Medical Informatics & Healthcare

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Definition: Medical Informatics

- The field concerned with the management and use of information in health care

- The scientific field that deals with biomedical information, data, and knowledge and their storage, retrieval, and optimal use for problem solving and decision-making.

- Medical informatics
  - Medical vs. Health care OR biomedicine
Basic Science = Core Themes

- Standards and vocabulary
- Usability
- Implementation and evaluation

Applied Science

- Decision-making

Informatics

- Social Informatics
- Medical Informatics
- Chemical Informatics

Bio-informatics
- Cell and biomolecules

Imaging Informatics
- Organ

Clinical Informatics
- People

Public Health Informatics
- Population

(Adapted from Hersh WR. Health/Medical/Biomedical Informatics A general Introduction. 2003)
Emergence of Medical Informatics As a Discipline: Driving Forces

**Enabling Factors**

- Expanding Knowledgebase of Medicine
  - Unmanageable by traditional paper based medicine
  - Explicit Knowledge for CDSS
- Rapid Advances in Information & Communication Technology (ICT)
- Consumerism:
  - Move Toward Self-Care
  - Informed & Shared Decision Making

**Problems in Health Care**

- Underuse
- Overuse
- Variations in use of services
- Medical Error
- Patient Safety
- Increasing Cost of Healthcare
- Managed Care
- Capitated Payments
Adverse Events:
NOT Local Epidemic BUT Global Endemic

- Adverse event rate: per 100 admissions

해당 결과는 각 연구에 따르는 의료 관리 (medical management)의 실패로 인한 순상으로 발생한 손상을 의미한다.
Benefits of CDSS: Patient Safety

Bates et al. (1998)  
Bates et al. (1999)  
Evans et al. (1999)  
Chertow et al. (1999)
Problems in Health Care: Underuse

Extensive literature review performed at RAND in 1998:

- Only 50% of Americans receive recommended preventive care

- Patients with acute illness:
  70% received recommended treatments
  30% received contraindicated treatments

- Patients with chronic illness:
  60% received recommended treatments
  20% received contraindicated treatments

의료서비스 과소제공으로 인한 예방가능한 사망

<table>
<thead>
<tr>
<th></th>
<th>HMO</th>
<th>HMO</th>
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<tbody>
<tr>
<td>22%</td>
<td>86.4</td>
<td>100.0</td>
</tr>
<tr>
<td>42%</td>
<td>67.2</td>
<td>83.1</td>
</tr>
<tr>
<td>7.6~ 16.6%</td>
<td>73.7</td>
<td>87.1</td>
</tr>
<tr>
<td></td>
<td>46.4</td>
<td>74.2</td>
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<tr>
<td></td>
<td>46.7</td>
<td>68.0</td>
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<tr>
<td></td>
<td>47.2</td>
<td>20.6</td>
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<tr>
<td></td>
<td>74.8</td>
<td>94.8</td>
</tr>
<tr>
<td></td>
<td>60.5</td>
<td>74.7</td>
</tr>
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</table>


(https://www.healthpark.or.kr/health_info/column/pages/column_view.php?f_m_uno=37&page=3)
Benefits of CDSS: Underuse

- Pneumococcal Vaccination
  - Before: 0.8
  - After: 35.8

- Influenza Vaccination
  - Before: 1.0
  - After: 51.4

- Prophylactic Asprin at Discharge
  - Before: 27.6
  - After: 36.4

- Compliance with Guideline
  - Before: 21.9
  - After: 46.3

- Subcutaneous Heparin Use
  - Before: 47
  - After: 47

Of what we do in routine medical practice, what proportion has a basis (for best practice) in published scientific research?

- Williamson (1979): <10%
- OTA (1985): 10-20%
- OMAR (1990): <20%

The rest is opinion
- That doesn't mean that it's wrong -- much of it probably works but it may not represent the best patient care

Benefits of CDSS: Overuse

- Reduction in frequency and charge of laboratory tests
  - Tierney et al (1990): 14% (frequency), 13% (charge)
  - Bates et al (1997): 4.5% fewer tests
  - Bates et al (1999): 70% of test cancelled
  - Tierney et al (1987): 16.8% (intervention) vs. 10.9% (control)
  - Tierney et al (1988): 8.8% lower charges

- Radiologic test
  - Sanders & Miller (2001): 60% agreement in brain MRI
    - 38% (phase 1), 55% (phase 2)
Benefits of CDSS: Efficiency

- Decrease in turnaround times
- Elimination of transcription errors
- Improvements in order counter signature
- Decrease in length of stay (LOS)

Tierney et al (1993)
- Lower charges: 12.7% ($887)
- Shorter LOS: 0.89 days
Exploding Knowledge Base

- More than 8,000 new articles per week
  - During 2000, the U.S National Library of Medicine added to its on-line archives
  - That represented about 40% of all articles published world-wide, in biomedical and clinical journals.

  (National library of Medicine: Fact Sheet MEDLINE. 30 May 2001)

- To maintain current knowledge, a general internist would need to read
  - 20 articles per day
  - 365 days of the year

  An impossible task…

  (from James B. MiniATP course. 2002)
Why Do Errors Happen?

Human OR System?
- Medical errors occur
  - Not from individual recklessness
  - But rather from basic flaws in the way the health system is organized
- People make errors
  - However, it is usually the system behind the errors that is at fault.
- To tackle medical errors, we must have a health-care system that makes it
  - Easy to do the right thing
  - Difficult to do the wrong thing.

Myth of infallible physician
- “Unfortunately, all humans, not just old ones, have a tendency to forget, so functions that depend on memory are bound to have some failures. This is known as the human factor.” (Leape, 1997)
How good is American health care?

How good is American health care?

![Bar chart showing % "ideal patients" receiving different medications by teaching status](chart.png)

% "ideal patients" receiving

<table>
<thead>
<tr>
<th>Medication</th>
<th>Major teaching</th>
<th>Minor teaching</th>
<th>Nonteaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asprin</td>
<td>91.2</td>
<td>86.4</td>
<td>81.4</td>
</tr>
<tr>
<td>ACE inhibitors</td>
<td>63.7</td>
<td>60.0</td>
<td>58.0</td>
</tr>
<tr>
<td>Beta-blockers</td>
<td>48.8</td>
<td>40.3</td>
<td>36.4</td>
</tr>
<tr>
<td>Reperfusion</td>
<td>55.5</td>
<td>58.9</td>
<td>55.2</td>
</tr>
</tbody>
</table>

### Beta blockers at discharge

<table>
<thead>
<tr>
<th>Month</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.92</td>
<td>0.98</td>
<td>0.95</td>
<td>0.93</td>
<td>0.95</td>
</tr>
<tr>
<td>1</td>
<td>0.89</td>
<td>0.91</td>
<td>0.96</td>
<td>0.87</td>
<td>0.96</td>
</tr>
<tr>
<td>2</td>
<td>0.95</td>
<td>0.99</td>
<td>0.97</td>
<td>0.98</td>
<td>0.99</td>
</tr>
<tr>
<td>3</td>
<td>0.93</td>
<td>0.98</td>
<td>0.96</td>
<td>0.92</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Proportion of ideal patients receiving beta blockers at discharge.
An intelligent practitioner working in combination with information resources/technology is “better” than the practitioner without such support.

→ Creating an environment of “supported practice”

Adapted from Hersh WR. Health/Medical/Biomedical Informatics: A general Introduction. 2003
Types of Clinical Decision Support

- Alerts and reminders
  - Critical lab results: hyperkalemia, hyperglycemia
  - Preventive health services

- Assisting > Critiquing
  - Order set, Antibiotics prescription assistance
  - CPOE

- Interpretation, diagnosing
  - ABGA interpretation
  - Diagnosis: Iliad, Dxplain, QMR
Architecture of Clinical Decision Support System

- Alert/Reminder
- Clinical Workstation
- Event Monitor
- Rules Engine
- Common Data Repository
- Gather data
- Beeper
- Fax
- E-mail
- Database

- Select patient
- Record observation
- Enter order

Gather data

Event Monitor

Rules Engine

Common Data Repository

Clinical Workstation

Alert/Reminder

Trigger
Adverse Event Detection (1):

Computerized ADE Surveillance System

ADE surveillance system

Generate ADE alerts

Create Daily Report (8 am)

Independent Verification by Clinical Pharmacist or Trained Nurse

Verified ADE DB

Inform Clinician

Store Information

Pt. name Diagnosis ADE signal Drugs given

Inform Clinician

Trigger Condition Met

ADE Alert

Data Sources

Pharmacy Data Lab Data Clinical Documentation
Adverse Event Detection(1):
Logic of Computerized ADE Surveillance

- Knowledge-based
  - As an antidote, vitamin K is given when a patient has bleeding tendency due to warfarin medication

- Patient-specific
  - E.g> Vitamin K order stored in EMR

- Computerized ADE surveillance:
  Combining the two
  - E.g> Vitamin K order can be used as a signal to detect ADEs
Monitoring (1):
CLAS (critical laboratory alerting system)

- **Goal**
  - To evaluate the **effect of an automatic alerting system** on the time to treatment ordered for patients with critical laboratory results.

- **Design**
  - Prospective randomized controlled trial

- **System description**
  - 12 alerting conditions (high/low/falling)
  - For intervention patients, the covering physician was automatically notified about the presence of the results.
## Frequency Distribution of Alerts

<table>
<thead>
<tr>
<th>Rule Alerting Criterion</th>
<th>No.* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hematocrit has fallen 10% or more since last result and is now less than 26%</td>
<td>38 (19.8)</td>
</tr>
<tr>
<td>2 Serum glucose is greater than or equal to 400 mg/dL</td>
<td>34 (17.7)</td>
</tr>
<tr>
<td>3 Hematocrit has fallen 6% or more since previous result, and has fallen faster than 0.4% per hour since last result, and is now less than 26% and the patient is not on the cardiac surgery service</td>
<td>32 (16.7)</td>
</tr>
<tr>
<td>4 Serum K(^+) is greater than or equal to 6.0 mEq/L</td>
<td>32 (16.7)</td>
</tr>
<tr>
<td>5 Serum K(^+) has fallen 1.0 mEq/L or more over the last 24 hours and is now less than 3.2 mEq/L</td>
<td>29 (15.1)</td>
</tr>
<tr>
<td>6 Serum K(^+) less than 3.3 mEq/L and patient has an active order for digoxin</td>
<td>15 (7.8)</td>
</tr>
<tr>
<td>7 Serum Na(^+) is greater than 160 mEq/L</td>
<td>5 (2.6)</td>
</tr>
<tr>
<td>8 Serum Na(^+) has fallen 15 mEq/L or more in last 24 hours and is now less than 130 mEq/L</td>
<td>4 (2.1)</td>
</tr>
<tr>
<td>9 Serum glucose is less than or equal to 40 mg/dL</td>
<td>3 (1.6)</td>
</tr>
<tr>
<td>10 Hematocrit is less than or equal to 15%</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>11 Serum K(^+) is less than or equal to 2.4 mEq/L</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>12 Serum Na(^+) is less than or equal to 115 mEq/L</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>192 (100)</td>
</tr>
</tbody>
</table>

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# Effect of Intervention on Time until Treatment Was Started and on Time until Condition Was Resolved

<table>
<thead>
<tr>
<th></th>
<th>Median (Interquartile Range)</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time until treatment was ordered (in hours)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All cases (N = 192)</td>
<td>1.2 (0.4–0.8)</td>
<td>4.3 (10.6)</td>
</tr>
<tr>
<td>Intervention cases (n = 94)</td>
<td>1.0 (0.2–2.6)</td>
<td>4.1 (12.1)</td>
</tr>
<tr>
<td>Control cases (n = 98)</td>
<td>1.6 (0.6–4.2)</td>
<td>4.6 (9.1)</td>
</tr>
<tr>
<td>P value</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Time until condition was resolved (in hours)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All cases (N = 184)</td>
<td>8.8 (4.6–20.7)</td>
<td>17.4 (24.3)</td>
</tr>
<tr>
<td>Intervention cases (n = 89)</td>
<td>8.4 (4.0–14.5)</td>
<td>14.4 (18.7)</td>
</tr>
<tr>
<td>Control cases (n = 95)</td>
<td>8.9 (5.4–23.2)</td>
<td>20.2 (28.5)</td>
</tr>
<tr>
<td>P value</td>
<td>0.11</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Decision Support(2): Computerized Physician Order Entry (CPOE)

- **Definition**
  - Allows physicians to enter orders into a computer rather than write them on paper
  - Improve medication process and decision-making

- **CPOE Incorporate**
  - Relevant patient information
  - Decision logic

Into ordering process

Structured Orders:  
Dose Frequency List
Percentage of Medication Orders with Doses Exceeding the Maximum

CPOE
Improving Information Access

- Information access
  - Impaired access to information
    - Errors
  - Access to external sources of information
    - Evidence-based practice

- Infobutton
  - Usage of patients’ clinical information to automatically generate context-specific search
  - Laboratory test for a drug level
    - National Drug Code or
    - Physicians’ Desk Reference (PDR) for prescribing information
  - Medication list → patient education materials
## CPMC Battery: Culture, Routine Catheterized

### SPECIMEN DESCRIPTION
CATHETERIZED URINE

### CULTURE:
>100K COL/ML MORGANELLA MORGANII
10-100K COL/ML ....... SUSCEPTIBILITY NOT ROUTINELY TESTED ON COAGULASE NEGATIVE
STAPHYLOCOCCUS. IF TREATMENT IS INDICATED,
MOST ARE SENSITIVE TO CEP OR TMP/SXT.

### ORGANISM
>100K COL/ML MORGANELLA MORGANII

### METHOD
MICROSCAN MIC.

---

**SANDIEGO, CARMEN**

### MORGANELLA MORGANII

| AMPT | ST | S | T | IMP | P/T | CID | OFL | CEP | CFZ | CFX | CEZ | A/S | SCFT | GEN | TMP | AMI |
|------|----|---|---|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|
| 2 S  | 2 S| 2 S| 2 S| 2 S| 2 S | 2 S | 2 S | 2 S | 2 S | 2 S | 2 S | 2 S | 2 S | 2 S  | 2 S | 2 S | 2 S |

- **Go Back to List**
Standardization of Practice Patterns

- Provision of reminders to clinicians
  - Regarding standardized protocols or clinical practice guidelines
  - Focused on a single action item
  - Impacts: some results from RCTs
    - Decrease errors of omission
    - Increase compliance with preventive care guidelines & clinical practice guidelines

- Clinical pathways & disease management plans
  - Less frequently studied in a computer-based format
  - Focused on multiple multidisciplinary activities
Computerized Reminder as Displayed to Physicians

- **PNEUMONIA VACCINE 23V**
  - Vaccination indicated for:
    - All pts >= 65 yo
    - Pts >= 2 yo with chronic disease (eg. CHF, COPD)
    - Pts >= 2 yo with asplenia (eg. sickle cell ds)
    - Pts >= 2 yo with chronic liver ds
    - Immunocompromised pts >= 2 yo (eg. HIU, malignancy)
    - NH pts >= 2 yo

**SUGGESTED ORDER MENU**

1. **ORDER** PNEUMONIA VACCINE 23V NOW 0.5 mL IM 1xONLY
   - Give pneumovax to decrease morbidity/mortality

2. **ORDER** FLU INJECT NOW 0.5 mL SQ or IM 1X only
   - Give flu shot to decrease morbidity/mortality

3. **OMIT** ECOTRIN EQU NOW 325 mg PO QAM
   - Pt on vent: Begin SQ heparin to decrease DVT risk

4. **ORDER** HEPARIN SQ NOW 5000 units Q12H
Computerized Protocols for Standardization of Clinical Decisions

A protocol for management of intravenous fluid & hemodynamic factors in patients in the intensive care unit.

Standards & Vocabulary
Babel Tower and Clinical Information System

KNOWLEDGE DATABASE

DECISION MAKING PROCESS OR, DATA & TIME DRIVER

OUTPUT

ICU/SURGERY

- Ventilators
- Pulse Oximeters
- IV Pumps
- MIB Data
- Bedside Monitors

DATA & TIME DRIVER

- Data Review
- Alerts
- Computations
- Interpretations
- Protocols

INTEGRATED CLINICAL DATABASE

- Pharmacy
- ECG Lab
- X-Ray
- Blood Gas Lab
- Surgery Schedule
- Admitting
- Medical Records
- Respiratory Therapy
- Catherization
- Blood Bank
- Laboratory
- Pathology
- Surgery & Anesthesia Charting
- Nursing Procedure Charting
- Nurse Dictation
- Infectious Care Disease Plans

INTEGRATED CLINICAL DATABASE

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INTEGRATED CLINICAL DATABASE

- Respiratory Therapy
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- Nursing Procedure Charting
- Nurse Dictation
- Infectious Care Disease Plans
Interoperability

“The ability of two or more systems or components to exchange information and to use the information that has been exchanged.”

Basis for Communication

Any meaningful exchange of utterances depends upon the prior existence of an agreed upon set of **semantic** and **syntactic** rules.

Standards & Vocabularies

- **Vocabularies**
  - UMLS, VA, NHS Clinical Terms (Read), SNOMED (RT/CT), LOINC, ICD, DRGs, Pharmacy, Nursing, PTXT (HELP)

- **Messaging standards**
  - HL7 (ASTM, CEN), CCOW

- **Knowledge representation**
  - Arden Syntax, GLIF

- **Structures & Models**
  - ANS.1, XML, GALEN & GRAIL, CORBA

- **Services (middleware)**
  - CORBAmed
Advantages of using standards

- Decrease costs
  - Development
    - Higher level of specialization: improving functionality
  - Implementation
    - "plug-and-play", saving time
  - Maintenance
    - Simplification, enabling constant evolution

- "Best of breed"
  - Functionality
  - Domain-specific (customization)
  - High quality

- Multiple software vendors
  - Freedom of choice
    - Functionality, price, performance, platform
  - "Simple" exchange of components
Electronic Health Record (EHR)
Paper-based Medical Records

- Illegible
- Incomplete
- Inaccessible from multiple sites
- Less organized
- Insecure
Problems with Paper-based Medical Records

- **Inaccessible** ↔ **Ubiquitous access**
  - Unable to locate medical records (MR) (30%), data in MR, or data in MR quickly
  - Illegible

- **Redundant and inefficient** ↔ **Organized and efficient**
  - Duplicated document → thickness ↑
  - e.g.> Admission note, consulting note, and nursing note

- **Passive** ↔ **Clinical decision support**
  - Unable to monitor contents of MR and generate warnings
  - Unable to control data automatically

- **Low reusability** ↔ **Quality data**
  - Manual chart review: tedious, laborious, erroneous process
  - EHR based clinical research
Methods of Data Acquisition
What's EHR

- OCS
- Lab (LIS)
- ADT
- Nursing
- PACS
- Scheduling
- EHR
- Pharmacy
- Billing
- Clinical Documentation
- Pharmacy
- Billing
ISO 정의
전자건강기록 (EHR)

Institutional EHR
Personal EHR
Sharable EHR
Public EHR

• 의료기관 진료기록
• 진료 목적 공유
의료정보: 
퇴원요약, 
약물알레르기 정보
• 개인 건강관리정보의 기록 및 관리
• 의학연구
• 전염병감시 등
공공의료
### Demonstrate Values of EHR Through Evaluation

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
<th>Light EHR</th>
<th>Medium EHR</th>
<th>Full EHR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online patient chart</td>
<td>Chart pull saving</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Transcript saving</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Electronic prescribing</td>
<td>Adverse Drug Event prevention</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Alternative drug suggestion</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Lab &amp; Radiology</td>
<td>Appropriate testing guidance</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Electronic charge capture</td>
<td>Billing capture</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Billing error</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Net Benefit (cost)</strong></td>
<td><strong>($18,200)</strong></td>
<td><strong>$44,600</strong></td>
<td><strong>$86,400</strong></td>
<td></td>
</tr>
</tbody>
</table>

Policy Issues: Barriers, Incentive & Mandate

- **Important barriers**
  - Cost of EHR vs. Demonstrated benefits
  - Attitude of clinical leaders on EHR
- **Payment system and dissemination of EHR**
  - CPOE: who pays and who harvests?
  - Result of CBA
    - Fee-for-service << Case payment (DRG) << Capitation (HMO)
- **Incentives**
  - Federal government
    - External funding for the investment in acquiring an EHR
  - CMS (Center for Medicare & Medicaid)
    - Quality and payment rate
  - LeapFrog Group
    - Proposes an incentive bonus for providers having and using CPOE in hospital
- **California’s legislative mandate**
  - To Implement CPOE system for urban hospitals by 2005
Telemedicine

- The exchange health information at a distance to facilitate clinical care using telecommunication technology

Applications of Telemedicine

- Telepathology
- Teledermatology
- Teleradiology
- Telesurgery
- TeleHomecare
  - Use of information, communications, measurement and monitoring technologies to evaluate health status and deliver healthcare from a distance to patient care at home
Telemedicine vs. TeleHomecare

- TeleHealth = Telemedicine + TeleHomecare

*Telecare = TeleHomecare
Telemedicine vs. TeleHomecare

Telemedicine
- Associated with sophisticated, expensive, and high-tech tools of institutionalized medicine
- Remote care delivered by physicians

TeleHomecare, Telehealthcare
- Associated with the usual routine care provided in home health visit by nurses
- Focused on the care of chronically ill patients
Monitor: Patient with a chronic illness (i.e., diabetes, asthma, HIV) is issued a home monitoring unit to track daily progress, weight, and medications taken. He/she...
- Measures and/or records specific status indicators using the device, which uploads the data to the service center via telephone dial-up.
- May also have access to interactive self-care advice via the monitoring unit or PC dial-up to a secure personal Web site.

Input: If the patient's status is good, the patient simply continues to regularly submit condition indicators.

Education: Case manager contacts the patient regularly to deliver general education or as a response to a decline in status, to advise seeking physician care or provide care instructions (adjust meds, diet, etc.).

Storage: The patient's data is stored in a database for future review/liability and possibly aggregated analysis.

Progress: Case manager regularly logs on to the system to check patient progress, assisted by alerts flagging situations that require attention.

Alerts: Physician receives alerts when patient status declines and is given regular summary of patient status/progess often including a flowsheet. If physician is not electronically linked, this occurs via fax or mail.

*Source: E-disease Management. FCG, 2001.*
울혈성 심부전 관리: 시스템 개요

• 값싸고
• 소형
• 매일 아침
• 환자의 체중, 임상증상, 기능상태에 대한 자료를 수집
• 정보를 네트워크를 통해 데이터센터로 전송
• 얻어진 정보를 이용하여 사례관리
울혈성 심부전 관리: Health Buddy
오늘 체중을 재셨나요?
체중이 얼마나 늘었요?
몸속에 물이 늘어났습니다.
짠 음식, 수분섭취를 줄이고 꼭 약을 드세요.
숨을 쉬기에 어느 정도 힘드세요?

How many pounds higher is your weight today than yesterday?
1. 1-2 pounds
2. 3-4 pounds
3. 5 or more pounds

A slight weight gain can mean you are retaining water. Remember to take your medicines today, avoid salty foods, and don't drink too much fluid.
울혈성 심부전 관리: 평가

- 입원
  - 절반으로 감소
- 응급실 방문
  - 73% ▼
- 진료비 절감: 연간 환자 1인당
  - $5,271
- ROI (return on investment)
  - 200 %

73% P

ROI (return on investment)
- 200 %
Consumer Health Informatics
Definition

- Consumer informatics is the branch of medical informatics that
  - analyses consumers’ needs for information
  - studies and implements methods of making information accessible to consumers
  - models and integrates consumers' preferences into medical information systems

- The most challenging and rapidly expanding field in medical informatics

Consumer Health Informatics vs. Provider Medical Informatics
Driving Forces

Effort to cut healthcare costs by improving patients' abilities to help themselves and make informed choices

Emergence of evidence based medicine

Increasing availability of interactive information accessible to consumers

Growing need to equalise relationships between health professionals and lay people

Desire of most consumers to assume more responsibility for their health

Medical Knowledge

Information Technology

Consumerism
Welcome to NHS Direct Online
Your gateway to health information on the internet

- Home
- About NHS Direct
- Frequently asked questions
- Send us your enquiry

Other Links:
- National Knowledge Service
- UK Online
- NHS Direct Wales

- Want to find out more about an illness or condition?
  Our health encyclopaedia covers a wide range of health topics.

- Not feeling well?
  try our self-help guide for advice.

- Looking for information about the NHS?
  Search our local information database.

Search

Go

Help

Hot Topics
- Get involved in developing a new NHS service
- Help us test a prototype website
- Safety on the roads
- Road Safety Campaign
- NHS Direct get top marks from CHI
- Summary report of CHI review
- Seasonal sniffles
- Steer clear of colds this winter
- Keep your guard up against flu
- Book your flu jab today
Canadian Health Network

Health info for every body

February 4, 2004

Health Centres
Groups & Topics

Groups
- Aboriginal Peoples
- Children
- Ethnic Groups
- Men
- People with Disabilities
- Seniors
- Women
- Youth

Topics
- Active Living
- Cancer
- Complementary and Alternative Health
- Determinants of Health
- Environmental Health
- Health Promotion
- Health System
- Healthy Eating

Active Living

Active living is a way of life in which physical activity is valued and integrated into daily living and leisure pursuits. Being active is about participating in physical activities that are enjoyable, require some effort, and promote health and happiness. Examples of active living include taking the stairs instead of the elevator, going for a walk or run at lunch, biking to work, or playing a sport.

Getting there... How healthy eating and active living helped one woman reach her goal

Active living and childhood obesity
Active living and diabetes
Active living and healthy eating
Active living for pregnant women
Discussion Groups
Games & Quizzes
Kids' Stuff
Newsstand
Program / Service
Resource List
Video
Balance

- Virtual interaction
- Self-care
- Responsive to patients
- Face-to-face interaction
- Seeking professional-care
- Management of demand
Improved Understanding of a Condition* 64%
Conducted Further Research on Condition* 46%
Discussed Disease/Treatment* with Friend/Family 30%
Made a Treatment Decision 19%
Discussed a Disease or Treatment with Dr 19%
Sought Further Info from Library 10%
Made Dr Appointment 8%
Altered Exercise or Eating Habits 7%
Switched Prescriptions or Medicines 6%

* Disease, condition, diagnosis, or treatment

Source question: Please indicate what has happened as a result of using information you obtained from MEDLINEplus today or in your most recent visit.
Tailored Health Information

- Empower consumers by putting health information into their hand
  - An electronic record provides a natural base for individually tailored health messages, online records also open new avenues for health education.

- Empirical study
  - Effect of tailored information for cancer patients
  - Patients preferred the tailored information.
  - Tailored information has also been effective in a number of other areas, including instigating changes in health behaviour or in increasing knowledge.
## Personal Electronic Health Record

### Health Record
- Health summary
- Immunizations
- Recent medical visits
- View future appointments
- Health record access log

### Mail
- Inbox
- Outbox

### Services
- Contact your provider
- Contact an advice nurse
- Contact a pharmacist
- Request an appointment
- Update health record
- Contact Membership Services
- Website feedback
- KP Online

### Administrative
- Change password
- Change email address
- Change address/phone
- Terms and conditions
- Wallet card

### Health Summary
**Name:** Ten Kpnw  
**Medical Record Number:** 7173-97-98  
**Primary Physician:** Mariene Brannon, ISD  
**Clinic:** Montgomery

#### Current health issues
- **Heart Failure**  
  - Date Noted: 09/02/2003
- **Case/care Management**  
  - Date Noted: 11/29/2000
- **Arthritis - Wrist**  
  - Date Noted: 10/31/2006
- **Hearing Problems**  
  - Date Noted: 10/21/2000
- **Long-term (Current) Use Of Anticoagulants**  
  - Date Noted: 09/10/2005

**My Notes:**
Check with doctor about Physical Therapy.

### Current medications
- **MOTRIN 600MG TABLET #C**  
  - Instructions:  
  - Provider: Michael Krall, M.D.
- **BACLOFEN 20MG TABS**  
  - Instructions:  
  - Provider: Michael Krall, M.D.
Organizations Concerned with Medical Informatics

- American Medical Informatics Association - www.amia.org
- International Medical Informatics Association - www.imia.org
- Agency for Healthcare Quality and Research - www.ahrq.gov
- Health Information Management Systems Society - www.himss.org
- American Health Information Management Association - www.ahima.org
- National Committee on Vital and Health Statistics - www.ncvhs.hhs.gov