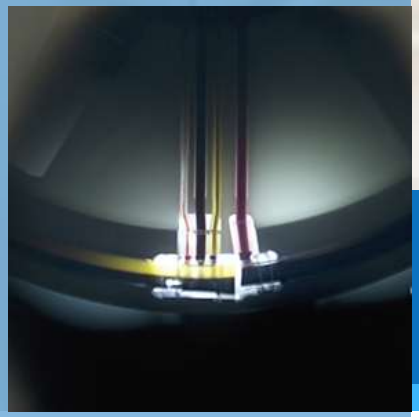
Patient Data Management Systems

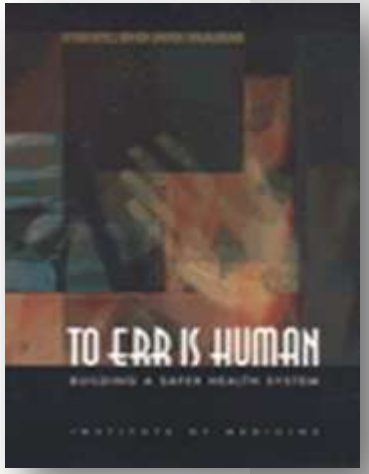
The Good
The Bad
And the Rest …

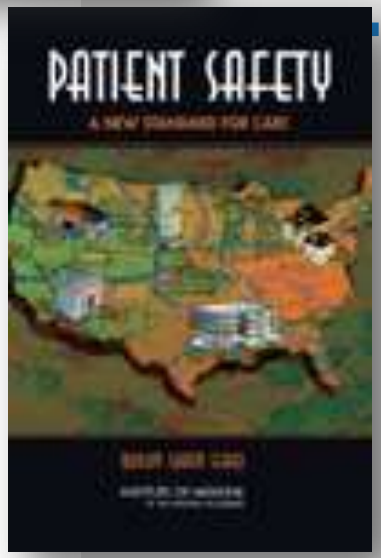


Christian Lovis, MD MPH
Division of medical information sciences
christian.lovis@hcuge.ch

Hôpitaux Universitaires de Genève

errors in healthcare





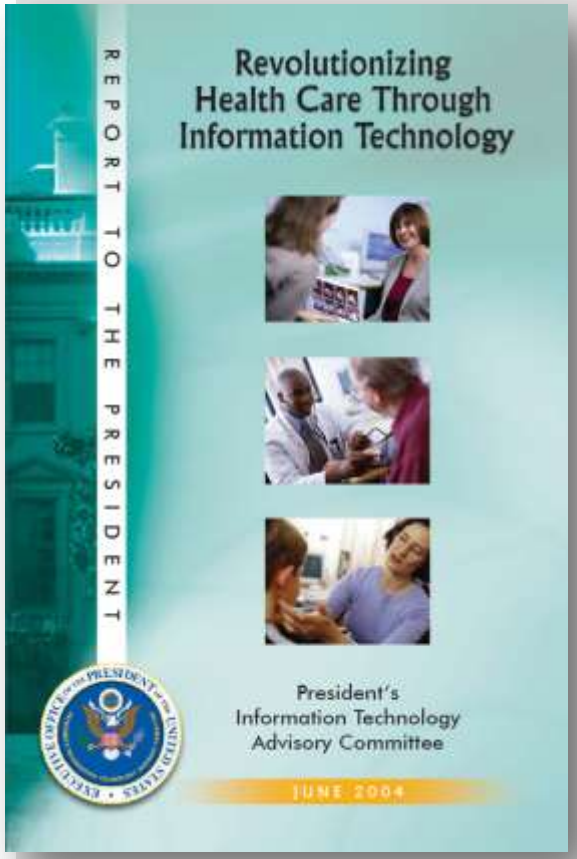
under-use, overuse, misuse of the health care system…

- IOM Roundtable on Quality (JAMA 1998)

“To Err is Human”: building a safer Health System

- 2,9-3,7% inpatients have complications
- 6.6-13.6% lead to death, 50% evitable
- 8th mortality cause in the USA
- drug errors > 7’000 death/y in the USA
- (workers: 6’000)

IOM report 1999, 2003



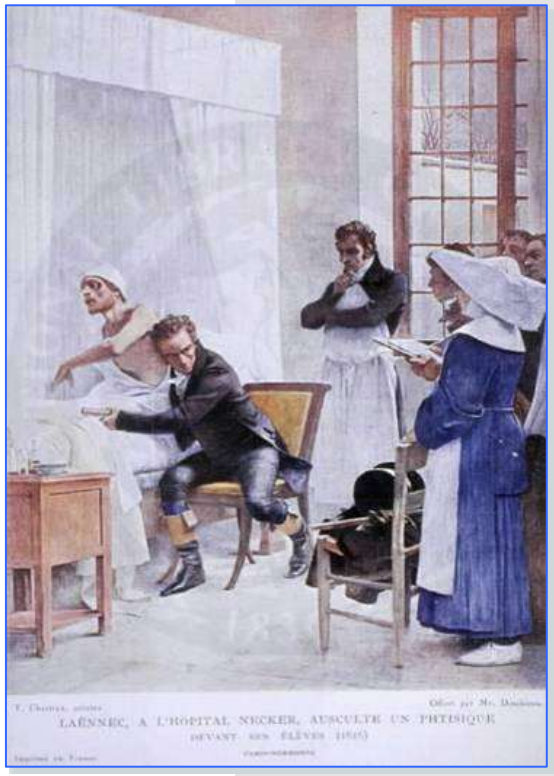
...the most remarkable feature of this twenty-first century medicine is that we hold it together with nineteenth-century paperwork [1]

Standardized clinical vocabulary is essential to computerized decision-support tools using sharable protocols that lower error rates and improve the quality of health care.

Part I—Promoting the Electronic Health Record, Clinical Decision Support, and Computerized Provider Order Entry

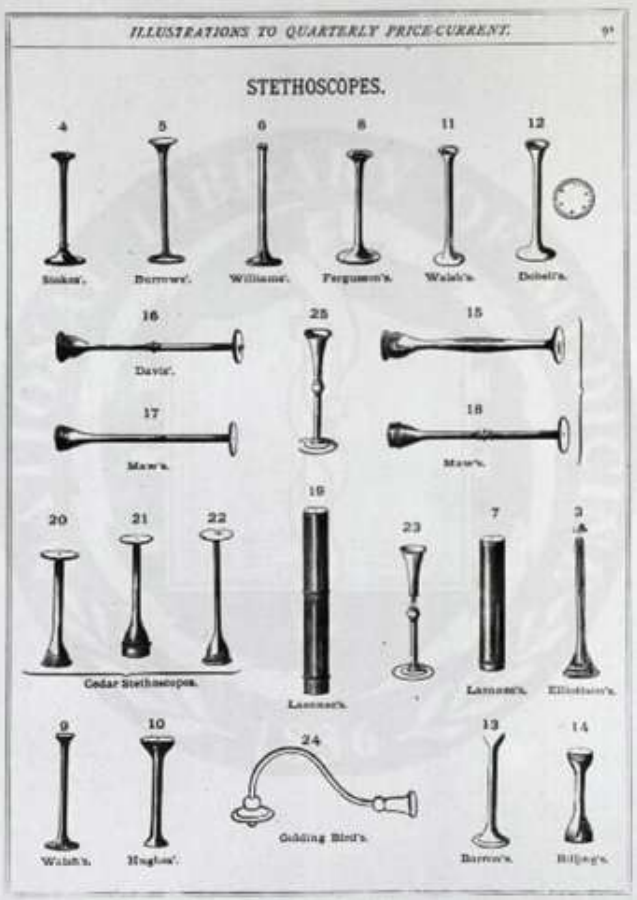
HUG
Hôpitaux Universitaires de Genève

technology



Made of wood and brass, this is one of the original stethoscopes belonging to the French physician Rene Theophile Laennec (1781-1826) who devised the first stethoscope in 1816. It consists of a single hollow tube. The familiar binaural stethoscope, with rubber tubing going to both ears, was not developed until the 1850s. Regarded as the father of chest medicine, Laennec demonstrated the importance of the instrument in diagnosing diseases of the lungs, heart and vascular systems. Ironically, he died of tuberculosis

and tools ...



Geneva University Hospitals

A history of 30 years of PDMS

Nineties : HP CareView

Twenties : EMTek

Currently: GE Clinisoft

Fourth generation on the go …

Challenge One

Interoperability

Integration

Cooperation

Collaboration

Geneva
University
Hospitals

the context

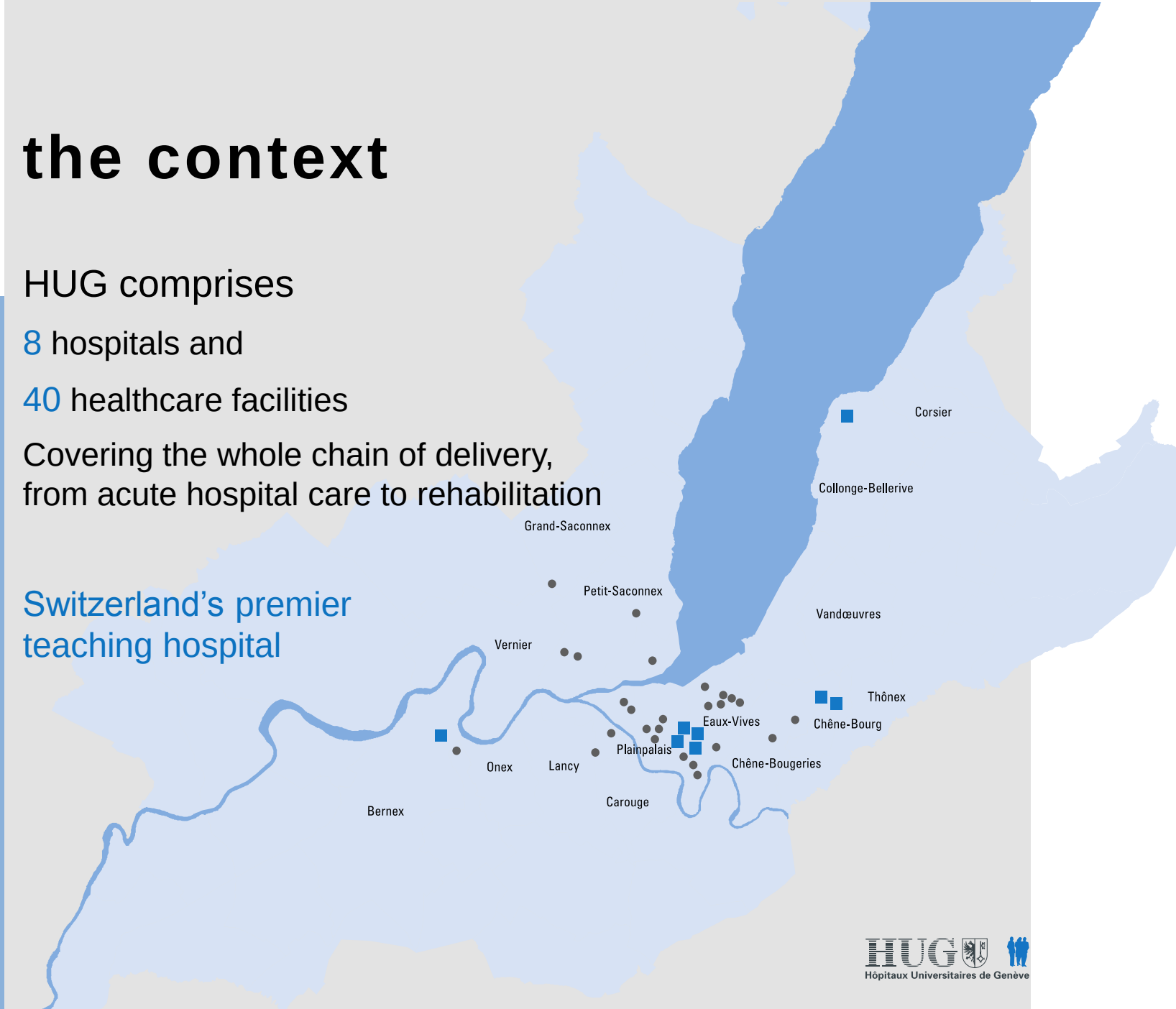
HUG comprises

8 hospitals and

40 healthcare facilities

Covering the whole chain of delivery,
from acute hospital care to rehabilitation

Switzerland's premier
teaching hospital



HUG
Hôpitaux Universitaires de Genève

Geneva
University
Hospitals

inpatients

1908 beds, of which:

36 adult intensive care

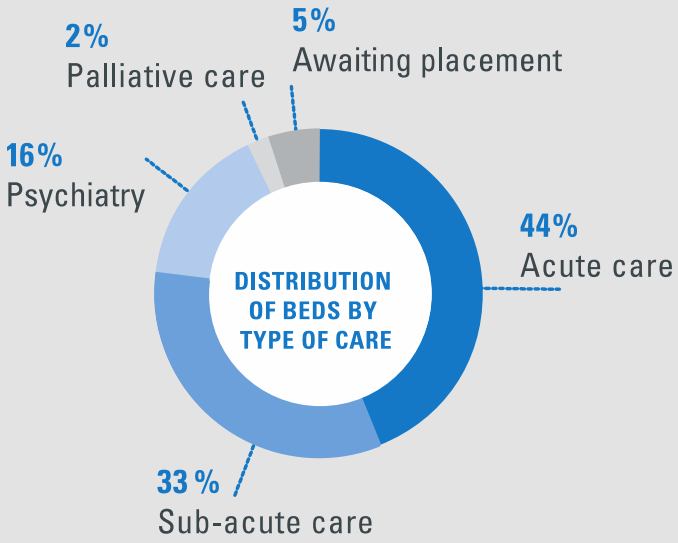
19 paediatric and neonatal intensive care

48,112 patients hospitalized

25,547 surgical operations

69 transplants

3,972 births



HUG
Hôpitaux Universitaires de Genève

Geneva
University
Hospitals

outpatients

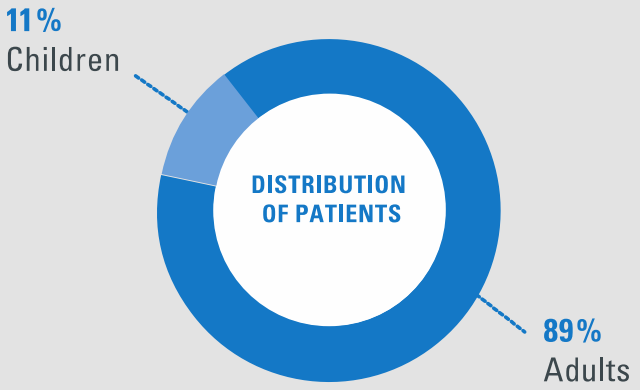
864,471 consultations

6,224 surgical procedures
(one-day surgery)

Emergencies

84,305 emergencies, involving:
59,562 adults
24,743 children

1 emergency every 6 minutes



HUG
Hôpitaux Universitaires de Genève

hyperbaric ward

Geneva
University
Hospitals

« Flat pannel » rooms

Geneva
University
Hospitals

Flat Pannel

36 surgery theatres

Geneva
University
Hospitals

Da Vinci surgical robot

P4 lab, PET-MRI, Cyclotron …

Geneva
University
Hospitals

P4 high-security laboratory

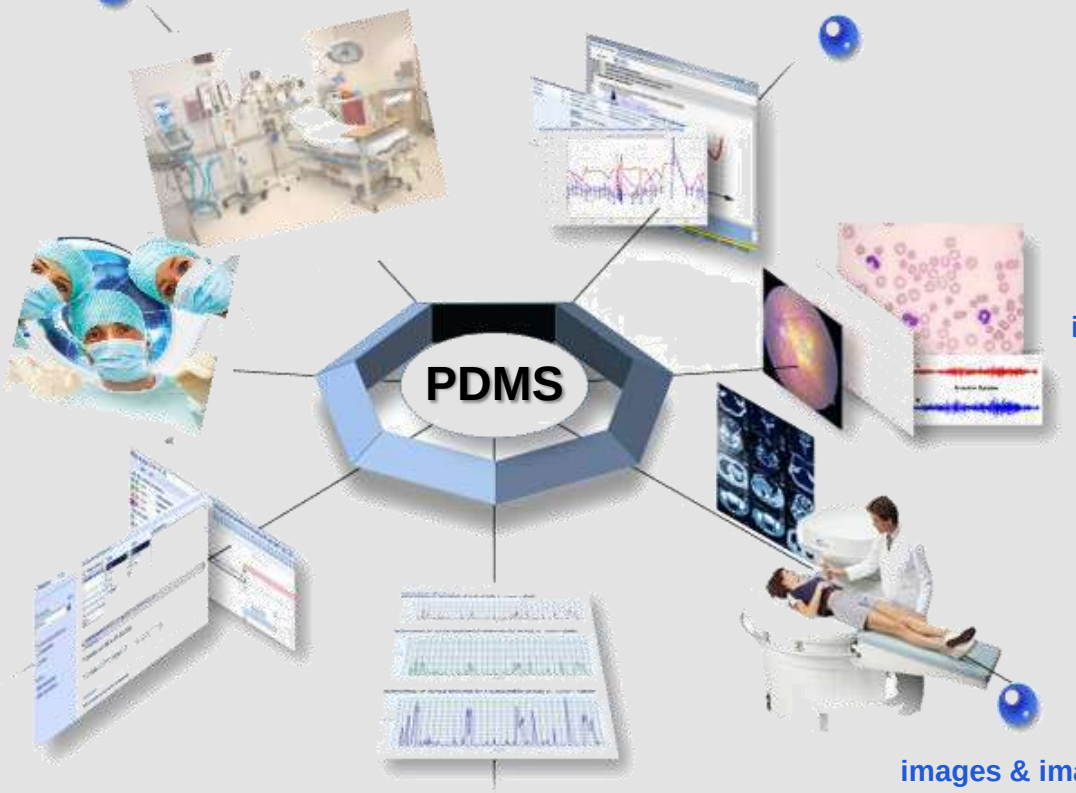
PET-IRM

One of Europe's most modern equipment parks

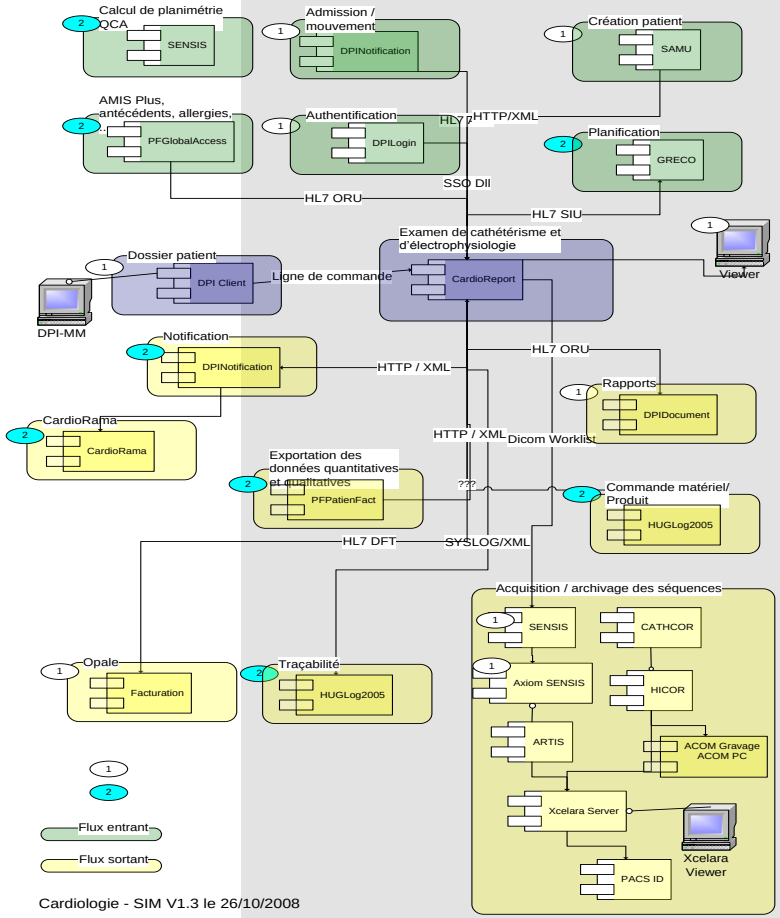
Total value: CHF **304** million
Annual investment:
CHF **20** million

HUG
Hôpitaux Universitaires de Genève

Integration is key



Interventional cardiology



Hôpitaux Universitaires de Genève

Challenge TWO: time persistence

Data migration to enterprise data warehouse

Data persistence for transactional care system

Semantic persistence

Data quality

Statistics, reporting

Clinical research

Sustainability of knowledge engineering

Parameterization, expert knowledge

Hôpitaux Universitaires de Genève

past
documentation

present
decisions and acts

future
scheduling and planning

workflow

population health
the analysis and processing of consolidated events on a population basis allows a fine understanding of health and disease determinants

patient history
the patient history is the sum of all events linked to his own line of life, including all events coming from the health system related to him

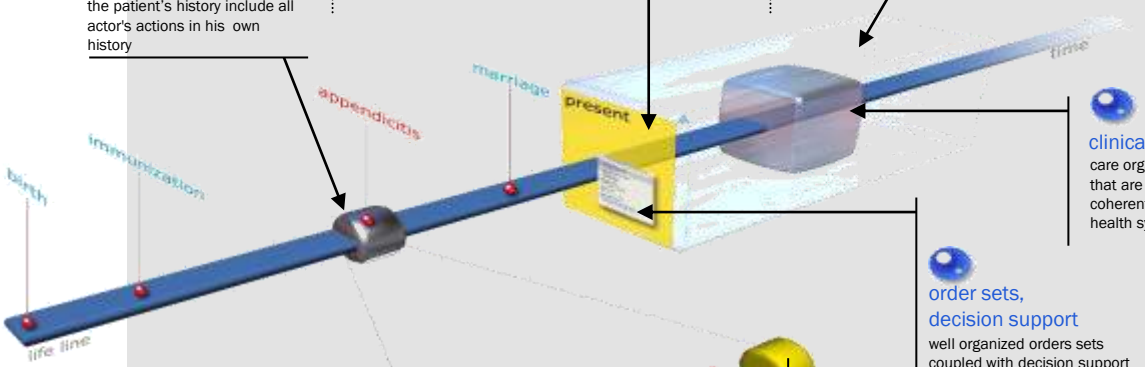
real-time whiteboards
whiteboards can deliver real-time information, such as ER load or hospital activity and improve the work of care providers and the efficiency of managers

actual care planning
clear view of all present actions allows efficient care and better understanding of the case. It eases decision taking

preventive medicine
the ability to generalize future events, such as check up, immunization, and careful helps large population-based actions and follow-up.

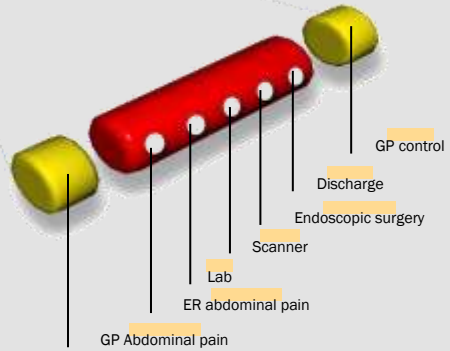
patient agenda
a consolidated patient agenda summarizes all events to come and helps care providers to manage time, care and organize ward's work. It is a precious patient's empowerment tool

continuum of care
the patient's history include all actor's actions in his own history



clinical pathways
care organized in clinical pathways that are planned and scheduled coherently according to patient and health system resources

order sets, decision support
well organized orders sets coupled with decision support leverage care providers efficiency and improves quality of care

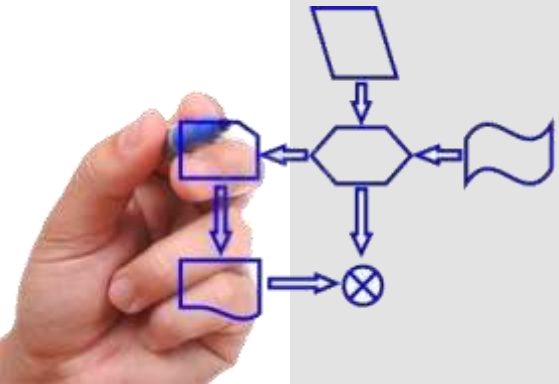


HUG
Hôpitaux Universitaires de Genève

Two examples

Transactional data

Expert knowledge



Challenge Three: meaningful ?

Is paperless a goal ?

ROI ?

Morbidity, mortality

Healthc Inform. 2009 Sep;26(9):40-4.

For all the right reasons. Approaching CPOE from a patient safety and care quality perspective is the first critical step toward success.

Hagland M.

Abstract

True CPOE success is about facilitating improved patient safety, care quality, and efficiency in a multidisciplinar environment, and on an ongoing basis. CPOE implementation forces clinician leaders to examine and rework long-ingrained care delivery processes, especially as they build or adapt order sets. The likelihood that CPOE will be a requirement of meaningful use could compel a rapid acceleration in implementation.

AMIA Annu Symp Proc. 2011;2011:1207-16. Epub 2011 Oct 22.

Improving Patient Safety by Modifying Provider Ordering Behavior Using Alerts (CDSS) in CPOE system.

Saxena K, Lung BR, Becker JR.

Affiliations of the Author: Adventist Health System Information Services (AHS-IS), part of Adventist Health System that supports 44 hospitals across the United States and has 7700 plus licensed beds. The organization provides support to 4 million patients each year.

Abstract

Medication errors are not unusual in acute care settings. This prospective time series analysis/study evaluates the use of Clinical Decision Support System (CDSS)/alerts in helping providers not to make errors, when putting in orders in a CPOE system. We reviewed electronic health records for all the inpatients coming to 5 community hospitals for a 6 months duration (July 2010 - December 2010). Responses to 9 synchronous alerts (CDSS tools) were studied, that were prompted on computer screens when providers were putting in medication orders in EMR. These alerts guided the providers regarding any drug duplications, interactions, contraindications of the prescribed medicine with patient's clinical condition etc. The CDSS system in place changed the physician behavior & patient therapy 41.75% of the times when medication orders were placed. These alerts substantially decreased the medication error rate/adverse drug events (ADE's) in the patients receiving care at these 5 hospitals.

Clinical Information Technologies and Inpatient Outcomes

A Multiple Hospit

Ruben Amarasingham, M
Darrell J. Gaskin, PhD; N

Background: Despite s
mation technologies will
outcomes, few studies h
in a large number of hos

Methods: We conducte
ban hospitals in Texas
Technology Assessment
tal's level of automation
with the information sy
tential confounders, we
tomation of hospital info
duced rates of inpatient
and length of stay for 167
admitted to responding
2005, and May 30, 2006

Results: We received a sufficient number of responses from 41 of 72 hospitals (58%). For all medical conditions studied, a 10-point increase in the automation of notes and records was associated with a 15% decrease in the adjusted odds of fatal hospitalizations (0.85; 95% confidence interval, 0.74-0.97). Higher scores in order entry were associated with 9% and 55% decreases in the adjusted odds of death for myocardial infarction and coronary artery bypass graft procedures, respectively. For all causes of hospitalization, higher scores in decision support were associated with a 16% decrease in the adjusted odds of complications (0.84; 95% confidence interval, 0.79-0.90). Higher scores on test results, order entry, and decision support were associated with lower costs for all hospital admissions (–$110, –$132, and –$538, respectively; $P<.05$).

Conclusion: Hospitals with automated notes and records, order entry, and clinical decision support had fewer complications, lower mortality rates, and lower costs.

Arch Intern Med. 2009;169(2):108-114

utomation of notes and rec-
% decrease in the adjusted
0.85; 95% confidence inter-
in order entry were associ-
ses in the adjusted odds of
on and coronary artery by-
ively. For all causes of hos-
decision support were asso-
in the adjusted odds of
fidence interval, 0.79-0.90).
rder entry, and decision sup-
er costs for all hospital ad-
$538, respectively; $P<.05$).

automated notes and rec-
decision support had fewer
complications, lower mortality rates, and lower costs.

Arch Intern Med. 2009;169(2):108-114

Al-Dorzi et al. BMC Medical Informatics and Decision Making 2011, 11:71
http://www.biomedcentral.com/1472-6947/11/71

RESEARCH ARTICLE Open Access

Impact of computerized physician order entry (CPOE) system on the outcome of critically ill adult patients: a before-after study

Hasan M Al-Dorzi[1,2], Hani M Tamim[1,2], Antoine Cherfan[1], Mohamad A Hassan[1], Saadi Taher[1] and Yaseen M Arabi[1,2*]

Conclusions: The implementation of CPOE in an adult medical surgical ICU resulted in no improvement in patient outcomes in the immediate phase and up to 12 months after implementation.

Unexpected Increased Mortality After Implementation of a Commercially Sold Computerized Physician Order Entry System

Yong Y. Han, Joseph A. Carcillo, Shekhar T. Venkataraman, Robert S.B. Clark, R. Scott Watson, Trung C. Nguyen, Hülya Bayir and Richard A. Orr

Pediatrics 2005;116;1506-1512
DOI: 10.1542/peds.2005-1287


PEDIATRICS

Unexpected Increased Mortality After Implementation of a Commercially Sold Computerized Physician Order Entry System

This information is current as of February 9, 2006

American Academy of Pediatrics

Hôpitaux Universitaires de Genève

Unintended Effects of a Computerized Physician Order Entry Nearly Hard-Stop Alert to Prevent a Drug Interaction

A Randomized Controlled Trial

Brian L. Strom, MD, MPH; Rita Schinnar, MPA; Faten Aberra, MD, MSCE; Warren Bilker, PhD; Sean Hennessy, PharmD, PhD; Charles E. Leonard, PharmD; Eric Pifer, MD

ARCH INTERN MED/VOL 170 (NO. 17), SEP 27, 2010 WWW.ARCHINTERNMED.COM
1578

ORIGINAL INVESTIGATION

HEALTH CARE REFORM

Unintended Effects of a Computerized Physician Order Entry Nearly Hard-Stop Alert to Prevent a Drug Interaction

A Randomized Controlled Trial

Brian L. Strom, MD, MPH; Rita Schinnar, MPA; Faten Aberra, MD, MSCE; Warren Bilker, PhD; Sean Hennessy, PharmD, PhD; Charles E. Leonard, PharmD; Eric Pifer, MD

Background: The effectiveness of computerized physician order entry (CPOE) systems has been modest, largely because clinicians frequently override electronic alerts.

Methods: To evaluate the effectiveness of a nearly "hard stop" CPOE prescribing alert intended to reduce concomitant orders for warfarin and trimethoprim-sulfamethoxazole, a randomized clinical trial was conducted at 2 academic medical centers in Philadelphia, Pennsylvania. A total of 3991 clinicians were assigned to either an intervention group receiving a nearly hard stop alert or a control group receiving the standard practice. The study duration was August 9, 2006, through February 13, 2007.

Results: The proportion of desired responses (ie, not overriding the alert-triggering drug within 10 minutes of firing) was 57.2% (111 of 194 hard-stop alerts) in the intervention group and 13.9% (20 of 144) in the control group (adjusted odds ratio, 8.12; 95% confidence interval, 3.049-0.331). However, the study was terminated early because of 4 unintended consequences identified among patients in the intervention group: a delay of treatment with trimethoprim-sulfamethoxazole in 2 patients and a delay of treatment with warfarin in another 2 patients.

Conclusions: An electronic hard-stop alert as part of an inpatient CPOE system seemed to be extremely effective in changing prescribing. However, this intervention prevented clinically important treatment delays in 4 patients who needed immediate drug therapy. These results illustrate the importance of formal evaluation and monitoring for unintended consequences of programmatic interventions intended to improve prescribing habits.

Trial Registration: clinicaltrials.gov Identifier: NCT00671268

Arch Intern Med. 2010;170(17):1578-1583

Author Affiliations: Center for Clinical Epidemiology and Biostatistics, Department of Biostatistics and Epidemiology, and Center for Education and Research on Therapeutics (Drs Strom, Bilker, Hennessy, Leonard, and Pifer and Ms Schinnar) and Division of Gastroenterology (Dr Aberra), University of Pennsylvania School of Medicine, Philadelphia. Dr Pifer is now with El Camino Hospital, Mountain View, California.

See Invited Commentary at end of article

INTERNATIONAL JOURNAL OF MEDICAL INFORMATICS 79 (2010) e58–e70

ELSEVIER

journal homepage: www.intl.elsevierhealth.com/journals/ijmi

Anatomy of a failure: A sociotechnical evaluation of a laboratory physician order entry system implementation

Linda W. Peute[a,*], *Jos Aarts*[b], *Piet J.M. Bakker*[c], *Monique W.M. Jaspers*[a,*]

[a] *Department of Medical Informatics, Academic Medical Center, University of Amsterdam, The Netherlands*
[b] *Institute of Health Policy and Management, Erasmus MC, Rotterdam, The Netherlands*
[c] *Department of Quality and Process Innovation, Academic Medical Center, University of Amsterdam, The Netherlands*

Sélectionner patient

Accès récents

Cyril MULLER (1/8/1985)
Brigitte GALLAS (2/12/1980)
Astrid BERGES (19/4/1999)
Anna CHATELLIER (4/7/2001)

Rechercher patient

Entrer nom du patient

Anna CHATELLIER | Brigitte GALLAS | Cyril MULLER

Madame Brigitte GALLAS né le 2/12/1980, 31 ans, Numéro patient 97008627
Hospitalisé depuis le 6/10/2011 dans le service de cardiologie
Episode de soins : 97016389
Poids : 73 kg, Taille : 175 cm, (selon méthode Mosteller : 1.88 m²)

Prescriptions

Rechercher médicament

li

lisinopril [illegible]hopril cp

Feuille d'ordres

Ordres à valider :

	Médicament	Voie	Actions
	siméthicone Flatulex cp 42 mg 1x/j	PO	Modifier Enlever

Tous signer | Abandonner

Prescriptions médicales actives :

	Médicament	Voie	Actions

Scénario

Veuillez prescrire un lisinopril à Brigitte Gallas

Terminer scénario

	Patient	Message	Echéance	Actions
	Cyril MULLER	Antibiogram à ordre	10/11/2011	Détail Rejeter Repousser

Terminé

Internet

100%

J Am Med Inform Assoc. 2012 Jan 1;19(1):66-71. Epub 2011 Sep 2.

Comparison of a basic and an advanced pharmacotherapy-related clinical decision support system in a hospital care setting in the Netherlands.

Eppenga WL, Derijks HJ, Conemans JM, Hermens WA, Wensing M, De Smet PA.

IQ healthcare, 's-Hertogenbosch, The Netherlands.

The PPV was significantly higher in the advanced system (5.8% vs 17.0%; $p<0.05$).

drug-(drug) interaction (9.9% vs 14.8%; $p<0.05$),
drug-age interaction (2.9% vs 73.3%; $p<0.05$)
dosing guidance (5.6% vs 16.9%; $p<0.05$).

We need more evidence

Clinical research

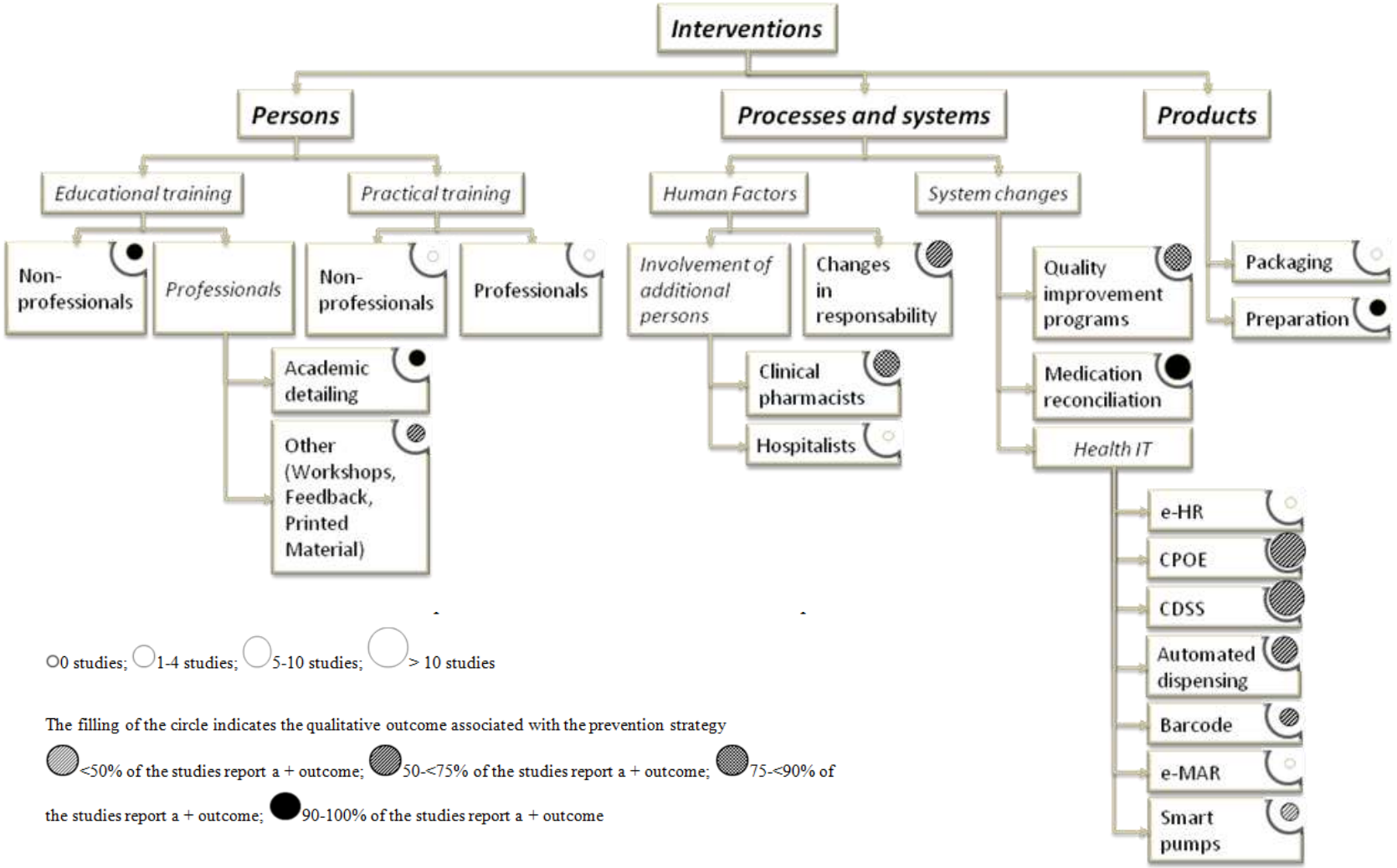
Evidence-based developments

Evidence-based ergonomics

Strategies for Prevention of Medication Errors: What Has Been Published?

Hanna M Seidling[1], Dr. sc. hum.,
Pascal Bonnabry[2], PhD
Marc Cuggia[3], MD, PhD[5],
David W Bates[4], MD, MSc,
Walter E Haefeli[1], MD,
Christian Lovis[5], MD MPH

[1]Department of Clinical Pharmacology and Pharmacoepidemiology, University of Heidelberg, Germany
[2]Pharmacy, Geneva University Hospitals and School of pharmaceutical sciences, University of Geneva, University of Lausanne, Switzerland
[3] University Rennes XXXX
[4] Division of General Medicine and Primary Care, Brigham and Women's Hospital and Harvard Medical School, MA, USA
[5]Division of Medical Information Sciences, Geneva University Hospitals and University of Geneva, Switzerland



○0 studies; ◯1-4 studies; ◯5-10 studies; ◯ > 10 studies

The filling of the circle indicates the qualitative outcome associated with the prevention strategy

◍<50% of the studies report a + outcome; ◍50-<75% of the studies report a + outcome; ◍75-<90% of the studies report a + outcome; ●90-100% of the studies report a + outcome

confusion of goals and perfection of means
seems to characterize our age

Albert Einstein