costs - hence are excluded from this figure

Need to Unleash The Benefits of Healthcare IT

Key infrastructure and technology needed

Network Infrastructure

- High Speed Network

Leadership and Governance

Interoperability and Standards

- Enterprise Architecture
- National Data Standards

Change Management

Strengthening Analytics

- Exploit the power of technology



Interoperability – Standards

Establishing a suite of standards that are:

- Clinically-Driven
- Easy to Use
- Internationally Recognised

to ensure clinical data included in the EHR can be:

- Shared and exchanged safely and reliably for the monitoring and care of patients
- Used meaningfully for secondary purposes including production of clinical knowledge

Global Standards Engagements

- HL7 (Health Level Seven)
- IHTSDO (International Health Terminology Standards Development Organization)
- ISO TC215 on Health Informatics

Standards also provide a platform for long term semantic interoperability and research informatics

Change Management

“It simply doesn’t make sense that patients in the 21st century are still filling out forms with pens on papers that have to be stored away somewhere.

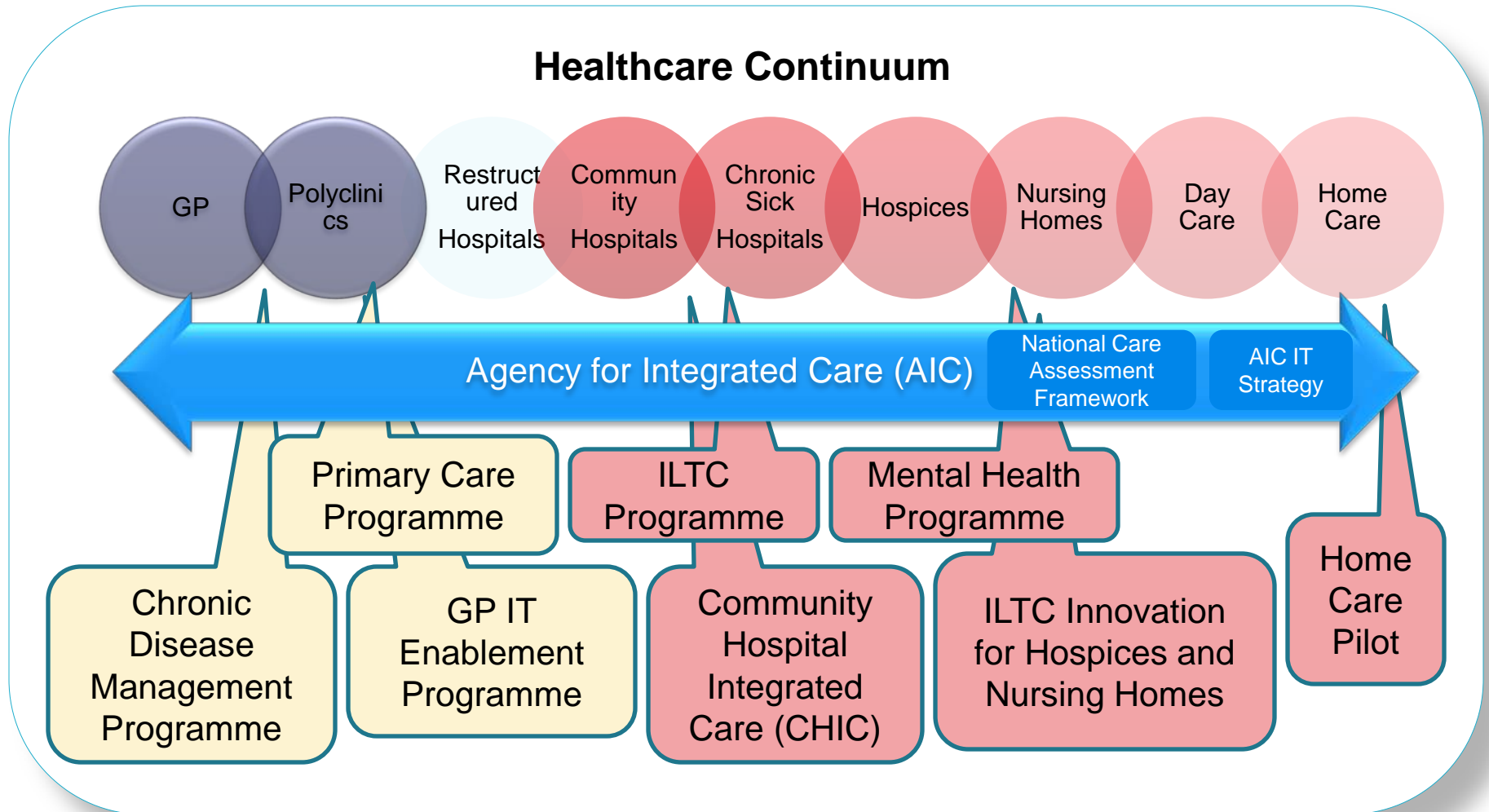
US President Barack Obama
American Medical Association
Annual Conference, 15 June 2009

Need to manage change as large majority of clinicians learnt their professions in the absence of automation, and continue to practice without it

Concerns	Programmes & Initiatives
Privacy of patient information	Privacy and Security Framework
Impact on efficiency of work	Process redesign & workflow integration
Cost of automation	Subsidies and incentives
Quality of available solutions	Common functional requirements definition
How to make transition from paper-based to e-documentation	Peer network & transition support services

Beyond the NEHR

Supporting systems that need to be in place to fully realize NEHR benefits



GP IT-Enablement Programme

Aim to support clinical transformation in GP healthcare sector:

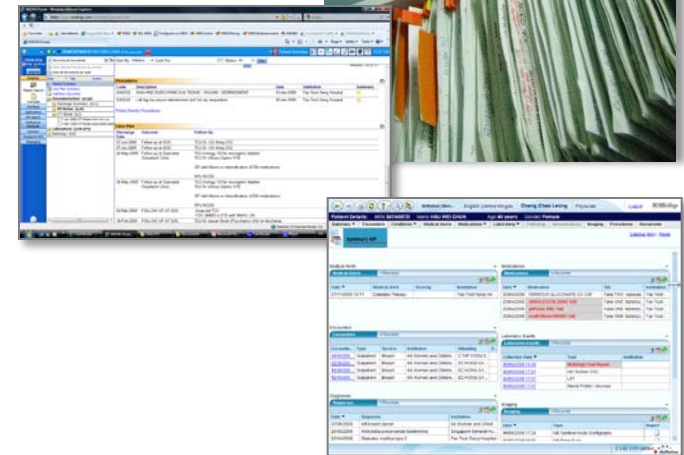
- Pillar 1: Support *clinical transformation* within clinic practice
- Pillar 2: Strengthen *care partnership* and linkages
- Pillar 3: Encourage *professional collaboration* through trusted relationships and networks within the primary care sector

5-year Strategy

- Developed in consultation with 100+ GPs over past year, including international experts and professional bodies (CFPS, SMC, SMA)

Phase 1 in progress

- Implementing CMS-EMR solution for 50 GPs



Community Hospital Integrated Care (CHIC)

Aim to implement a common platform to support 6 Community Hospitals' operational and clinical needs

- Improve patient care
- Enhance operational efficiency
- Contribute national initiatives

Obtained buy-in and alignment across all 6 CHs

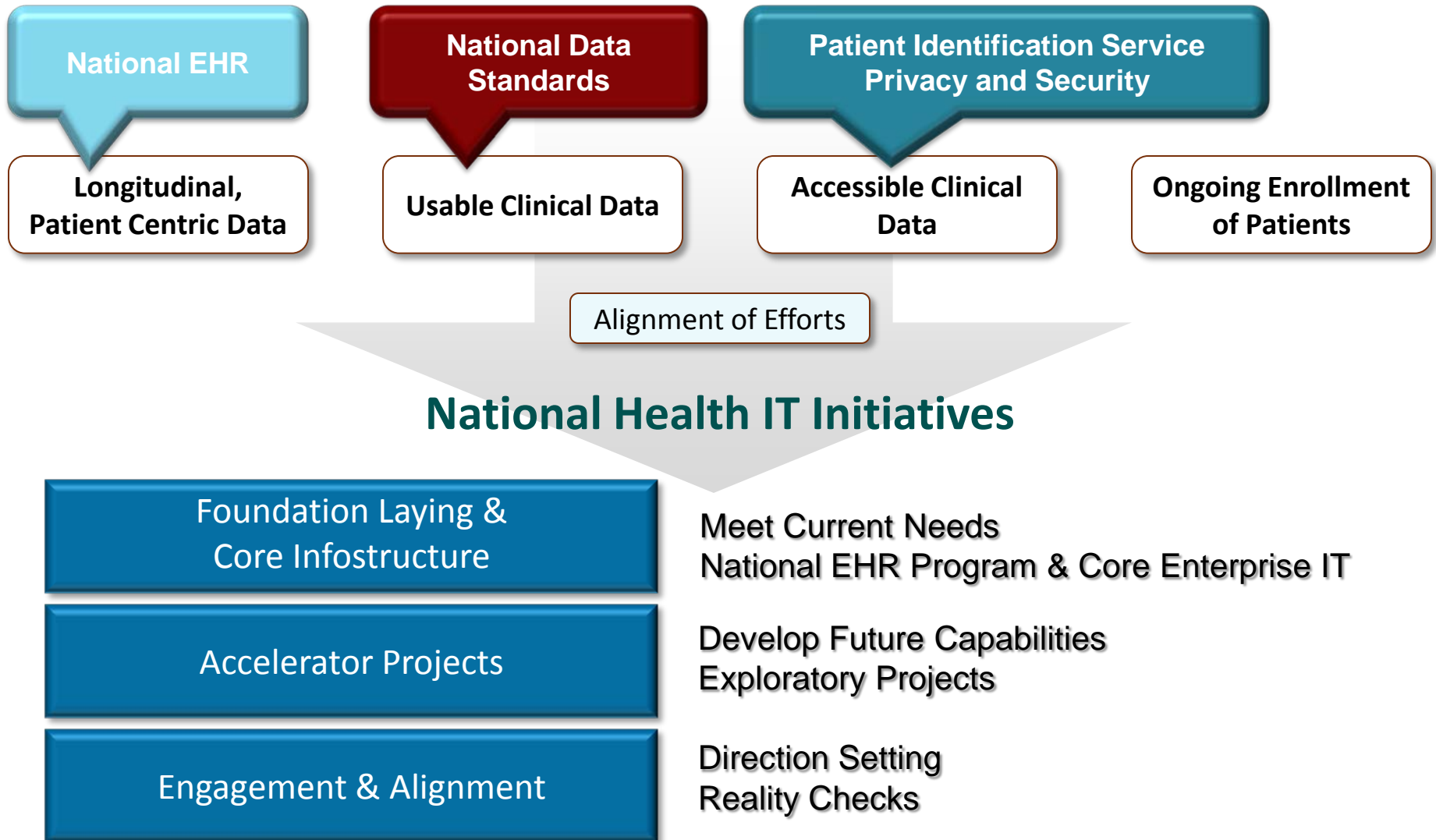
- Setup of a MOH-MOHH-CHs committee to jointly make decisions and agree on harmonised requirements

Programme review in progress

- Alignment with regional health services (RHS) model
- Validating CHs needs and priorities
- Aligning with National EHR Enterprise Architecture



Leveraging National HIT for Analytics & Research



The promise of the EHR

Better Clinical Care and Streamlined Workflows

Patient information at the point of care

- Supports clinical decision making and workflows
- Enables providers involved in patient care journey to work as a team
 - Seamless transition of patient into different care settings
 - Better management of chronic illnesses
- Enables greater patient participation and supports self-help

Better Practices and Greater Patient Safety

Shared patient's clinical records

- Enforces better prescribing practices with peer reviews
- Reduces human errors related to handwritten records
- Takes the guesswork out from the lack of past records
- Prevents duplicate and unnecessary tests; and adverse drug events



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