

전자의무기록

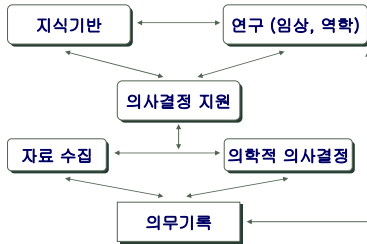
의무기록의 역할

Why keeps records?

- 임상진료에 필요한 모든 정보의 저장소
- 개인의 건강 상태에 대한 포괄적 기록
- 진료를 위한 기억의 보조 도구
- 임상 의학적 판단을 위한 의사결정 도구
- 예후 예측에 필요한 핵심 정보
- 의료인간 의사소통의 도구
- 법적 문서
- 급여지급의 근거 문서
- 연구, 평가, 계획 수립의 기초 자료

의무기록의 중심적 역할

Centrality of Medical Record



의료산업은 IT산업?

- 35-39% of hospital operating costs due to professional and patient communication
- Physicians spend 38%, nurses 50% of their time charting
- Exponential growth of medical knowledge and literature

의무기록의 관리의 복잡성

Who keeps records?

- 의사
- 간호사
- 물리치료실
- 실험실, 검사실
- 방사선실
- 약사
- 접수
- 행정직원
- 경영자
- 환자

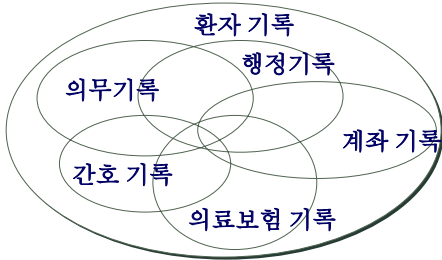
의무기록의 다양한 정보와 지식

Who cares records?



의무기록의 관리의 복잡성

Who uses records?



임상기록 vs. 청구자료

Money determines much...

- 정보시스템 관련 비용:
 - ✓ 의료 (1-2%), 일반산업 (6-7%), 금융 (10-12%)
- 진료비 청구는 피해갈 수 없는 지지선이다...
 - ✓ billing
 - ✓ cost control
 - ✓ quality control, esp. if demonstrable cost savings
 - ✓ retention and satisfaction (maybe)
- 경리-경영 담당자가 관리하는 시스템?

Clinical Information System

Intelligent Integration of

- OCS - LIS - RIS - PACS - EMR
- Departmental Information Systems
- Library Information Systems
- Research Database



Hospital Information System is Dead!

전자의무기록의 목적과 기대효과

- 공간, 시간 (24/7)
- 이종 자료의 통합관리
- 기록의 질 향상
 - ✓ readable
 - ✓ clear & explicit
 - ✓ comprehensive
- 진료의 질 향상
 - ✓ 다양한 자료표현, 자료 재조합, 의사결정 지원
 - ✓ 의사소통 향상
 - ✓ 진료과 및 진료기관 사이의 정보공유
 - ✓ 컴퓨터 자원, 알람, 기억보조, 가이드라인
- 임상연구, 진료평가, 정책연구
- 교육, 지식의 구조화 및 명료화

종이기록의 장점

- Familiar
- No training cost
- Portable to the point of care
- No downtime
- Flexibility; easy to record subjective data
- Browsing and scanning: find by unanticipated characteristics (i.e., handwriting..)

종이기록의 단점

- Content: missing, illegible, inaccurate
 - ✓ E.g., one hospital study: 11% of tests were repeats to replace lost information
 - ✓ Too thick (1kg in average)
 - ✓ fail to capture rationale
 - ✓ incomprehensible to patients and families
- 75% of face sheets had no discharge disposition, 48% no principal Dx.
- 28% of Medicare discharges coded incorrectly (DRG inflation)

종이기록의 단점

- **Unavailable at up to 30% of patient visits**
 - ✓ Two clinic visits a day
 - ✓ Doctors keep records in their offices
 - ✓ Failure to deliver
 - ✓ Misfiled in file room
- **Discontinuity across institutions**
 - ✓ In/Out patient records separate

임상자료의 형식

Why is this hard?

- **Numerical measurements**
 - ✓ lab data
 - ✓ bed side measurements
 - ✓ home instrumentation
- **Recorded signals (e.g. EEG, EKG, EMG..)**
- **Images (XR, MRI, CT, US, pathology...)**
- **Genes (SNPs, expr. Arrays, pedigrees...)**
- **Coded(?) discrete data**
 - ✓ Family Hx.
 - ✓ Patient's medical Hx.
 - ✓ Current complaints
 - Symptoms
 - Signs
 - ✓ Physical Ex.
 - ✓ Medications
- **Narrative text**
 - ✓ Dr.'s & Nr's notes
 - ✓ Discharge summaries
 - ✓ Referring letters

임상자료의 구조

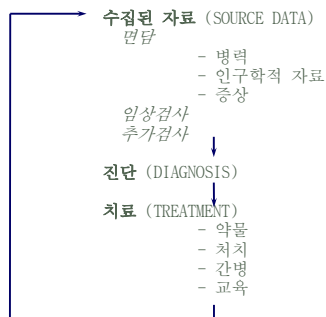
Why is this hard?

- **Doctor's journal (traditional)**
- **Time order of collection, per patient (Mayo)**
- **Source of data**
- **Problem-Oriented Medical Record (POMR) (L. Weed, 1969)**
 - ✓ Notes organized by problems
 - ✓ SOAP: subjective, objective, assessment, plan

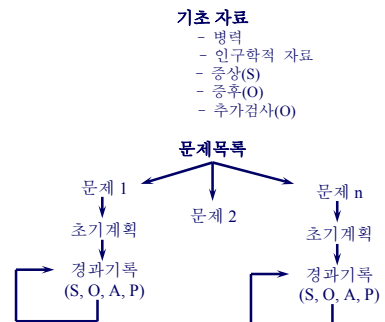
전자의무기록 개발의 어려움

- 지식의 모델링 vs. 일차원적 전산화
 - ✓ 의학용어 표준화 (ICD, SNOMED, UMLS..)
 - ✓ 의무기록의 구조화
- 의미론적 일관성 유지: 의학용어 및 어휘의 조직화
- 인간적 측면들
 - ✓ 의사-환자관계
 - ✓ 사용자 인터페이스
 - ✓ 프라이버시, 보안, 비밀보장
 - ✓ 진료정보의 사회학
- 비용
- 교육과 변화

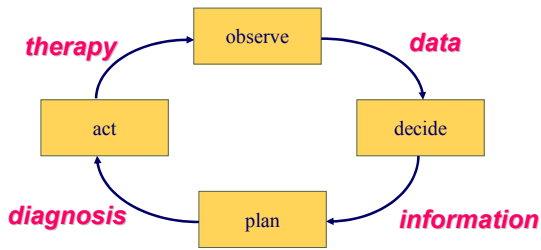
자료수집원 지향식 조직화



문제 지향식 조직화 (POMR)



The Medical Cycle



The Problem List

- “those features in the patient’s psychobiological makeup that require continuing medical attention”
 - ✓ Social Hx.
 - ✓ Risk factors
 - ✓ Symptoms
 - ✓ Physical findings
 - ✓ Lab tests
- Causally organized; e.g., GI bleeding caused by duodenal ulcer appears under ulcer

Example Problem List

No	Active	Date	Inactive	Date
1	Hypertension	1953		
2	Recurrent bronchitis	1958		
3	Penicillin allergy	1958		
4			S/P pyelonephritis	1960
5	Gallstones	Oct 1972	→ Cholecystectomy	Mar 1973
6	Arthralgias	Mar 1973	→ #9	June 1973
7	Pleurisy	Mar 1973	→ #9	June 1973
8	Proteinuria	Apr 1973	→ #9	June 1973
9	SLE	June 1973		
10	Unemployment	Nov 1973		

Problem-related Plans

- **Diagnostic**
 - ✓ Lab tests, radiology studies, consultations, continued observations
- **Therapeutic**
 - ✓ Medications, diet, psychotherapy, surgery
- **Patient education**
 - ✓ Instruction about self-care, about goals of therapy, prognosis

Plans per Problem

1. Diarrhea

Dx

- stool for occult blood, culture, ova, and parasites
- sigmoidoscopy
- barium enema if persistent

Tx

- avoid food that exacerbate

Ed

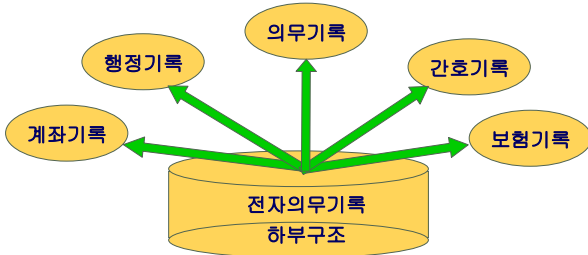
- Informed that more information is needed to make a diagnosis, will aim to symptomatic therapy for now.

문제 지향식 조직화

- 문제는 진단보다 큰 개념
- 문제 목록의 중요성을 강조
- 문제 중심으로 체계적인 접근방법을 선택하도록 도움
- 합성적, 포괄적 vs. 분석적, 전문과지향적
- 단점:
 - ✓ 문제들의 독립성, 상속성.
 - ✓ 구현이 어렵다
 - ✓ 중복

의무기록의 하부구조와 표면구조

What is the unified view of records?



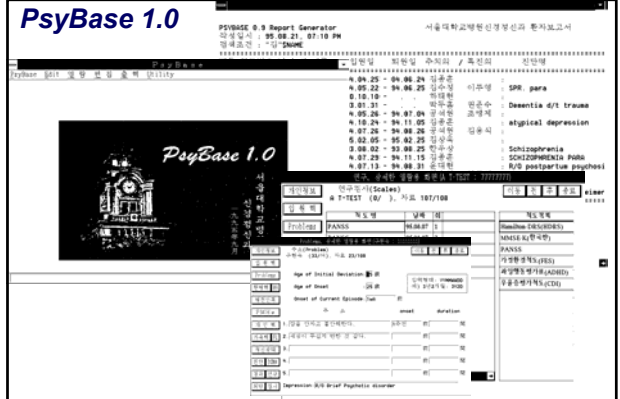
Ethnographic Design

- Xerox Park analysis of office work
 - ✓ Sociologists, Anthropologists, Engineers
 - ✓ Much work is
 - communication
 - assignment of responsibilities
 - problem solving

Current Status

- Fully computerized in many hospitals
 - ✓ Labs, pharmacy, billing
- Some computerization
 - ✓ Visit histories, discharge summaries, vaccination records, emergency dept. notes, pathology & radiology reports.
- Little computerization
 - ✓ Anything outside hospitals & large clinics
 - ✓ History, physical ex. , plans, rationales....

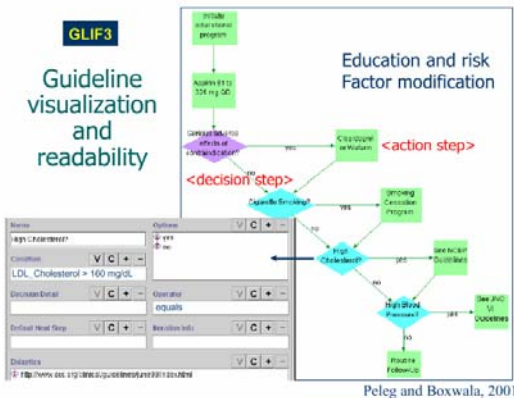
PsyBase 1.0



1995년 서울대학교병원 신경정신과에서 사용되기 시작한 국내 최초의 전자의무기록 PsyBase 1.0.

GLIF3

Guideline visualization and readability



What's needed

- Record Content
 - ✓ uniform core data elements
 - ✓ standardized coding system and formats
 - ✓ common data dictionary
 - ✓ information on outcomes of care and functional status
- Record Format
 - ✓ Front page problem list
 - ✓ Ability to flip through the record
 - ✓ Integrated among disciplines and sites of care
- System Performance
 - ✓ Rapid retrieval
 - ✓ 24/7
 - ✓ Available @ convenient places
 - ✓ Easy data input

What's needed

- **Linkages**
 - ✓ To other info. Systems (i.e., radiology lab)
 - ✓ Transferability of information among specialties and sites
 - ✓ With relevant literature
 - ✓ Other registries and institutional databases
 - ✓ To records of other family members
 - ✓ E-billing
- **Training and implementation**
 - ✓ Minimal training required
 - ✓ Graduated implementations
- **Intelligence**
 - ✓ Decision support
 - ✓ Clinician reminders
 - ✓ "Alam" systems, customized

What's needed

- **Reporting**
 - ✓ "Derived documents", i.e., insurance forms
 - ✓ Easily customized output, UI
 - ✓ Standard clinical reports, i.e., discharge summary
 - ✓ Custom and ad hoc reports
 - ✓ Trend reports and graphics
- **Control and Access**
 - ✓ Easy patient access
 - ✓ Safeguard of confidentiality

Success Factors

Institutional Commitment

Leadership

Architecture

People

Applications

Barriers

- **Delayed Rewards & Resistance**
 - Skinnerian model of clinician behavior*
 - "My practice is different"*
- **Clinician Typing**
 - "Everyone knows that clinician won't type."*
- **Maintenance of Data**
- **Dual Charting**
 - Legal Record vs Record for Patient Care*
- **Data Security and Confidentiality/Privacy**
 - "My data is more sensitive than your data"*
- **Printing**