Patient Entered Electronic Health Records with EMR Integration: Lessons Learned

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Houston, Texas, USA
M. D. Anderson Cancer Center

- FY 2007 Admissions – 22,257
- FY 2007 Visits/Treatments/Procedures – 922,985
- New Patients Served – 29,157
- Inpatient Units – 16
- Operating Room Locations – 2
- PACU locations – 3
- Multidisciplinary Care Centers – 21
- Employees – about 17,000
- Nurses – 3,000 (17%)
Strategic Initiative (2005-2010)

- We will improve our information systems, bioinformatics, and computational capabilities to enable us to collect, integrate, and analyze large clinical and research databases, and to generate knowledge
  - Direct a portion of IS activities to the institutional needs in research
  - Deploy secure information technology solutions that allow appropriate access to all clinical and research data
  - Expand bioinformatics and research computing activities through faculty recruitment and educational programs
EMR Design Strategy

- Build our EMR, ClinicStation, using Service Oriented Architecture (SOA)
  
  "A service-oriented architecture is essentially a collection of services. These services communicate with each other. The communication can involve either simple data passing or it could involve two or more services coordinating some activity. Some means of connecting services to each other is needed."
  

- Connect registration, ADT, and scheduling with existing and new ancillary information systems using an organization-wide data presentation layer through a single user-interface
Clinical Systems

- HIS - **Invision, Siemens** (Registration, ADT, Scheduling, Billing)
- Pharmacy - **Centricity, GE Medical Systems**
- Laboratory - **Pathnet, Cerner**
- Pathology - **PowerPath, Tamtron**
- Blood Bank - **MAK, Gambro BCT and MAK-System International**
- Radiology - **Novius Radiology (RIS), Siemens**
- Radiology Images - **Stentor, Phillips PACS**
- Document Imaging - **Documentum, IBM**
- Scanned Documents - **Documentum, IBM**
- Cardiology - **Enconcert interfaced to Apollo, Phillips Medical**
- EKG Management - **TraceMaster interfaced to Apollo, Phillips Medical**
- Pulmonary - **J-Lab, Jaeger Pulmonary Function System**
- Transcribed Documents - **Documentum, IBM**
- Respiratory Care - **MediLinks, MediServe**
- Pre-Op, OR, PACU, ICU - **Picis CareSuite, PICIS**
- Case Management - **Maxsys II, Landacorp**
- Rehabilitation Services - **Medilinks, MediServe**
- Radiation Oncology - **Mosaiq, IMPAC Medical Systems**
- Consents - **iMedConsents, DialogMedical**
- Medical Photography - **Cumulus, Canto**
Clinical Staff Data Entry

- **ClinicStation, EMR**
  - Ancillary system service calls are made to view and utilize data
    - Lab, Radiology, OT/PT etc.
  - Other applications built to support gap
    - Vital signs, height & weight, calculated BMI & BSA, pediatric growth charts, allergy, medication list and medication reconciliation, ePNA, ePHDB
    - More development in the future
Patient Data Entry

- **myMDAnderson**, patient web-portal
  - Electronic Patient History Database (ePHDB)
    - Patient medical history, with a focus on cancer and cancer exposure risks (Read only)
  - Electronic Patient Needs Assessment (ePNA)
    - Identified patients needs and subsequent referrals are electronically sent to Ancillary Departments (RN may edit)
  - Screening frequency
    - New patients
    - Every 30 days for outpatients
    - Every admission
    - Ad hoc
Web portal and EMR relationship
ePHDB Development

- Converted paper-based patient history to an electronic process
  - *myMDAnderson*
    - Home Computer
    - Lobby Computer

- Provides Patient Medical History (patient perspective)
  - Chief complaint
  - Demographics
  - Past medical history (gender specific)
  - Review of systems
  - History of current problem
  - Prior Cancer history & treatment
  - Family cancer history
  - Symptom inventory
  - Tobacco/Alcohol history
  - **Patient needs assessment**

- Baseline data: 93% completion
ePNA Development

- Converted paper-based Patient Needs Assessment to an electronic process
  - *myMDAnderson* (patient reported)
    - Home Computer
    - Lobby Computer
  - ClinicStation (nurse interview)

- Benefits
  - Eliminates manual faxes to ancillary departments
  - Eliminates follow-up phone calls
  - Creates ancillary work queues for screening referrals
  - Provides routine assessments
  - Serves as first element of Nursing Assessment
    - Clinic visits
    - Admission assessment
# Development Timeline

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<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
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<tbody>
<tr>
<td><strong>A</strong></td>
<td>ePHDB</td>
<td>ePNA</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td></td>
<td>ePHDB &amp; ePNA</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td></td>
<td>ePNA*</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td></td>
<td>ePNA*</td>
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</table>

* Hardwire Computer

* Wireless Computer
Patient History - ePHDB

- "Backdoor" for New Patient
  - One time use from home
  - MRN/Date of Birth
  - User account is provided after first visit

- ClinicStation - Data review
This is a New Patient, prior to myMDAnderson access
Data Entry Menu

Patient History Database (PHDB)

Please complete the following items before your first appointment. The information you provide will be kept confidential. Your answers help your health care team plan your care.

Helpful Hints

- Be sure to complete an entire section at one time. Otherwise, the section will be marked as incomplete.
- Once you have completed a section, your answers cannot be viewed. If you’d like to change an answer, please complete the section again.
- During your appointment, your health care team will review your answers and you may provide more information at that time.

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<tr>
<th>Section</th>
<th>Status</th>
<th>Estimated Completion Time</th>
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<td>Demographics</td>
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<td>1 to 3 minutes</td>
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<tr>
<td>Race/Ethnicity/Birthplace</td>
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<td>1 to 3 minutes</td>
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<td>Exposure</td>
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<td>Symptom Inventory</td>
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<td>Clinical Care</td>
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<td>30 to 45 minutes</td>
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Go to next incomplete module  Logout
ePHDB in *myMDAnderson*

**Clinical Care** ~ [Patient History Database (PHDB)]

**Past Medical History**

The following questions should be answered for medical problems you have had in the past only. You will be asked about your current medical problems in a later part of the questionnaire. You may select all items that applied to you in the past or select "None" if the listed items do not apply to your past medical history. You must select at least one item for each section. For some of the questions you will be asked for details such as your age or the year the problem first occurred. You only need to provide either the age or the year, not both. Please try to answer the questions as completely as possible.

**Heart and Blood Vessels**
- [✓] None
- [ ] Heart failure
- [ ] High blood pressure
- [ ] Heart attack
- [ ] Poor circulation
- [ ] Stroke
- [ ] High cholesterol/Lipids
- [ ] Irregular heart beat
- [ ] Valvular disease (problems with any heart valves)

**Brain and Nerves**
- [ ] None
- [✓] Headaches or migraines
- [ ] Neuropathy (peripheral nerve disease)
Needs Assessment - ePNA

- Data Entry Options
  - *myMDAnderson*
    - Home
    - Clinic
      - Backdoor: *myMDAnderson* account issues
  - ClinicStation
    - Nurse interview
ePNA Workflow
myMDAnderson – Home Page
ePNA in *myMDAnderson*

*myMDAnderson*

**Patient Needs** < Patient History Database (PHDB)

Please help us with your visit by selecting all of the boxes that apply to you within the last 7 days. Thank you.

**SOCIAL WORK**

I am concerned about (select all that apply):
- Family
- Diagnosis
- Change in mood / behavior
- Grief / loss
- Infertility
- Physical / emotional / sexual or domestic abuse
- Child abuse / neglect
- None of the above

I need help with the following (select all that apply):
- Coping
- My care at home
- Specific cultural needs
- Housing / Change in living arrangements
- Transportation
- Employment
- Finances
- None of the above

On a scale from 0-10, select the number that best describes how much distress you have experienced in the past week (Answer on a scale from 0 (No Distress) to 10 (Extreme Distress)):
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

I have questions about (select all that apply):
- Living Will
- Medical Power of Attorney
- Out of Hospital Do Not Resuscitate Order
- Other: [ ] (maximum 100 characters)
- None of the above

☐ I would like to see a social worker.
Nurse’s Patient List – EMR View

<table>
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<tr>
<th>MRN</th>
<th>Last Name</th>
<th>First Name</th>
<th>DOB</th>
<th>Allergies/Reactions</th>
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<th>POD</th>
<th>BED</th>
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<td>07/03/08 07:24</td>
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Pods: 14

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<td>SARCOMA</td>
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Ordered & Incomplete Tasks: 3

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<th>Patient Name</th>
<th>Rm/Bd</th>
<th>Task Summary</th>
<th>Task Information</th>
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<td>07/01/08 21:30</td>
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<td>Needs Assessment</td>
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<tr>
<td>07/02/08 17:57</td>
<td>718029</td>
<td>CROW, TERRY</td>
<td>1025</td>
<td>Needs Assessment</td>
<td>Needs Assessment</td>
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</tbody>
</table>
ePNA in ClinicStation

Social Work:
- Are you concerned about:
  - Family
  - Injuries
  - Child Abuse
  - Physical, Emotional, Sexual or Domestic Abuse
- Do you need help with the following:
  - Coping
  - Care at home
  - Specific cultural needs
  - Transportation
  - Housing/Change in living arrangements
- On a scale of 0-10, how much emotional distress have you experienced in the past week?
  - No Emotional Distress 0 1 2 3 4 5 6 7 8 9 10 Extreme Emotional Distress
- Do you have questions about:
  - Living Will
  - Medical Power of Attorney
  - Out of hospital Do Not Resuscitate Order
  - Other
- Would you like to see a Social Worker? Yes No

Nutrition:
- Have you had unintentional weight change? Yes No
- If yes, please indicate whether this was weight gain or weight loss. This weight loss/gain took place over the last:
  - 1 Week
  - 1 Month
  - 3 Months
  - 6 Months
  - Other
- Are you:
  - Pregnant or Breastfeeding?
  - Receiving IV nutrition (TPN) or tube feeding?
- Do you have questions about:
  - Diabetic diet
  - Buried management
  - Nutritional supplements/herbs/herbal form:
  - No nausea
  - Vomiting
  - Loss of Appetite
  - Dry Mouth
  - Other

PT/OT:
- Have you fallen? Yes No
- Help walking
- Help getting out of bed/chair, getting on/off the commode
- Do you need?
Post-Implementation Evaluation

- Patient Entered Data
  - ePHDB (Center A and Clinic B)
  - ePNA (Center A and C)
- Center C Feedback (ePNA)
  - Nurse
  - Patient
- Ancillary Department Data (ePNA)
  - Feedback
  - Evaluation of electronic referral process
ePHDB Data Collection Method
Center A

Percentage

July 1-28 Aug 5-Sep 1 Sep 2-29 Oct 7-Nov 3 Nov 4-Dec 1 Dec 2-29 Jan 6-Feb 2 Feb 3-Mar 1 Mar 2-29 Apr 6-May 3

% of Patients Using Paper Tool
% of Patients Using Electronic Process
Linear (% of Patients Using Paper Tool)
Linear (% of Patients Using Electronic Process)
ePHDB Data Collection Methods
Center A

1. July 1-28
2. Aug 5-Sep 1
3. Sep 2-29
4. Oct 7-Nov 3
5. Nov 4-Dec 1
6. Dec 2-29
7. Jan 6-Feb 2
8. Feb 3-Mar 1
9. Mar 2-29
10. Apr 6-May 3

Number of Patients

- # of Patients Using Paper Tool
- # of Patients Using Electronic Process
Summary Center A - ePHDB

1. Daily implementation support and staff communication (business office, nurses and patients)
2. Support diminished, leadership changes, ePNA added to workflow
3. New patient referrals drop with 1-2 day new patient turn-around
4. Computer down and not reported
ePHDB Data Collection Methods
Clinic B

<table>
<thead>
<tr>
<th></th>
<th># of Patients Using Paper Tool</th>
<th># of Patients Using ePHDB at Home</th>
<th># of Patients Using ePHBD in Clinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar 10 - 16</td>
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<tr>
<td>Mar 17- 22</td>
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<td>Week of 3/24</td>
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<td>Week of 3/31</td>
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<td>Week of 4/7</td>
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<td>Week of 4/14</td>
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<td>Week of 4/28</td>
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<td>Week of 5/5</td>
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<td>Week of 5/12</td>
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</table>
Summary Clinic B - ePHDB

- Leadership support and planning
- Different outcome
- Computer not functioning
ePNA Data Collection Methods-
Center A

Week of 2/24
Week of 3/2
Week of 3/9
Week of 3/16
Week of 3/23
Week of 3/31
Week of 4/6
Week of 4/13
Week of 4/22
Week of 4/27

Number of Patients

Patient-entered data
RN interview
Incomplete
Summary Center A & C – ePNA in myMDAnderson

- Center A utilizes myMDAnderson
  - Home: 7%
  - Clinic: 0.7%
  - Nurse: 59%

- Center C utilizes myMDAnderson
  - Home: 2%
  - “Backdoor” on day of clinic: 10%
  - Nurse: 59%
Perceived Influence on Workflow (ePNA)

Patient Response - 140

- Waiting Room Delay: 23%
- Exam Room Delay: 12%
- Yes: 77%
- No: 88%

Nurse Response - 11

- Waiting Room Delay: 27%
- Exam Room Delay: 45%
- Yes: 73%
- No: 55%
Nurse Perceptions (ePNA) Influence on Workflow

Positive
- Saves time when patients complete ePNA prior to nurse interview
- Patients prompted in clinic
- Eliminates paper
- Easy to complete
- Reminder in Nurse work queue
- More needs identified and referrals

Negative
- Technology slow
  - Wireless network
  - Server
  - Tablet
- Patient reluctant to complete ePNA in waiting room
- Patients do not understand the difference between current and past needs
Patient Self-Reported Tablet Proficiency

Center C = 140 Patient Responses

- Very Comfortable: 53%
- Comfortable: 20%
- Somewhat Comfortable: 12%
- Uncomfortable: 6%
- Very Uncomfortable: 20%
Suggested Improvements (ePNA)

Patient
- Encourage *myMDAnderson* completion prior to visit
- Utilize a smaller and lighter handheld device
- Provide last ePNA response
- Shorten the questions
- Increase font size
- Improve network wireless speed

Nurse
- Encourage completion prior to visit
- Offer patient more device options; e.g. laptop on wheels or computer kiosks
- Provide historical data previous ePNA
- Increase the time interval for completion of ePNA – currently every 30 days
- Educate patients
Perceived Change in Ancillary Service Follow-up

Patient Responses = 140

- Improved
- Not Improved
- No Needs Identified

Nurse Responses = 11

- Improved
- Not Improved
Perceptions of Improvement in Ancillary Services

Patients
- “This is a good and fast way to chart and keep up with things (referrals)”
- “Makes communication easier”
- “Simplifies” the referral process
- “When it’s (ePNA) in the computer they all see my needs, then I get help quicker.”
- Decreases time and paperwork
- “I requested other services on the (ePNA) and I received a very quick response”

Nurses
- The patient is often seen by the ancillary departments before they leave the clinic
- After review by the nurse, identified needs are sent directly to ancillary department
- “Referrals are made more consistently”
- Patient care in the clinic is more efficient
Ancillary Work list
# ePNA History View

**Needs Assessment:** 9

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<tr>
<th>Patient Needs Assessment</th>
<th>Date Documented</th>
<th>Documenting User</th>
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<td>282273 - TEST, PATIENT M M 29yo F 02/03/1979 (17.8 cm 3.4kg BSA 0.13㎡) 06/17/08</td>
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<td>TRAINING RN</td>
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</table>

**Patient Needs Assessment Summary: 5/18/2008 9:44:55 PM**

**Patient Location:**

**Social Work**

The patient wants to see a social worker.

**Follow up notes:**

**Nutrition**

Patient has not been eating enough for the last 3 days or longer due to:

Other: left leg skin

**Follow up notes:**

**Action Taken:**

Heat pt

**Due Date:** 5/19/2008 12:00:00 AM

**Screened By:** DE LOS REYES, TANAY RD 5/19/2008 2:34:04 PM

**PTOT**

Patient needs help in Activities of Daily Living:

Other: lymphedema.

**Follow up notes:**
### Ancillary QA / Statistical Report

<table>
<thead>
<tr>
<th>MRN</th>
<th>Patient Name</th>
<th>Report To Location</th>
<th>Attending MD Name</th>
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Ancillary Department Issues

- Point-of-care documentation by nursing is frequently completed after patient departure
- Workflow for ePNA completion time
- Documentation in two or more systems to complete referral is necessary for some ancillary departments
- Unable to forward ‘inappropriate’ referrals to another department
- Unable to utilize individualized work queues
ePNA Impact on Ancillary Referrals

Social Work Referrals

- Paper & Fax Process
- ePNA Implemented
Ancillary ePNA Benefits

- Role-driven departmental worklist
- Increased referrals for some departments
- Referral process streamlined as compared to paper / fax system
- Patient history is available in a central location
Lessons Learned - Organizational

- Operational leadership commitment
- Stable staff environment
- Patient education
- Determine new workflow and responsively change practice
  - Roles and responsibilities
  - Workflow transition
  - Real-time data entry to support timely referrals
  - Conversion of paper process cannot be done without workflow analysis
- Minimize duplication between patient and clinical assessment (e.g. weight, smoking)
- Patient computers
  - Location
  - Furniture
  - Security
  - Funding
  - Maintenance
- Reporting
  - Compliance
  - Referrals per area
  - Needs per clinical diagnosis groups
  - Needs by clinical area
Lessons Learned - Patient

- Communication to patients
- Support for patients using new software
  - Home
  - Hospital
- Patient age considerations
  - Tablet
  - Email and computer use
- Resources to support patients
  - Role of myMDAnderson team
- Access to myMDAnderson
  - Not every patient uses it
  - Password management
  - Backdoor process
  - Currently, access to sign-up requires center intervention
What is next?

- Determine if this is a sustainable business model
  - New patient
  - Returning patient
- ePHDB changes in ClinicStation
  - Modify order of modules
  - Add symptom inventory scales
  - Display partial myMDAnderson data
  - Utilize data for physician documentation
- ePNA changes
  - Modify outpatient screening questions
  - Evaluate current IT and business models and recommend changes
What is next? (Continued)

- Change in Web Portal
  - Modify/shorten the clinical section
  - Provide on-screen feedback to indicate successful data upload
  - Enable patient to print a copy of data entered
  - Enable self-enrollment for myMDAnderson
  - Uncouple ePNA & ePHDB
  - Allow patient-identified proxy
  - Evaluate current IT and business model and recommend changes
Recommendations

- Assure organizational leadership commitment
- Agree upon the business model for patient-entered medical data
- Understand and support work flow process change
- **Essential**: Provide and maintain ongoing data analysis and feedback to leadership & users
Special Thanks

- Sharon McLane, Director, Nursing Informatics
- Dr. Margaret Spitz, Chair, Epidemiology
- Lymphoma / Myeloma Center
- Undiagnosed Breast Clinic
- Melanoma / Skin Center
Thank You

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