Computing Support for the Enterprise

John P. Glaser, Ph.D.
Vice President and CIO
Partners HealthCare System

HST 950 2-03
<table>
<thead>
<tr>
<th>Category</th>
<th>FY99 Actual</th>
<th>FY00 Actual</th>
<th>FY01 Actual</th>
<th>FY02 Forecast</th>
<th>FY03 Budget</th>
<th>FY02/FY03 Growth</th>
<th>Compound Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>34,217</td>
<td>40,135</td>
<td>45,109</td>
<td>56,133</td>
<td>62,741</td>
<td>12%</td>
<td>16%</td>
</tr>
<tr>
<td>Fringes</td>
<td>7,807</td>
<td>9,274</td>
<td>10,322</td>
<td>12,836</td>
<td>15,049</td>
<td>17%</td>
<td>18%</td>
</tr>
<tr>
<td>Total Salaries and Fringes</td>
<td>42,024</td>
<td>49,409</td>
<td>55,431</td>
<td>68,969</td>
<td>77,791</td>
<td>13%</td>
<td>17%</td>
</tr>
<tr>
<td>Supplies</td>
<td>1,306</td>
<td>1,791</td>
<td>1,476</td>
<td>2,161</td>
<td>1,560</td>
<td>-28%</td>
<td>5%</td>
</tr>
<tr>
<td>Direct Rent and Utilities</td>
<td>5,274</td>
<td>5,233</td>
<td>6,057</td>
<td>6,027</td>
<td>7,464</td>
<td>24%</td>
<td>9%</td>
</tr>
<tr>
<td>Consulting</td>
<td>5,296</td>
<td>5,057</td>
<td>7,182</td>
<td>5,284</td>
<td>5,790</td>
<td>10%</td>
<td>2%</td>
</tr>
<tr>
<td>Outside Services</td>
<td>12,443</td>
<td>10,229</td>
<td>16,703</td>
<td>19,352</td>
<td>20,073</td>
<td>4%</td>
<td>13%</td>
</tr>
<tr>
<td>Other</td>
<td>1,745</td>
<td>2,181</td>
<td>1,276</td>
<td>2,359</td>
<td>1,695</td>
<td>-28%</td>
<td>-2%</td>
</tr>
<tr>
<td>Subtotal (w/o Depreciation)</td>
<td>68,089</td>
<td>73,899</td>
<td>88,127</td>
<td>104,153</td>
<td>114,373</td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>Depreciation</td>
<td>47,914</td>
<td>48,485</td>
<td>55,541</td>
<td>57,338</td>
<td>56,608</td>
<td>-1%</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>116,003</td>
<td>122,385</td>
<td>143,668</td>
<td>161,491</td>
<td>170,981</td>
<td>6%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Defining The Nature of “Support”

- Derived IT response from goals and strategies
- Assessment of strategic trajectories
- Continuous focus and improvement of core activities
- Technology applied to core processes/activities
How Should We Support Our Disease Management Initiative?

- Develop and publish best practices
- Monitor costs, quality and care activity of a cohort
- Guide documentation
- Remind providers and patients of steps to be taken
- Critique specific care decisions
- Monitor and manage a specific patient
**IS Support of Partners Goals**

<table>
<thead>
<tr>
<th>Goal</th>
<th>IS Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and education</td>
<td>- Research patient data registry</td>
</tr>
<tr>
<td></td>
<td>- Genetics and Genomics platform</td>
</tr>
<tr>
<td></td>
<td>- Grants management</td>
</tr>
<tr>
<td>Patient care: Quality improvement</td>
<td>- Quality measurement databases</td>
</tr>
<tr>
<td></td>
<td>- Order entry</td>
</tr>
<tr>
<td></td>
<td>- Longitudinal medical record (LMR)</td>
</tr>
<tr>
<td>Patient care: Sharing data across the</td>
<td>- Enterprise master person index (EMPI)</td>
</tr>
<tr>
<td>system</td>
<td>- Clinical data repository (CDR)</td>
</tr>
<tr>
<td></td>
<td>- Common infrastructure</td>
</tr>
<tr>
<td>Patient care: Non-Acute care services</td>
<td>- Nursing documentation (InSync)</td>
</tr>
<tr>
<td></td>
<td>- 4-Next</td>
</tr>
<tr>
<td>Financial stability</td>
<td>- Revenue enhancements</td>
</tr>
<tr>
<td></td>
<td>- PeopleSoft</td>
</tr>
<tr>
<td></td>
<td>- Cost accounting (TSI)</td>
</tr>
<tr>
<td>PCHI</td>
<td>- Longitudinal medical record (LMR)</td>
</tr>
<tr>
<td></td>
<td>- PCHI.net</td>
</tr>
<tr>
<td></td>
<td>- Data warehouse</td>
</tr>
</tbody>
</table>
Budget Decision Making Process

- Partners goals and strategies
- Partners strategic initiatives
- Parent/system IS budget targets
- IS Leadership
- PHS function and strategic proposed initiatives
- Support plans and requirements
- Proposed research and development agenda
- Review with Partners CEO, COO & CFO
- Review with Operating Heads
- IS budget
Days A/R Outstanding has Shown Steady Improvement
## Outpatient Registration Reconciliation

<table>
<thead>
<tr>
<th>Member #</th>
<th>Demographics</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Y</td>
<td>87%</td>
</tr>
<tr>
<td>Y</td>
<td>N</td>
<td>3%</td>
</tr>
<tr>
<td>N</td>
<td>Y</td>
<td>7%</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>3%</td>
</tr>
</tbody>
</table>
Payer-Provider Shared Business Logic

Payer Systems

Payer A Claim Rules
Payer B Claim Rules
Payer C Claim Rules

Provider Systems

Provider copies of Payer Claim Rules

Registration
Scheduling
CPOE
Computerized Medical Record
Accounts Receivables/Billing
Synchronization of Subscriber and Master Patient Index Databases

**Payer Systems**

- Subscriber DB
- EMPI DB

**Provider Systems**

- Subscriber DB
- EMPI DB

- **Batch Reconciliation**

- **Real-time Reconciliation**

- **Shared Database**

**Shared Subscriber/EMPI DB**
A Broad Look at Partners
Clinical Systems

- Provider order entry
- Computerized medical record
- Knowledge repositories
- Physician-to-physician consultation
- Patient-provider communication/monitoring
- Care analysis
COUMADIN (WARFARIN SODIUM)  Route: PO

- Strength/Form: 1MG TABLET
- Dose: 1 Tablet(s)
- Dispense: 30 TABLET(S)
- Start Date: 03/15/2001

- Freq: QD
- PRN
- Refills
- End Date

- Prescription: Yes
- Patient Educated: No
- Directions: Take as directed

- Comments: (This will not print on prescription)
- Add to Favorites for: My List, Practice

- History
- Change Dose
- Discontinue
- Ok
- Renew
- Cancel
Warning

You are ordering SULFADIAZINE.

Drug allergy interaction warning - the patient has a documented allergy to Aspirin (reaction: Anaphylaxis)

Enter anyway  Cancel Order
Serious Medication Error Rates Before and After OE

Delta = -55%
p < .01

Bates et al, JAMA, 1998
Impact of BWH Inpatient Provider Order Entry

- Nizatidine use, for all oral H2 blocker orders, increased from 12% to 81%
- The percent of doses over the suggested maximum decreased from 2% to .6%
- The percent of orders for Ondansetron, with a frequency of 3 times daily, increased from 6% to 75%
- The percent of bed rest orders with a consequent order of heparin increased from 24% to 54%
**VITAL SIGNS:** 08/17/2000

| BP  | 120/80 | PULSE | 77 | RESP | 20 | TEMP | 98.4 | Height | N/A | Weight | 147 |

**Reminders**
- Patient has coronary artery disease on problem list and aspirin is not on the medication list. Recommend aspirin.
- Patient is overdue for Mammogram (rec: q 1 year).
- Patient has CAD and/or CHD risk equivalent and is overdue for total cholesterol and/or LDL cholesterol (rec: q 1 year)

<table>
<thead>
<tr>
<th>Medications</th>
<th>Problems</th>
<th>Procedures</th>
<th>Allergies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthroid 100 QD [N]</td>
<td>Coronary artery disease</td>
<td>Hysterectomy</td>
<td>Codeine</td>
</tr>
<tr>
<td>Inderal 20 TID [N]</td>
<td>Congestive heart failure</td>
<td>Appendectomy</td>
<td>Sulfa</td>
</tr>
<tr>
<td>Lisinopril 20 QD [N]</td>
<td>Hypothyroidism [N]</td>
<td>Ptca</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sinusitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hypertension [N]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerd [N]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Summary of the Scope of the Outpatient Care Problem

(1) Gandhi T et al. Adverse drug events in primary care, under review, NEJM.  
(3) Gandhi TK et al. Adverse drug events in primary care, under review, NEJM.  
(6) Maviglia SM, et.al. Using an electronic medical record to identify opportunities to improve compliance with cholesterol guidelines J Gen Intern Med 2001

<table>
<thead>
<tr>
<th>For Every:</th>
<th>There Appear to Be:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 patients coming in for outpatient care (1)</td>
<td>14 patients with life-threatening or serious ADEs</td>
</tr>
<tr>
<td>1000 outpatients who are taking a prescription drug (2)</td>
<td>90 who seek medical attention because of drug complications</td>
</tr>
<tr>
<td>1000 prescriptions written (3)</td>
<td>40 with medical errors</td>
</tr>
<tr>
<td>1000 women with a marginally abnormal mammogram (4)</td>
<td>360 who will not receive appropriate follow-up care</td>
</tr>
<tr>
<td>1000 referrals (5)</td>
<td>250 referring physicians who have not received follow-up information 4 weeks later</td>
</tr>
<tr>
<td>1000 patients who qualified for secondary prevention of high cholesterol (6)</td>
<td>380 will not have a LDL-C, within 3 years, on record</td>
</tr>
</tbody>
</table>
Costs of LMR vs. Benefits
LMR Benefits

- Decreased billing errors: 13%
- Increased billing capture: 14%
- Radiology savings: 15%
- Lab savings: 4%
- Drug savings: 29%
- Chart pull savings: 5%
- Transcription savings: 5%
- ADE prevention: 15%
Partners Handbook
Journals and References

Literature Search:
OVID
Pubmed

References:
Harrison’s Principles of Internal Medicine
The Merck Manual of Diagnosis and Therapy
MicroMedex
Physicians Desk Reference (PDR)

Journal Abstracts / Table of Contents:
American College of OB/Gyn (ACOG)

Primary Care Online which includes:
- Lippincott’s Manual of Nursing Practice
- Nursing Care Plans
- Lippincott’s Nursing Drug Guide
- Laboratory and Diagnostic Tests
- Primary Care Medicine
- Textbook of Internal Medicine
- Interpretation of Diagnostic Tests
- Washington Manual of Medical Therapeutics
- Facts and Comparisons Pocket Drug Guide
- Griffiths 5-Minute Clinical Consult

MicroMedex Drug Summary
- Scientific American Medicine
- Scientific American Surgery
- StatRef

UpToDate
Cervical Cancer

Screening Recommendations

The goal of this guide is to provide physicians with clear guidelines for cervical cancer screening.

The recommendations presented herein are designed to provide women with optimal and personalized care. They are based on a comprehensive assessment of recent literature on cervical cancer screening. This guide is not intended to convey rigid standards. Instead, it should be tailored to the needs of each individual woman.

Medical Impact of Cervical Cancer
Scope of Knowledge in Medicine

- 10,000 diseases/problems/syndromes
- 3,000 medications
- 1,100 laboratory tests
- 300 radiology procedures
- 460,000 articles indexed annually by MEDLINE
PCHI.net Impact: Access to Knowledge Resources

Percentage of providers

Before PCHI.net  After PCHI.net

- Book
- Journal
- Practice (Colleague)
- PCHI (Colleague)
- Computer
Survey of Physician’s Experience Using a Handheld Reference Guide  

- 60% used qRx more than twice a day
- 88% report more than 3/4 of questions addressed
- 81% report improved drug-related decisions
- 46% report 3 or more drug decisions per week were affected
- 50% report 1 or more preventable adverse drug events were avoided per week
- Overall efficiency improved in inpatient (71%) and outpatient (69%) practice
Welcome to Partners Online Specialty Consultations.

Partners Online Specialty Consultations is a health care consultation service provided by physicians at Partners hospitals, to physicians in conjunction with their patients. Physicians and patients, nationwide, may arrange remote specialty consultations to support their care by accessing the expertise of our physicians at Massachusetts General Hospital, Brigham and Women’s Hospital and Dana-Farber/Partners CancerCare.

To learn more about the process visit these links:

- About Us
- Frequently Asked Questions
- How does it work?
- Request a Consultation

Are you a first time visitor?

- Register as Referring Physician
- Register as Patient

Are you already registered?
Care Impact of eConsults
Partners Internal Analysis 2002.

- Diagnosis changed in 6% of cases
- Care plan changes discussed in 85% of cases
  - New chemotherapy regimen recommended - 67%
  - Other medical regimen & surgery discussed - 17%
  - Radiation therapy suggested - 13%
  - Termination of drugs recommended - 3%
  - Drug dosage change suggested - 3%
Welcome Bilbo Oetest

You have no new messages in your Inbox.

THE BRIGHAM AND WOMEN'S PHYSICIAN GROUP provides comprehensive adult medical care, from routine health screening to complex diagnostic evaluations. Our 10-physician general medicine practice includes a nephrologist, endocrinologist and cardiologist. All of these physicians are affiliated with Brigham and Women's Hospital and are faculty of Harvard Medical School.
The Kaiser Experience

◆ KP-Online supports:
  - Ask a question
  - Review guidelines and consumer information
  - Review benefits

◆ Piloted with 100,000 members

◆ Resulting in:
  - 11% fewer office visits
  - 14% treated their illness at home
  - 46% fewer calls to nurses
  - 42% improved perception of Kaiser
  - 59% reported understanding their disease better
Date: 02/27/98 11:04:57 AM
Medical Record #3596964

Report Type: Summary

<table>
<thead>
<tr>
<th>Date</th>
<th>Type</th>
<th>Pulse</th>
<th>Systolic</th>
<th>Diastolic</th>
<th>Oximetry</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/20/98 09:27:00 AM</td>
<td>YSS</td>
<td>57</td>
<td>105</td>
<td>66</td>
<td>97</td>
<td>162.0</td>
</tr>
<tr>
<td>02/21/98 08:49:00 AM</td>
<td>YSS</td>
<td>57</td>
<td>109</td>
<td>62</td>
<td>97</td>
<td>162.0</td>
</tr>
<tr>
<td>02/23/98 04:13:00 PM</td>
<td>YSS</td>
<td>67</td>
<td>124</td>
<td>73</td>
<td>97</td>
<td>165.0</td>
</tr>
<tr>
<td>02/24/98 09:01:00 AM</td>
<td>YSS</td>
<td>59</td>
<td>122</td>
<td>75</td>
<td>98</td>
<td>163.0</td>
</tr>
</tbody>
</table>

**Average:**
- Pulse: 60.00
- Systolic: 115.00
- Diastolic: 69.00
- Oximetry: 97.25
- Weight: 163.00
The Mercy General Experience

◆ Health Buddy (for CHF) supports:
  – Patient reporting of status
  – Analyses of patient condition
  – Email between providers and patients

◆ Impact (compared to phone-based system):
  – RN case load increased from 130 to 250 patients
  – Average days between change in symptoms and care access improved from 5 days to 1 day
  – Annual readmission costs per patient decrease from $81,900 to $58,500
Comparison of Site Scores on Five Quality Domains

- HEDIS performance
- Patient satisfaction
- Clinic function
- Asthma compliance
- Diabetes compliance
Partners HealthCare System
Systems Integration Components
## Quality Measure

<table>
<thead>
<tr>
<th>Quality Measure</th>
<th>Status Hospital B</th>
<th>Status Hospital B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death: Inpatient by diag/proc</td>
<td>x/m</td>
<td>x</td>
</tr>
<tr>
<td>Infection, acquisition of specific Organism</td>
<td>na</td>
<td>d/m</td>
</tr>
<tr>
<td>LOS, overall</td>
<td>x/m</td>
<td>x</td>
</tr>
<tr>
<td>Medication errors</td>
<td>x</td>
<td>m</td>
</tr>
<tr>
<td>Readmission: emergent within 28 days</td>
<td>m</td>
<td>x</td>
</tr>
<tr>
<td>Sepsis, vascular cath</td>
<td>x</td>
<td>d/m</td>
</tr>
<tr>
<td>Complication rates by surgeon</td>
<td>na</td>
<td>d/m</td>
</tr>
<tr>
<td>OR time by procedure</td>
<td>x/m</td>
<td>d</td>
</tr>
<tr>
<td>ED length of stay</td>
<td>x</td>
<td>d/m</td>
</tr>
</tbody>
</table>

**Legend:**  
- x = available electronically and used in existing quality measurement reports;  
- m = manual data collection;  
- d = used in existing quality measurement reports and available in department-specific database;  
- na = not available
Scale of the Integration Effort

- 51,000 user accounts
- 55,000 email accounts
- 2,500,000 patients in the Partners Master Patient Index
- 350,000,000 test results in the Clinical Data Repository and growing at a rate of 100,000 transactions per day
- 80,000,000 images archived
- 1,800 physician users of the Computerized Medical Record
- 26,000 inpatient orders entered into CPOE each day
- 720 active projects
Conclusions

- Information technology can be a critical contributor to the strategies and plans of integrated delivery systems
- Implementing the technology is difficult and may never be easy; there is nothing looming that will fundamentally ease the challenge
- The support agenda is developed through four fundamental vectors:
  - Derived from overall strategy
  - Assessment of strategic trajectories
  - Continuous improvement of care activities
  - Technology lens