Total Expenditure on Health as Percentage of GDP

- USA
- France
- New Zealand
- Sweden
- Australia
- Japan
- Hong Kong

5.4% = 2.4% + 3.0%

Sources: (1) Census and Statistics Department, 2011 GDP
(2) OECD Health Data October 2012
February 1973
J. Ingram White

- Off lidocaine 1% etopressin
- Adrenergic 1% epinephrine
- Etopressin 1% epinephrine
- Hydration 1 L intravenous
- Intravenous 1 L 6 mg/kg
- None on antibiotics, immediate fever & shakiness

Plan: Local debridement, admission, antibiotics for possible infection
“…net savings from national implementation of fully standardized interoperability between providers… could yield $77.8 billion annually”

“…We suspect that the clinical payoff in improved patient safety and quality of care could dwarf the financial benefits projected…”

Key Message

A standardised eHealth system can achieve better, safer, more efficient care delivery on an industrial scale at a reasonable cost
Established 1991

- 42 Public Hospitals
- 47 Specialist Outpatient Clinics (SOPD)
- 73 General Outpatient Clinics (GOPC)

- Close to 28,000 Beds
- Around 70,000 Staff
- Around 22,700 Nurses
- Around 5,700 Doctors
- Around HK$ 50B Annual Operating Budget (~AUD$8B)

- 6.10m GOPC Attendances
- 9.37m SOPD Attendances
- 2.24m A&E Attendances
- 1.57m Inpatient and Day Patient Discharges

Source:
1. HA Statistical Report 2012/13
2. HA Information Fact Sheet Jun 2014
3. www.ha.org.hk

eHealth in the HA - The Road Less Travelled

- 1990 “Green fields”
- 1991 Patient administration + Departmental systems
- 1995 Clinical Management System (CMS)
- 2000 Electronic Patient Record (ePR)
- 2003 eSARS
- 2004 ePR Image Distribution
- 2006 PPI ePR sharing
- 2008 CMS Phase III
- 2009 Filmless HA
  - Hong Kong wide eHR
- 2010 Inpatient MOE
- 2013 Mobile CMS
Electronic Patient Record

HA’s Clinical Management System - An essential clinical tool

- **9M** patients
- **223M** episodes of care
- **1B** laboratory results
- **115M** radiology studies
- **388M** drug items
- **3.5M** updates / day
- **700K** hits / day
- **Sub-second** response time
- 7x24 > **99.98%** uptime since live run
The Seven Principles of Highly Effective Informaticians

1. The customer is always right
2. Medicine is an art and a science
3. Win - Win - Win - Win - Win - Win
4. One step at a time
5. Use it or lose it
6. Focus and prioritize
7. Embrace your informaticians
Principle 4: One Step at a Time

“Crossing the river, feeling one stone at a time”

Deng Xiaoping

Clinical documentation in the CMS: (1st Generation) Clinical coding

- ICD codes with extensions
- Clinician friendly terms attached to these codes
  - Multiple input mechanisms
Clinical documentation in the CMS:
(2nd Generation) Clinical Data Framework (CDF)

- Document disease
  - No coding required
- Generic framework with disease specific data

Clinical documentation in the CMS:
(3rd Generation) Generic Clinical Documentation (GCD)

- Flexible forms
- Structured data linked to terminology
- Automatic documentation with code generation
- Reuse of data previously entered
Principle 5: Use it or Lose it

Data use
Low data use
Poor data quality

Diabetes mellitus data capture

1. Enter Consultation Note
2. Select Specialty Form
3. Retrieve DM type and laboratory test results from ePR
4. Save DM FU Form
5. Return DM FU data to Consultation Note as free text and allow modification

ePR / Data Warehouse
Documentation becomes knowledge

Management data should be a byproduct of clinical documentation

Diseases & Procedures
Departmental data
Clinical documentation

Data warehouse

Clinical Data Analysis & Reporting (CDARS)

ePR

Reports & Analytics

Principle 1: The Customer is Always Right

Communicate, Engage, Align
Information Management in the Hospital Authority

- Allows data reuse - reduces transcription
- Improves data presentation
- Facilitate decision support
- Assists data retrieval/reporting
- Facilitate hospital management
- Enables new modes of care delivery

CMS III: A sustainable architecture

Security & privacy framework

Cients & displays

Service layer

Information standards & architecture

Electronic Patient Record
Generic Clinical Documentation (GCD) Thru’ Train
Example: Nursing Patient Assessment

### Patient Assessment Form

- **Physical Examination**
  - Vital signs
  - Body measurement
  - Urinalysis
  - Level of consciousness
  - MEWS
- **Social History**
  - Education
  - Religion
  - Household members, etc
- **Risk Assessment**
  - Infection
  - FTOCC
  - Fall
  - Pressure Ulcer
  - Missing
  - Suicide
- **Functional Assessment**

---

Is patient is at risk of pressure ulcer upon admission assessment?

- Pressure Ulcer: • At risk • Not at risk

---

Select the criteria in 'Criteria List'

- Risk of pressure ulcer
  - At risk
  - Not at risk

---

Selected Criteria

- Risk of pressure ulcer in {
  - At risk
  - Not at risk
}

---

[Add Criteria]
### CDARS Report

<table>
<thead>
<tr>
<th>Institution (EIS)</th>
<th>At Risk</th>
<th>Not at Risk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Forms</td>
<td>4944</td>
<td>41737</td>
<td>46681</td>
</tr>
</tbody>
</table>

**Pending update**

---

### Medication management in the CMS

- **1995**: Discharge medication
- **1996**: Outpatient prescriptions
- **2002**: Drug checking
- **2013**: Inpatient closed loop medications
Stage 1: Discharge and outpatient prescriptions

• Legible, standardized orders
  — Standardized formulary
  — Structured data
• Link to pharmacy
• Full medication history
  — Reduced transcription

Stage 2: Drug checking

• Purchase of third party drug checking system
• Capture allergies as structured data
• Monitor override reasons
  — Adjust level of alerts
• Add customized checking logic
Improving medication safety

• Since 2005, a CMS alert has caused the prescribing doctor to change a medication over 350,000 times
  – Allergy - 272,303 times
  – G6PD - 9,548 times
  – Pregnancy - 25,502 times
  – Drug-drug interaction - 38,162 times
  – Adverse drug reaction - 9,918 times
Stage 3: Closed loop inpatient medications

- Electronic Prescribing
- Prescription vetting & dispensing
- eMAR & barcoded administration

New Prescribing Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Safety</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV Drugs and IV Fluid infusion</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Permissible diluents</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>White / Black routes</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Conditional order</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Verbal orders</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Common orders</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Standardized drug display</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dose calculation with Body</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Medication reconciliation</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Digital signing</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
Administration Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Safety</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barcoding of right patient, drug, time</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Reminders and task lists</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Standardized schedules</td>
<td></td>
<td>✔</td>
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<tr>
<td>Verbal orders</td>
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<td>✔</td>
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<tr>
<td>Urgent refills</td>
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<td>✔</td>
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<tr>
<td>Barcode labels for prepared drugs</td>
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<td>✔</td>
</tr>
<tr>
<td>Dose calculation with Body weight</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Downtime handling</td>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>

HARRPE
(Hospital Admission Risk Reduction Programme for the Elderly)

Risk stratification for elderly Patients

Targeted intervention by call centre nurses
Hospital Admission Risk Reduction Programme for the Elderly (HARRPE)

Model development and validation

Training Dataset
1.37 million index episodes of target subjects in 2006

4 Validation Datasets
4 quarterly cohorts in 2006 each with a complete cohort of over 0.3 million index episodes

14 Predictor Variables
HARRPE score

Model building

Model

Model validation

Community Health Call Centre (CHCC)

- Identifying at-risk patients from the total population
- Delivering the patient lists to appropriate care providers in a timely fashion
- Enabling new models of care delivery
Community Health Call Centre (CHCC)

2007  High risk elderly (HARRPE)
2011  Mental Health Direct
2012  Chronic Disease Management
2013  Defaulter tracing

The Hong Kong Wide Electronic Health Record
HK-wide eHR Sharing System

DH

HA

ePR

Private Hospitals

Clinics software

EHR Repository

Access Portal

PPP

CMS onramp

HK-wide eHR Sharing System

DH

HA ePR

Private Hospitals

Clinics software

EHR Repository

Access Portal

PPP

CMS onramp

eHR Viewer

<table>
<thead>
<tr>
<th>Problem</th>
<th>Description</th>
<th>Institution</th>
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</thead>
<tbody>
<tr>
<td>10-Feb-2012</td>
<td>Diabetes Mellitus</td>
<td>AHN</td>
</tr>
<tr>
<td>10-Feb-2012</td>
<td>Type II DM with background retinopathy</td>
<td>AHN</td>
</tr>
<tr>
<td>10-Feb-2012</td>
<td>Type II DM with over nephropathy</td>
<td>AHN</td>
</tr>
<tr>
<td>04-Jan-2004</td>
<td>Hepatitis</td>
<td>Hospital A</td>
</tr>
<tr>
<td>04-Jan-2004</td>
<td>Portal hypertension</td>
<td>Hospital A</td>
</tr>
<tr>
<td>04-Jan-2003</td>
<td>Acute upper respiratory infection</td>
<td>Hospital A</td>
</tr>
<tr>
<td>01-Feb-1999</td>
<td>Viral hepatitis</td>
<td>Dr. Wong</td>
</tr>
</tbody>
</table>
**Key Message**

A standardised eHealth system can achieve better, safer, more efficient care delivery on an industrial scale at a reasonable cost.
Bold Claim

A standardised eHealth system can achieve better, safer, more efficient care delivery on an industrial scale at a reasonable cost.

In fact it may be the only thing that can do so.