의료의 질관리: Imperative for change

2008년 3월 11일
서울의대 의료관리학교실
김 윤
Topics

- **Course overview**
  - Lectures
  - Student presentations
    - 2 topic presentation per each class
    - 30 min presentation and 20 min discussion
    - 20 min wrap-up (lecturer)
  - Possible change in class time

- **Students’ expectations**

- **Requirements**
  - Discussion on Reading assignment
  - Course presentation
  - Attendance
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Student Presentation Topics

- Performance measurement
  - Quality indicator
  - Risk-adjustment
- Pay for Performance
  - US P4P: CMS
  - UK quality incentive: primary care focused
- Quality reporting
- Patient satisfaction
- Variation in clinical practice
- Improving medication safety
- Improving quality and safety through HIT
The profession of medicine

- **We put our patients first** -- as physicians, we place our patients' health needs and well-being before any other end; we act as our patients' advocates; we accept, promote, and honor a fiduciary trust on behalf of our patients.

- **We maintain a special body of knowledge** – as physicians, we maintain, apply and transmit a special body of knowledge not generally available outside of the profession. We also advance the science of medicine: physician scientists generate new medical knowledge as they practice medicine.

- **We reserve to ourselves the right to evaluate our own quality** -- given the body of special knowledge that defines the medical profession, only physicians are qualified to assess medical quality. We honor that obligation: we hold one another accountable for our behavior and for the outcomes we achieve on behalf of our patients.
“Quality is the optimal achievement of therapeutic benefit and avoidance of risk and minimization of harm.”

Joint Commission
Quality of care is not good enough considering current medical knowledge
- Quality
- Safety

Consumers want to know about quality of their providers
- “Shopping in the darkness”

Poor quality is costly
- Examples
  - Retest of radiology exam due to poor quality of image
  - Adverse events: require more test, treatment, and more length of stay
  - Poor quality of TKA (Total knee arthroplasty) operations result in early re-operations.
이며 질: 문제의 분류

- **Overuse**
  - A health care provided under circumstances in which its potential for harm exceeds the possible benefit.

- **Underuse**
  - failure to provide a health care service when it would have produced a favorable outcome for a patient.

- **Misuse**
  - An appropriate service has been selected but a preventable complication occurs and the patient does not receive the full potential benefit of the service.

From JAMA 1998;280:1002
Medical Injuries

First, do no Harm

- **As many as 48,000 to 98,000 Americans die each year from medical errors**
  - More people die from medical injuries than from breast cancer or AIDS or motor vehicle accidents
- **Direct health care costs totaling $9 - 15 billion per year**
- **A systems approach utilizing information technology is needed**

http://www.nap.edu/catalog/9728.html
From the literature:

- Harvard Medical Practice Study
  - Adverse event (AE) rate: **3.7%** (95% CI: 3.2~4.2)
  - Due to negligence: **27.6%** of AE (95% CI: 22.5~32.6)
  - Permanent disability (2.6%), death (13.6%)
  - **Adverse drug event (ADE): 19%**
  - Extrapolates to 1.3M iatrogenic injuries and 180,000 deaths, annually in the U.S. (= 3 jumbo jet crashes every 2 days)

- On average, there are **10 – 20 sentinel events per hospital per year.**
  - Most are never reported.
Epidemiology of Adverse Events: Harvard Medical Practice Study

- Wound Infection: 13.6%
- Technical Complication: 12.9%
- Late Complication: 10.6%
- Nontechnical Complication: 7.0%
- Adverse Drug Event: 19.4%
- Diagnostic Mishap: 8.1%
- Therapeutic Mishap: 7.5%
- Procedure-related: 7.0%
- Surgical Failure: 3.6%
- Nontotechnical Complication: 7.0%
- Operative: 47.7%
- Nonoperative: 52.3%
- Other: 10.3%
높은 의료사고 발생률: 전세계적 현상

• 입원환자 100명당 의료사고 발생률

![Diagram showing the number of medical errors per 100 hospital patients in different studies.]

- Harvard Medical Practice Study: 3.7
- Utah Colorado Study: 2.9
- Australian Healthcare Study: 6.6
- UK Pilot Study: 11.7
- Danish Pilot Study: 9.0
Adverse event [의료사고]
- An injury caused by medical management rather than the underlying condition of the patient
- cf> Patient safety: Freedom from accidental injury

Medical error [의료과오]
- The failure of a planned action to be completed as intended (i.e., error of execution) or the use of a wrong plan to achieve an aim (i.e., error of planning)
- cf> Preventable Adverse Event: An adverse event resulting from an error

의료소송
Failure in the process of medication management
- wrong drug, dose, route, patient, frequency

Errors that have the capacity to cause injury, but fail to do so, either by chance or because they are intercepted
E.g> Penicillin was given to a patient despite a known allergy to penicillin, but did not react
Adverse event

Medical error (Near miss)
예방할 수 없는가?

- Harvard Medical Practice Study (1984)
  - 70%: 예방 가능
  - 6%: potentially preventable
  - 24%: 예방 불가능

- UT & CO Study (1992)
  - surgical errors의 54%: 예방 가능
-SA1E: 무약 오류

- 6개월 된 아이가 급성백혈병으로 소아과 병동에 입원.
- 소아과 전공의가 오후 3시에 “vincristine 5mg IV”라는 무약 order를 작성하여 병동 약국에 스포로보 (계산 착오).
- 담당 교수가 order를 검토하면서 오류 발견하지 못하였음.
- 약사가 오류를 발견하여 병동 간호사 및 의사와 연락을 시도하였으나 실패하였음. 의사와 상의가 필요한 ‘문제 처방’으로 분류하여둠.
병동에서 처방 원본이 약국에 도착함. 오후 교대 근무 약사가 문제 처방전임을 인식하지 못하고 약을 조제함. 전산화된 용량 점검 시스템이 있었으나, 이상 용량임을 발견하지 못하였음.

병동 간호사가 order에 의문을 갖고 당직 전공의에게 문의함. 당직 전공의가 용량을 다시 계산하였으나, 전화 통화를 하면서 용량이 잘 몫 전달됨. 간호사가 오후 5시 20분 경에 치사량을 1분에 걸쳐 정맥 투여.

간호사가 환자 상태를 관찰(맥박수가 110에서 74로 낮아짐). 간호사가 당직의사를 호출하였고, 당직의사는 진찰 후 ‘환자 상태 양호’로 기록.

환자의 마가 아이스크림을 먹이려 할 때, 구토, 호흡곤란 발생. 5시 45분경 심폐소생술을 시행하였으나, 환자는 사망하였음.
어떻게 하면 투약오류를 예방할 수 있을까?
“Cascade of failure” phenomenon

1. The dose calculation error by the ordering physician.
2. Failure of the attending to identify the resident’s error.
3. Inability of the pharmacist to reach the unit nurse or ordering physician.
4. Failure of the PM pharmacist to recognize the order as the previously identified problem order.
5. Failure of the computer dose checking system to identify the unusual dose.

- Dose calculation function w/ CPOE
- Communication mechanism e.g. Cellular phone alerting, Inbox
- Electronic hands-off records
- CPOE w/ Dose checking
“Cascade of failure” phenomenon

6. Verbal mis-communication of the recalculated dose by the on-call resident.

7. Administration of the overdose by the nurse.

8. Incomplete assessment of the patient by the on-call resident after overdose.
시스템 방어에 있는 하나의 구멍만으로는 시스템에 결함을 유발하지 않음

시스템의 결함은 "Swiss Cheese" 조각의 구멍들이 나란히 정 되었을 때(프로세스의 여러 부분에 결함이 있을 때) 발생하여 환자에게 그 결과가 나타나게 됨.
The majority of medical errors are caused by faulty systems, processes, and conditions that lead people to make mistakes.

Mistakes could be minimized by designing a health system that make it harder for people to do something wrong, and easier to do it right.

But people do make mistakes, and when they do, blaming the individual does little to make the system safer or prevent someone else from making the same error.
미국
- 매년 의료과오로 약 44,000~98,000명 사망
- 교통사고, 유방암, AIDS로 인한 사망자 수보다 많음.
- 의료과오로 인한 의료비 지출: 9~15조/년

우리나라
- 의료과오: 4,500~10,000명 사망 추정 (교통사고 사망자 수 수준)
- 의료사고: 10,000~27,000명 사망 추정 (사고 사망자 수 수준)

의료사고 및 의료과오에 대한 체계적인 연구결과나 예방 대책 없음.
환자가 기가 막혀

“болезн한 펼쳐…” 좌우 뒤틀린 수술

2004년 인천 대학병원서...환자, 소송 제기

인천의 한 대학병원이 펼쳤는 수술을 하는 과정에서 의료진의 실수로 다른 쪽 팔 일부를 제거한 것이 뒤틀리게 박혀졌다.

이 병원은 2004년 1월 오른쪽 팔에 암중양이 있는 허리근(73)세에 대해 왼쪽 팔에 암이 있다고 진단해 왼쪽 팔에 있던 각은 중앙을 제거했다. 의료진은 허리근 중앙을 암 조직이 없는 양성 중앙을 확 인한 뒤 다시 검사한 결과 오른쪽 팔에 암 조직이 있다가 있다는 사실을 알게해 최씨가 암 조직이 없는 양성 중앙을 확 인하면 되는 수술을 했다. 최씨는 재수술 후 6일 동안 의사를 잃는 동안 17일 간 중환자실에 입원하는 고통을 겪었다. 최씨 가족들은 "두 차례 수술을 받은 뒤 말을 못하고 경도로 악화하기도 했고, 지금도 피가 석인 가래가 나오는 등 후유증이 계속되고 있다"고 주장했다. 최씨는 지난 2월 수술비 120만원과 수술비 등 600만원을 배상하려면 인천지방법원에 민사소송을 제기했다. 병원 관계자는 "의료진이 원측 팔에 암 중앙이 있는 것으로 알고 수술에 들어갔다"며 "내시경 소견만으로 수술했던 게 최근"이라고 말했다. 김영환 기자 yuksin@hanic.co.kr
우리나라 의료서비스는 안전한가?

손으로 쓴 처방전 사용에 따른 피해 사례

‘듀파스톤 (Dupaston)’, 유산방지약을 지칭하는 이 단어가 의료계에 커다란 파문을 불러일으키고 있다.

한 산부인과 의사가 날려 쓴 ‘듀파스톤’ 처방이 병원 직원에 의해 ‘다나줄 (Danazol)’로 잘못 기재되는 어처구니 없는 사건이 발생했다.

이 처방전을 받아 든 임산부는 먹어서는 안 되는 금기약물을 복용한 탓에 결국 태아를 유산했다. (e-헬스 통신, ’05-11-2)

약물 부작용 발병률
- 입원 환자 100명당 -

<table>
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<th>년도</th>
<th>약물 부작용 발병률</th>
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<td>호주</td>
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<td>미국</td>
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<td>6.1</td>
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<td>스위스</td>
<td>2004</td>
<td>7.5</td>
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<td>국내 연구</td>
<td>2005</td>
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예방가능한 사망(preventable death): 적정한 진료(optimal care)를 받았을 경우 예방할 수 있는 사망 사례 (American College of Surgeon, 1993)

구글 번역

예방가능한 사망(preventable death): 적정한 진료(optimal care)를 받았을 경우 예방할 수 있는 사망 사례 (American College of Surgeon, 1993)
어떻게 시스템을 개선할 것인가?

알지 못하는 문제를 해결할 수는 없다.

You can’t manage what you can’t measure
서울대병원 수혈사고 사례 (1995)

- 입원환자 수혈사고 발생
- 담당 검사가 간호부 “사건사고보고서”를 뒤져 과거의 수혈사고를 모두 기소
- “사건사고보고서” 사라짐
  “Kill the messenger”
비난/문책의 문화(Culture of Blame)에서
누가했는가?
안전의 문화(Culture of Safety)로
무엇이 잘 못 됐는가?
왜, 일어났는가?
변화의 장애 요인
오류의 존재를 인정
바뀌는 것에 대한 저항
징계, 보복, 당혹스러움에 대한 두려움
변화에 드는 비용 부담
Failure of Execution
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…
Current Medical Knowledge

Current Practice of Medicine

- Exploding Medical Knowledge
- Complexity of Medical System
A failure of execution

The science of current western medicine is the best the world has ever seen; (and continues to improve rapidly)

while the performance of American care delivery leaves much to be desired.


A Failure of Execution

“It's **not a question of knowing** how to treat heart disease, diabetes or mental illness.

We **know how**.  
We're **just not doing it**.

We're **literally dying**, waiting for the practice of medicine to catch up with medical knowledge.”

Margaret E. O'Kane, president, NCQA
Information overload

- Primary literature provides limited guidance on a broad range of urgent clinical questions
  - Comparative effectiveness and long-term patient outcomes
- Overwhelming quantity of evidence
  - “antihypertensive agents AND therapeutic use”
  - Identified 312 review articles that the PubMed database (Oct. 1, 2006~Sep. 12, 2007)
- Increase in the quantity of synthesized information
  - systematic reviews, clinical guidelines, and resources (e.g., The Cochrane Library)
  - AHRQ National Guideline Clearinghouse 54 clinical practice guidelines under the heading “antihypertensives.” (Sep. 2007)

- For physicians
  - Suffer from variable quality of researches and its limited generalizability
  - Frequently lack the knowledge in biostatistics necessary to interpret the findings of published clinical research
Variations of Healthcare: Overuse
Association btw hospital beds and discharges (1995-96)

Discharges per 1,000 Medicare Enrollees (1995–96)

Acute Care Beds per 1,000 Residents (1996)

All Medical Conditions
$R^2 = 0.54$

Hip Fracture
$R^2 = 0.06$
Association btw supply of cardiologist and visits to cardiologist (1995-96)

Cardiologist Visits per 1,000 Medicare Enrollees (1996)

Cardiologists per 100,000 Residents (1996)

R² = 0.49
Supply-sensitive care

- **For patients with chronic illness**
  - Frequency of certain types of care varies in close association with the supply of medical resources

- **Supply sensitive care account for**
  - 50% of Medicare spending
  - Visits to primary care (3 times) and specialist (6 times)
  - Hospitalization (4 times) and admission to ICU
  - Diagnostic testing and imaging exams
Evidence-based medicine virtually plays no role in governing the frequency of use of supply-sensitive care

- Medical textbooks contain few evidence-based clinical guidelines concerning when to:
  - Hospitalize
  - Admit to ICU
  - Refer to medical specialists

- BMJ’s Clinical Evidence Concise Contain not a single reference as to when to:
  - Hospitalize patients with cancer, chronic lung disease, or heart failure
  - Schedule them for physician visits and revisits
Roemer’s Law

Built bed is filled beds

- In the absence of the evidence on “best practices”
  - Other factors drive clinical decisions
  - Generally held assumption

- The more is better!
Is more better?

- Do populations receiving more supply-sensitive care have better outcome?
- Do they live longer?
- Do they have better quality of life?
- Are they more satisfied with their care?
## Resource input and health outcome

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<tr>
<th>Resource Inputs</th>
<th>Ratio, Q5 vs. Q1</th>
<th>Cohort Health Outcomes</th>
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<tbody>
<tr>
<td>Per-capita Medicare spending</td>
<td>1.61</td>
<td>Condition</td>
</tr>
<tr>
<td>Hospital beds per 1,000</td>
<td>1.32</td>
<td>Hip fracture</td>
</tr>
<tr>
<td>Physician supply per 10,000</td>
<td>1.31</td>
<td>Colon cancer</td>
</tr>
<tr>
<td>All physicians</td>
<td>1.31</td>
<td>Heart attack</td>
</tr>
<tr>
<td>Medical specialists</td>
<td>1.65</td>
<td>Functional status: same</td>
</tr>
<tr>
<td>General Internists</td>
<td>1.75</td>
<td>Satisfaction: same</td>
</tr>
<tr>
<td>Family practitioners/GP</td>
<td>0.74</td>
<td>Perceived access to care: worse</td>
</tr>
<tr>
<td>Surgeons</td>
<td>1.29</td>
<td></td>
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</tbody>
</table>
비용과 진료의 질

From Premier Hospital Quality Demonstration Project Participants Oct. 1, 2003 – Mar. 31, 2004
N of Hospitals = 244
**Significance of variation**

The Dartmouth Atlas Project: 306 hospital referral regions

Percent Reduction in National Medicare Spending if Salt Lake City or Rochester Benchmarks were the National Standard*

<table>
<thead>
<tr>
<th></th>
<th>Rochester</th>
<th>Salt Lake</th>
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<tbody>
<tr>
<td>Inpatient Spending</td>
<td>21.6%</td>
<td>31.9%</td>
</tr>
<tr>
<td>MD Visit Spending</td>
<td>35.3%</td>
<td>35.5%</td>
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</tbody>
</table>

*FOR VOLUME OF CARE (PATIENT DAYS, VISITS PER PERSON)

과잉 제공 (Overuse)
- 제왕절개분만율 OECD 국가 중 1위 -

- 행위별 수가제로 인한 의료서비스 과잉 제공 동기
- 의료비 절감에 대한 사회적 요구로 비교적 잘 알려짐

WHO 권고: 5 – 15%

1. In Portugal, births only include those taking place in public hospitals (in Mainland), therefore resulting in an over-estimation of caesarean rates.
2. 2001.
3. The OECD average is the consistent average for a common group of countries (Table A.2.18).
급성상기도 감염 항생제 처방률과 세계 최고 수준의 항생제 내성률

한국 세균 내성률 세계 최고

항생제 감염 심각…자 80% 내성

어린이 환자에도 지나친 항생제 사용

적절한 항생제 사용의 중요성
병원별 급성심근경색 사망률
- 중증도 보정 사망률 -

병원간 사망률 차이: 최대 44배
평균: 11.5%

사망률: 최저 0.9%, 최고 39.4%

자료: 건강보험심사평가원 (2005)
진료 질과 진료비 상관관계: 우리나라

A. Low Quality – High Cost
B. High Quality – High Cost → D. High Quality – Low Cost
C. Low Quality – Low Cost

High Quality – Low Cost (D) 영역 평균 급여비 적용

- 연간 59억 837만원 절감
- A, B, C 영역에 속한 환자 1인당 862,914원 절감
Variations of Healthcare: Underuse
과소 제공 (Underuse)

- 필수적인 예방 및 치료 서비스의 과소 제공
  - 높은 이환율과 사망률, 높은 진료비로 귀결
  - 필수적인 의료서비스의 과소 제공은 의료서비스의 과잉 제공에 비하여 더욱 심각한 문제

- 미국에서 필수적인 의료서비스 이용률 (1998)
  - 예방서비스 이용률: 50%
  - 급성질환에서 이용률: 70%
  - 만성질환에서 이용률: 60%

- 우리나라
  - 평가 활동 매우 빈약: 관련 통계 거의 없음.

필수서비스 과소제공으로 인한 예방가능한 사망

<table>
<thead>
<tr>
<th>서비스</th>
<th>미국 HMO 하위 10%</th>
<th>미국 HMO 상위 10%</th>
<th>예방가능한 사망자 수</th>
</tr>
</thead>
<tbody>
<tr>
<td>베타차단제 치료</td>
<td>86.4</td>
<td>100.0</td>
<td>1,700</td>
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<td>유방암 검진</td>
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<td>83.1</td>
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<tr>
<td>자궁경부암 검진</td>
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<td>87.1</td>
<td>700</td>
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<tr>
<td>콜레스테롤 조절</td>
<td>46.4</td>
<td>74.2</td>
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<td>혈압 조절</td>
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<td>혈당 조절</td>
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<td>산전 진찰</td>
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<td>94.8</td>
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<td>금연 교육에 따른 금연율</td>
<td>60.5</td>
<td>74.7</td>
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<td>계</td>
<td></td>
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<td>57,500</td>
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</table>

보건복지부. 2001년 국민건강. 영양조사. 2001
김창민. 여성 암 정복가능하다. 건강길라잡이.
(http://www.healthpark.or.kr/health_info/column/pages/column_view.php?fm_uno=37&page=3)
Knowing What Works in Health Care: A Roadmap for the Nation (2008)

The Care of Patients with Severe Chronic Illness: online report on the Medicare program by Dartmouth Atlas Project (2006)

To Err is Human: Building a Safer Health System (1999)

마리루 해리건, 의료의 질 관리
신영수. QA 자료집

1장 QA의 기본 개념
2장 QA의 역사
3장 TQM/CQI의 기본 개념
The Dartmouth Atlas Project works to accurately describe how medical resources are distributed and used in the United States. The project offers comprehensive information and analysis about national, regional, and local markets, as well as individual hospitals and their affiliated physicians, in order to provide a basis for improving health and health systems. Through this analysis, the project has demonstrated glaring variations in how health care is delivered across the United States. The project is run by The Dartmouth Institute for Health Policy and Clinical Practice (TDI).

Dartmouth College, Brookings Institution Announce Partnership: Mark McClellan and Elliott Fisher to Head Joint Health Policy Initiative. A program to improve the value of health care by addressing uneven quality and excess costs was unveiled recently by the Brookings Institution and Dartmouth College. The initiative will link population-based research programs at the newly-created Dartmouth Institute for Health Policy and Clinical Practice with the health policy research and development expertise of scholars at the Brookings Institution. The Brookings-Dartmouth initiative will focus on bringing researchers, lawmakers, and regulators together to develop and implement policies to address major failings in the U.S. health care system. Press release
Resources: The IOM Health Care Quality Initiative

- **To Err is Human: Building a Safer Health System** *(1999)*
  - Tens of thousands of Americans die each year from medical errors and effectively put the issue of patient safety and quality on the radar screen of public and private policymakers.

- **Crossing the Quality Chasm: A New Health System for the 21st Century** *(2001)*
  - Defines six aims—care should be safe, effective, patient-centered, timely, efficient and equitable—and 10 rules for care delivery redesign.

- **Fostering Rapid Advances in Health Care: Learning from System Demonstrations** *(2002)*
  - Redesigning primary care and care for those with chronic conditions
  - Creating an information and communications technology infrastructure
  - Making health insurance coverage available and affordable at the state level, and reforming malpractice to make it patient-centered, safety focused and nonjudicial.

- **Priority areas for national action** *(2003)*
  - Common conditions serve as a starting point for restructuring care delivery

- **Keeping Patients Safe: Transforming the Work Environment of Nurses** *(2004)*
  - Solutions to problems in hospital, nursing home, and other health care organization work environments that threaten patient safety through their effect on nursing care.
Crossing the Quality Chasm: The IOM Health Care Quality Initiative

- **Envisioning the National Healthcare Quality Report** (2001)
- **Health Professions Education: A Bridge to Quality** (2003)
- **Key Capabilities of an Electronic Health Record** (2003)
  - identifies eight care delivery functions that are essential for such records to promote greater safety, quality and efficiency.
  - A detailed plan to facilitate the development of data standards applicable to the collection, coding, and classification of patient safety information.
  - key areas related to the establishment of a national health information infrastructure,
    - a process for the ongoing promulgation of data standards; the status of current standards-setting activities in health data interchange, terminologies, and medical knowledge representation; as well as the need for comprehensive patient safety programs in health care organizations.
- **Improving the Quality of Health Care for Mental and Substance-Use Conditions: Quality Chasm Series** (2006)
- **Preventing Medication Errors** (2006)
Q&A