EHR overview

Definition of EHR

- the Health Information Management Systems Society's (HIMSS) :
- "The Electronic Health Record (EHR) is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting.
  - Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports.
  - The EHR automates and streamlines the clinician's workflow.
  - The EHR has the ability to generate a complete record of a clinical patient encounter, as well as supporting other care-related activities directly or indirectly via interface—including evidence-based decision support, quality management, and outcomes reporting."
- an EHR is generated and maintained *within an institution, such as a hospital, integrated delivery network, clinic, or physician office*

EMR

- Electronic Medical Record: An application environment composed of the clinical data repository, clinical decision support, controlled medical vocabulary, order entry, computerized provider order entry, pharmacy, and clinical documentation applications. This environment supports the patient s electronic medical record across inpatient and outpatient environments, and is used by healthcare practitioners to document, monitor, and manage health care delivery within a care delivery organization (CDO). The data in the EMR is the legal record of what happened to the patient during their encounter at the CDO and is owned by the CDO.

challenges and cultural changes

- traditional models of healthcare services have been associated with inefficient and inequitable healthcare, favouring expensive specialised interventions over some more useful measures to provide support for patients and families at home.
- challenges and cultural changes facing the safe and effective delivery of contemporary healthcare services:
  - the requirement to limit healthcare costs and to optimize resource utilization,
  - the shift of care from specialist centres to community settings,
  - the requirement to deliver evidence-based and quality-assured care,
  - the growth of consumerism and patient active participation in health care,

challenges and cultural changes

- equity of access and public involvement in priority setting,
- an increasing complexity of healthcare provision,
- an increasingly distributed and mobile clinical workforce,
- changes in the working patterns and accountability of healthcare professionals,
- the overwhelming growth of medical knowledge,
- a critical reliance upon comprehensive patient records,
- increasing concerns about the confidentiality of patient records.

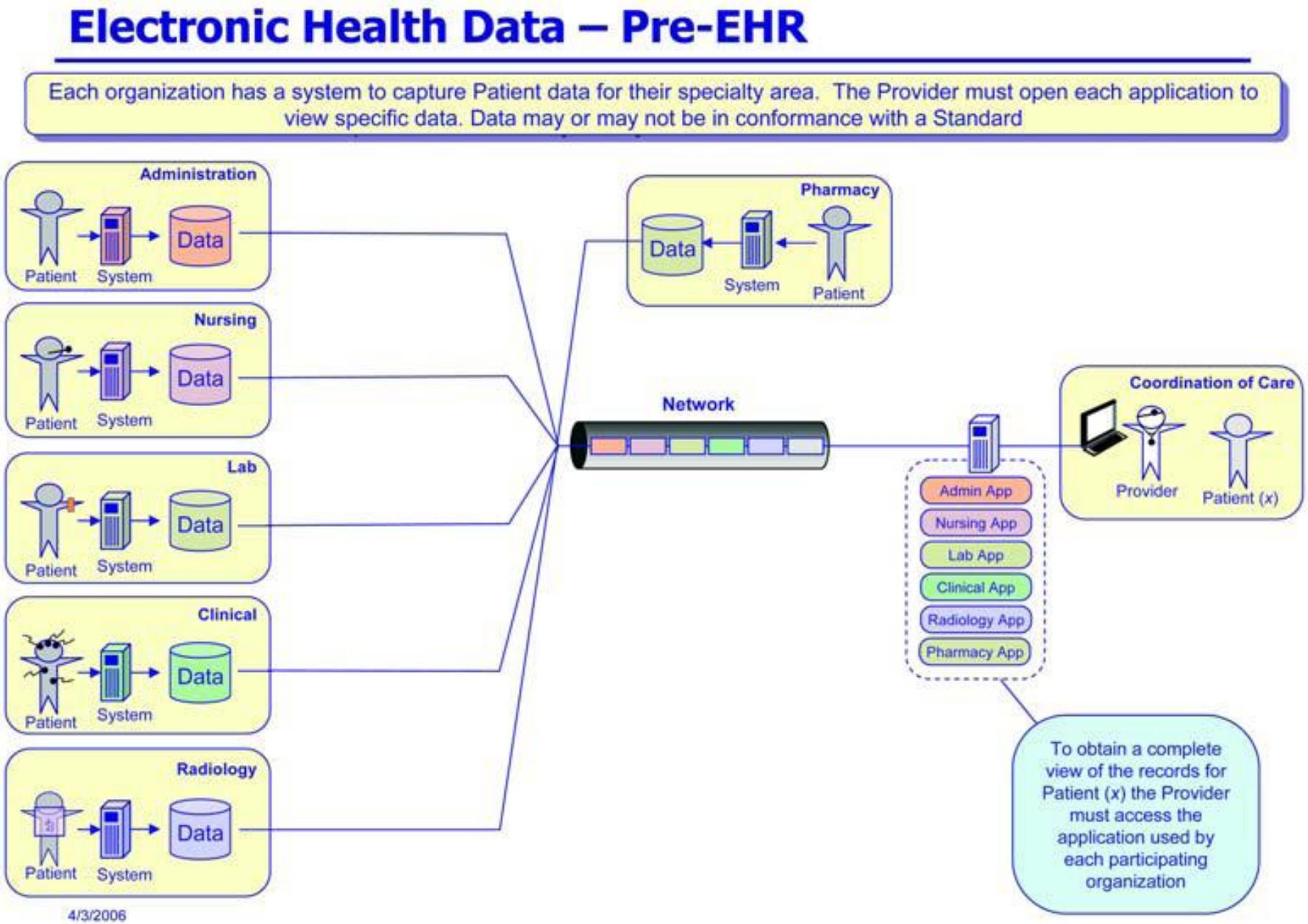
challenges and cultural changes

- Information technology may enable
  - a more patient-centred approach to healthcare:
  - quality measures focused on individual patients' needs and experiences of care;
  - services actively involving each patient in their self-management and providing care close to each patient's home and community.
- The widescale use of decision support and alerting systems that interact with patient records is considered an essential informatics solution to the prevention of errors

The clinical requirements for information technology solutions

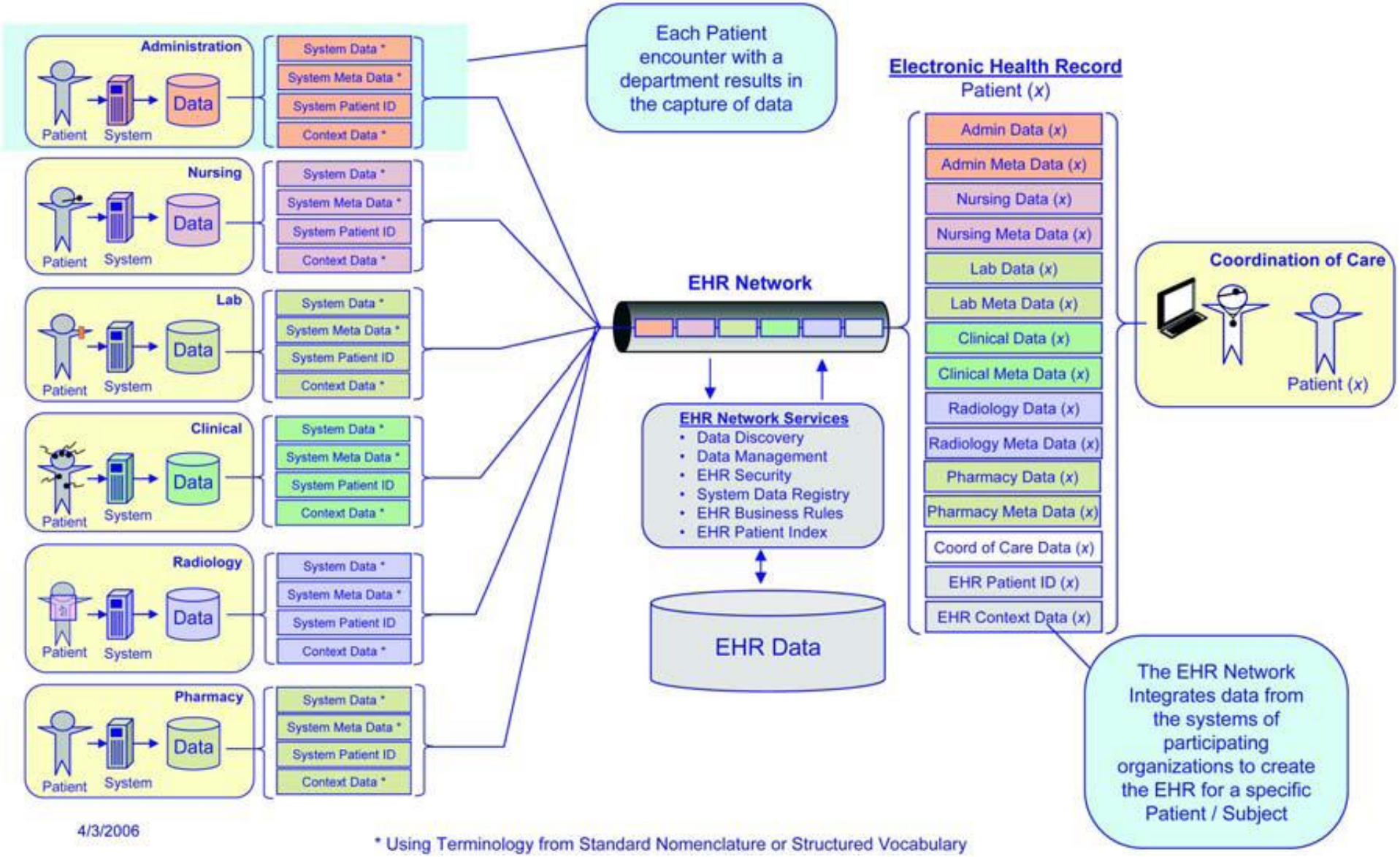
- improving multi-professional partnerships and clinical decision-making through ethically and legally acceptable access to patient record information and enhanced communication systems,
- developing an integrated knowledge environment that delivers evidence about best practice, clinical guidelines and educational materials directly to the clinical “coal face”,
- promoting systematic clinical practice, for example through data templates, clinical protocols and integrated care pathways, embedded within patient records,
- providing patients with relevant education and support to enable good practice in their own self-management,
- enhancing clinical performance by collecting feedback from patients on the various aspects of their care,
- stimulating a culture of evidence-based practice by linking results from clinical audit with professional educational programmes and resources.

Components of an EHR—Overview



Electronic Health Record – Concept Overview

The EHR represents the integration of healthcare data from a participating collection of Systems for a single patient.



4/3/2006

* Using Terminology from Standard Nomenclature or Structured Vocabulary

Key Components of EHR

Administrative System Components

Laboratory System Components

Radiology System Components

Pharmacy System Components

Computerized Physician Order Entry

Clinical Documentation

Administrative System Components

- Registration, admissions, discharge, and transfer (RADT) data are key components of EHRs.
- These data include vital information for accurate patient identification and assessment, including, but not necessarily limited to, name, demographics, next of kin, employer information, chief complaint, patient disposition, etc.
- The registration portion of an EHR contains a unique patient identifier, usually consisting of a numeric or alphanumeric sequence that is unidentifiable outside the organization or institution in which it serves.
- RADT data allows an individual's health information to be aggregated for use in clinical analysis and research.
- The identifier is sometimes referred to as the medical record number or master patient index (MPI).

Laboratory System Components

- Laboratory systems generally are standalone systems that are interfaced to EHRs
- Typically, there are laboratory information systems (LIS) that are used as hubs to integrate orders, results from laboratory instruments, schedules, billing, and other administrative information.
- Even when the LIS is made by the same vendor as the EHR, many machines and analyzers are used in the diagnostic laboratory process that are not easily integrated within the EHR (need standarization).
- Some EHRs are implemented in a federated model, which allows the user to access the LIS from a link within the EHR interface

Radiology System Components

- Radiology information systems (RIS) are used by radiology departments to tie together patient radiology data (e.g., orders, interpretations, patient identification information) and images.
- The typical RIS will include patient tracking, scheduling, results reporting, and image tracking functions.
- RIS systems are usually used in conjunction with picture archiving communications systems (PACS), which manage digital radiography studies

Pharmacy System Components

- These are islands of automation, such as pharmacy robots for filling prescriptions or payer formularies, that typically are not integrated with EHRs

Computerized Physician Order Entry

- Computerized physician order entry (CPOE) permits clinical providers to electronically order laboratory, pharmacy, and radiology services.
- CPOE systems offer a range of functionality, from pharmacy ordering capabilities alone to more sophisticated systems such as complete ancillary service ordering, alerting, customized order sets, and result reporting.
- Research report that 113,000 physicians are using CPOE regularly and 75,000 of these physicians are using CPOE in teaching hospitals
- This slow dissemination rate may be partially due to clinician skepticism about the value of CPOE and clinical decision support

Computerized Physician Order Entry

- There have been some major CPOE successes and some notable failures.
- Handler, et al, in an overview article concerning CPOE and clinical decision support systems, stated “that CPOE has been well demonstrated to reduce medication-related errors.
- However, CPOE and dosing calculators do not entirely eliminate error and may introduce new types of error.
- It has been shown that weight-based drug dosing calculators are faster for complex calculations and may be more accurate than hand calculations.
- Many CPOE systems have dosing calculators.

Clinical Documentation

- Electronic clinical documentation systems enhance the value of EHRs by providing electronic capture of clinical notes; patient assessments; and clinical reports, such as medication administration records (MAR).
- As with CPOE components, successful implementation of a clinical documentation system must coincide with a workflow redesign and buy-in from all the stakeholders in order realize clinical benefits, which may be substantial—as much as 24 percent of a nurse's time can be saved.

Clinical Documentation

- Examples of clinical documentation that can be automated include:
  - Physician, nurse, and other clinician notes
  - Flow sheets (vital signs, input and output, problem lists, MARs)
  - Peri-operative notes
  - Discharge summaries
  - Transcription document management
  - Medical records abstracts
  - Advance directives or living wills
  - Durable powers of attorney for healthcare decisions
  - Consents (procedural)
  - Medical record/chart tracking
  - Releases of information (including authorizations)
  - Staff credentialing/staff qualification and appointments documentation
  - Chart deficiency tracking
  - Utilization management

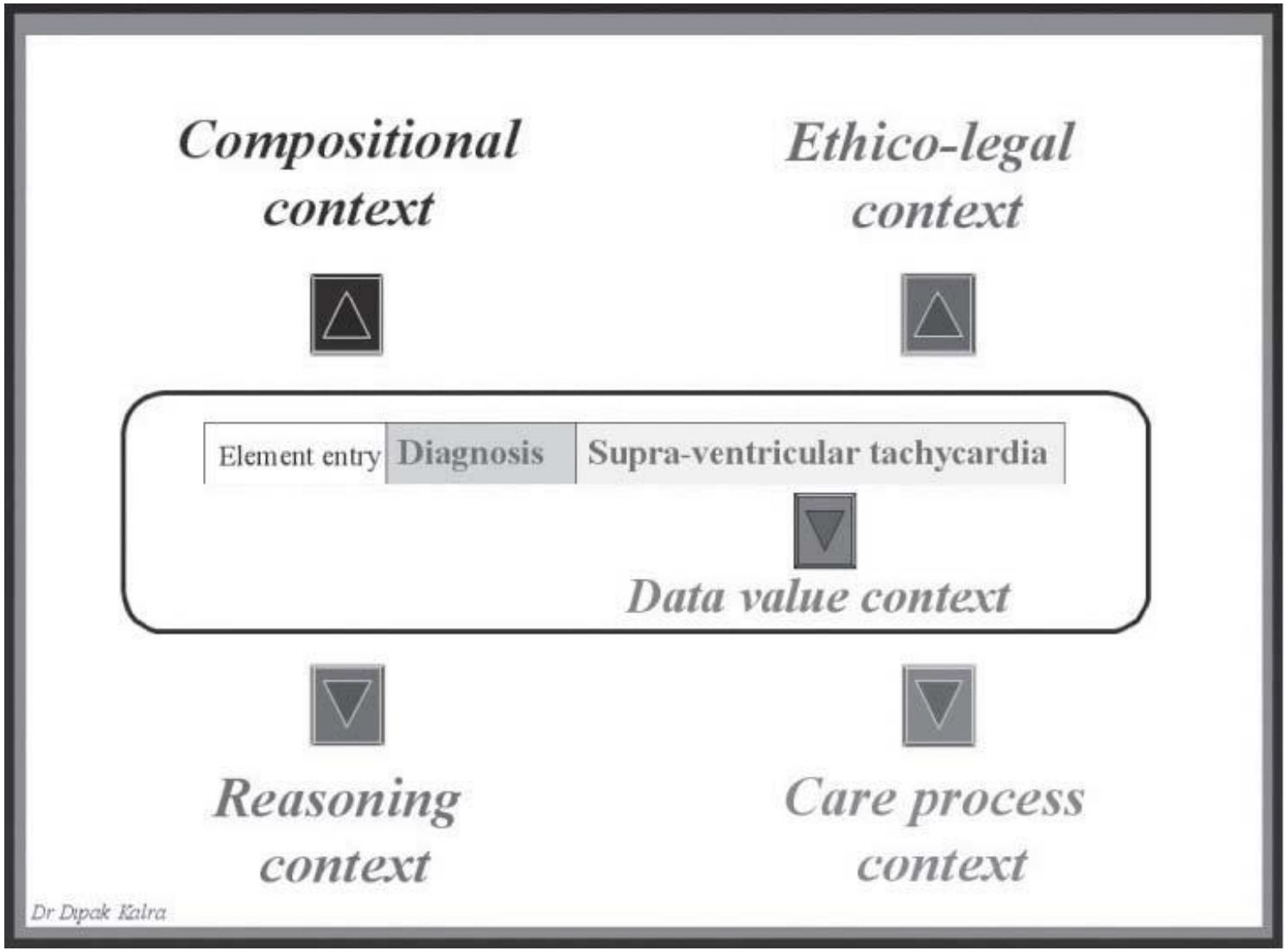
Karakteristik EHR yang baik

- Entry terbuat sebagai kontribusi formal untuk perkembangan dan menyusun riwayat melalui penyusun yang bertanggung jawab untuk tindakan kesehatan
- Penggunaan terminology atau teks bebas, praktisi klinis membutuhkan banyak dan variasi kosa kata untuk mengekspresikan variasi dan kompleksitas dari masing-masing pasien
- Sistem EHR harus dilandasi terminologi umum untuk mengekpresikan isi data klinis yang dapat mengakomodasi ekspresi selain mendukung kebutuhan untuk interpretasi terstruktur dan semi-struktur masing-masing entry

Persyaratan untuk menyusun EHR

- Riset tentang persyaratan untuk menyusun informasi rekam kesehatan memberi perhatian pada konteks isi informasi yang harus ditangkap selama entry individu klinis pada saat direkam.
- Konteks ini terdiri dari:
  - compositional context,
  - ethico legal context,
  - reasoning context,
  - care process context

ehr context


Compositional context
Ethico-legal context
Element entry
Diagnosis
Supra-ventricular tachycardia
Data value context
Reasoning context
Care process context
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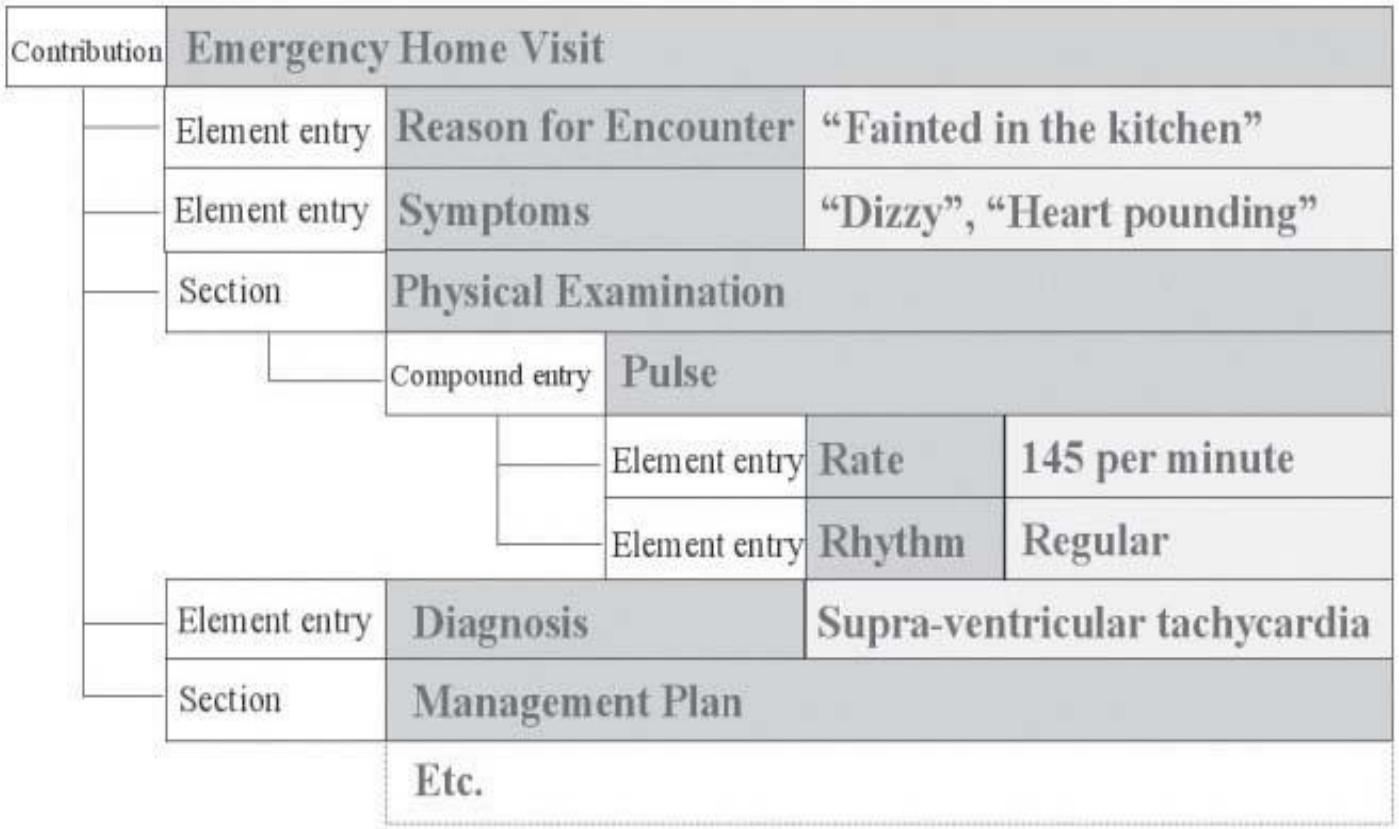
Compositional context example



Architecture construct | Entry name | Data value

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Compositional context

- Terdapat beberapa segi dari konteks ini yaitu
  - Setiap record entry harus dapat menunjukkan entry name
  - Record entry dapat berupa elemen misalnya berat badan atau komponen misalnya tekanan darah
  - Hirarki struktur formal dari record harus menjamin dimana entry benar-benar dilakukan dan digolongkan oleh pengarang.
  - Arsitektur record harus menegaskan *medico-legal*, penerimaan kohort data dari EHR harus difikirkan

Data Value context example

Element entry	Diagnosis	Supra-ventricular tachycardia

Term code = < G570z >
Term rubric = "Supra-ventricular tachycardia"
Language = <English>
Term set = < READ v 2>
Registered with = <UK NHS Information Authority>

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Data value context

- Konteks ini mengacu pada detil yang baik berkaitan dengan pemilihan nilai tersebut. EHR membutuhkan dapat menyusun berbagai macam data termasuk
  - teks, kuantitas, waktu, orang, multimedia
  - nama terminologi, versi dan registrasi agency
  - bahasa yang biasa dipakai ketika merekam data
  - range normal

Ethico-legal context example

Element entry	Diagnosis	Supra-ventricular tachycardia

↓

Subject of care =	NHS 123456
Recording HCP =	"Dr A Austin"
Legally responsible HCP =	"Dr D Kalra"
Healthcare Activity Location =	"Patient's home"
Version =	2.0
Access rights =	< All Clinical Staff >

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Ethico-legal context

- Sebagai contoh pembaca dapat memastikan bahwa data telah direvisi dari aslinya, yang berarti terdapat kesalahan dalam pencatatan dan telah dikoreksi (akses ke versi yang asli harus lebih sulit daripada versi yang terbaru). Macam konteks ini termasuk:
  - mengidentifikasi pengarang, agen yang berwenang dan tangungjawab legal untuk dokumentasi pelayanan kesehatan.
  - Identifikasi subyek pelayanan, dan subyek informasi dari yang diisikan tiap entry
  - Tanggal dan waktu dari pengisi record, transfer pelayanan dan kejadian yang dicatat.
  - Kontrol versi.
  - Hak akses, hak amandemen.

Reasoning context

- Konteks ini mengacu pada informasi yang mungkin berhubungan dengan entry untuk menjelaskan bagaimana atau mengapa diaplikasikan pada pasien di bagian ini.
- Reasoning context mungkin berisi:
  - kehadiran/absen suatu gejala
  - kepastian
  - keadaan klinis secara umum
  - catatan tambahan oleh pengisi
  - observasi abnormal
  - justifikasi atau alasan klinis
  - referensi pengetahuan

Reasoning context example

Element entry	Diagnosis	Supra-ventricular tachycardia

↓

Presence/absence = < Present >
Certainty = < Uncertain >
Severity = < Severe >
Clinical Reasoning = *" Most likely cause of SVT in a woman of this age with a history of thyrotoxicosis"*
Bibliographic Ref. = *< BMJ .....>*

Medical Knowledge Server

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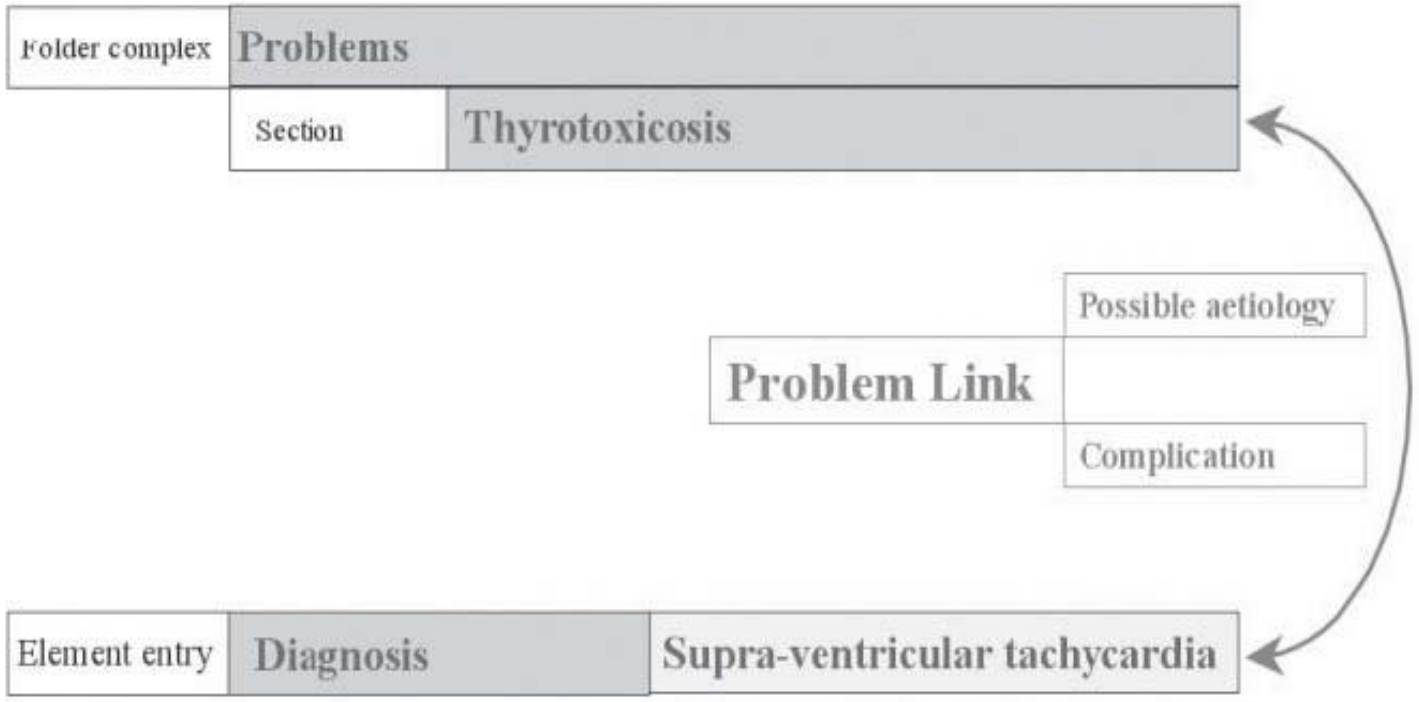
Care Process context example



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Care process context

- Konteks ini berkaitan dengan link dan pointer yang membantu untuk menampilkan non kronologis dari rekam kesehatan.
- Potensial link dan pointer yang harus terdapat dalam EHR adalah :
  - Sebab dan akibat
  - Permintaan dan hasil
  - Status proses
  - Definisi masalah
  - Episode perawatan
  - Jalannya protokol
  - Decission support systems [6]

Information-generating Context (fine-grained)

- The fine-grained real-world situation in which the information is gathered or created constitutes the context where data values situated in time are associated with the human or machine activity which created them
- Information is created in two other ways.
  - Firstly, whenever a subjective statement is made, such as a diagnosis or opinion rom the clinician, or whenever the patient recounts their experience of a problem.
  - The second is when a clinician proposes actions in the future, such as a course of therapy, care plan or other prescription for the patient

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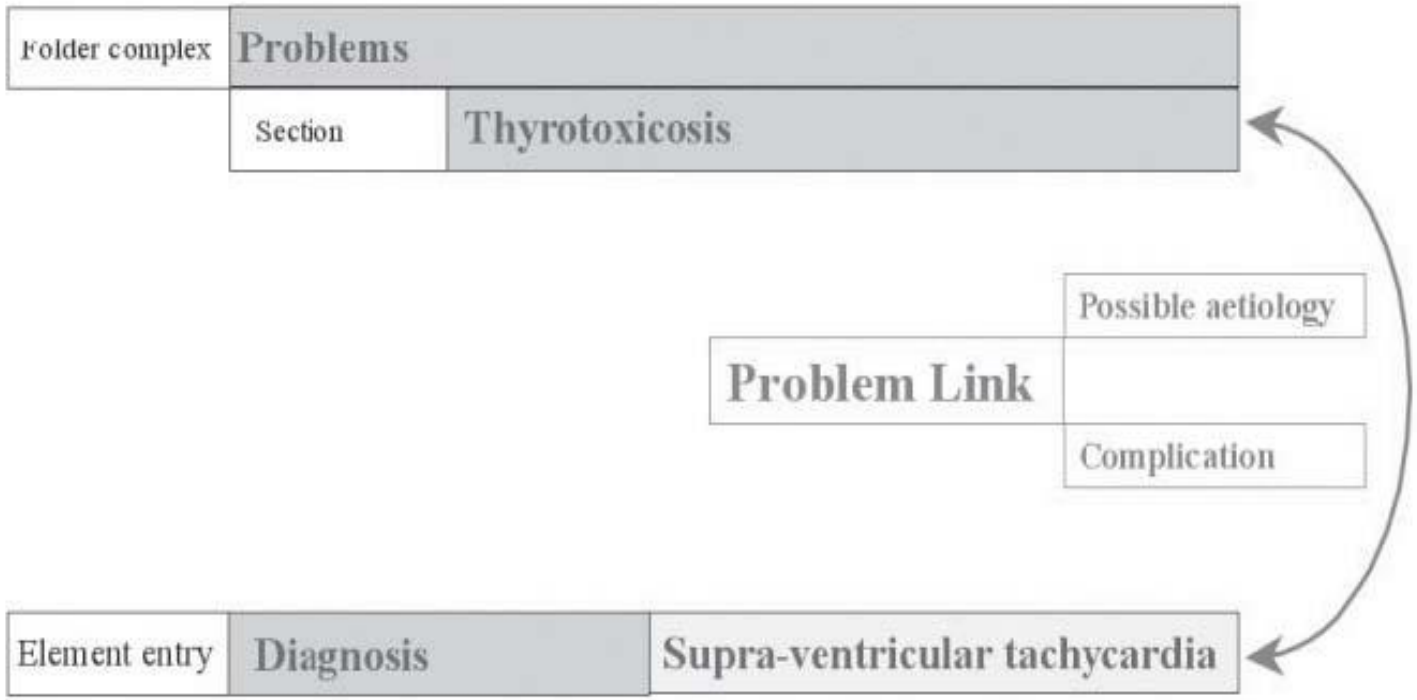

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