

MONITORING THE EMR FOR EVENTS OF CLINICAL IMPACT



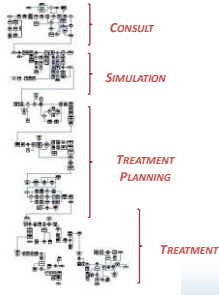
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Making Treatment Safer



- Identify Hazards
 - Prospective (FMEA)
 - Incident reports

- Intervene
 - Hazard-specific solutions
 - Safety Culture



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Near-misses and safety incidents (NMSI) in RT

- Most common causes for error:
 - Communication
 - Treatment planning
 - Following standard procedures
- Other errors:
 - Documentation
 - Equipment/hardware
 - Treatment delivery



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Clark et al, 2013

Factors increasing risk for NMSI

- Urgent initiation of treatment
- Specific tumors (head and neck, lymphoma)
- Modality (3D conformal)
- Cross-coverage by physicians
- Pediatric patients

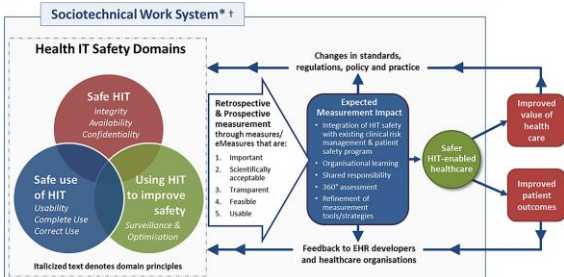


Physician's Perspective

- Predisposing clinical and technical factors are important for radiation therapy
- There are a number of clinical considerations that can impact quality and safety that are not directly related to therapy delivery
 - Clinical decision making
 - Communication between oncologic services
 - Labwork
 - Medication ordering



Healthcare Information System (HIT)





Usability

Table 1 Fourteen usability principles for the design of electronic medical records

1. Consistency—Design consistency and standards utilization	8. Message—Useful error messages
2. Visibility—System state visibility	9. Error—Use error prevention
3. Match—System and world match	10. Closure—Clear closure
4. Minimalism—Minimalist design	11. Reversibility—Reversible actions
5. Memory—Memory load minimization	12. Language—User language utilization
6. Feedback—Informative feedback	13. Control—User control
7. Flexibility—Flexible and customizable system	14. Documentation—Help and documentation

Adapted from Zhang and Walji.⁵⁴



Usability

- Minimizing the number of steps to complete a task
- Inclusion of visual and auditory warnings/alerts when there could be data entry errors (e.g. feedback)
- Avoiding user information overload
 - Presentation of only the important information
 - Reduce the number of screens with redundant information



EPIC interface

The screenshot displays the EPIC EMR interface for a patient named 'MORTIMER, J'. The interface includes several data panels:

- Vital Signs:** Shows temperature, heart rate, and oxygen saturation.
- Medications:** A list of active medications with columns for Name, Dose, Frequency, and Status.
- Active Wounds:** A list of wounds with columns for Name, Location, and Status.
- Chaplaincy Care:** A section for spiritual care services.
- ICU Patient Summary:** A summary of the patient's current ICU status.
- Blood Product Administration:** A list of administered blood products.
- Infection Monitoring Summary:** A summary of infection monitoring results.

The interface is organized into a grid layout with a left-hand navigation menu and a top navigation bar.

Usability Issues

- Minimalist design
- Useful error messages
- Automatic error prevention
- Flexibility



Electronic Medical Record (EMR) User-related errors

User-related errors	Example
Data entry errors	Clinicians manually type in notes which can result in data entry errors (vital signs, quantities/meds)
Copy and Paste errors	Copying and pasting from prior note into new note without an appropriate update
Chart management errors	"Prestarting" a note for patients prior to the visit and the note is never deleted if a patient is a "no show"
Order entry errors	Some EHR allow a clinician to choose a medication from a pre-determined list. New medications are not in the database so an unlisted med can be entered manually into the database. If the medication is entered incorrectly into the database, incorrect ordering can be perpetuated by other prescribers



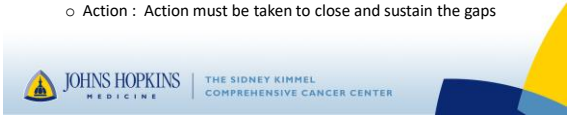
Medication management systems

- Adverse Drug Events (ADEs) can cause harm
- Almost half of all medication safety issues occur at the ordering stage
- Detection of ADEs and potential adverse events by self-reporting fails to catch the majority of errors
 - Most hospitals use voluntary reporting to track medication safety problems and these systems miss more than 90% of actual adverse events



Addressing the Clinical Concern

- Computer Prescriber Order Entry (CPOE) systems help to standardize medication orders
- Even computerized medication systems require that leaders are engaged in ensuring best practices and decision support for drug selection, dosing, and monitoring are implemented
- NQF Safe Practices, the "4A Innovation Adoption Model"
 - Awareness : Hospitals aware of gaps
 - Accountability : Right teams are accountable for changing workflow/behavior
 - Ability : Leaders invest in those who need new abilities
 - Action : Action must be taken to close and sustain the gaps



Evidence-Based Practice

- Adherence to evidence-based practice improves patient outcomes
- National Comprehensive Cancer Network (NCCN) and ASCO have published evidence-based practice standards for most cancer diagnoses
- Adherence to guidelines nationally is as low as 60%



EMRs and Quality

- Cancer care is often delivered on a case by case basis by well-intentioned providers with no formal guidelines
- Chemotherapy and radiation therapy orders were handwritten
- EMRs have changed that....



EMRs

- EMRs on their own don't improve quality
- EMRs can improve care when implementation is effective and there is ongoing use of a system to monitor and improve clinical practice

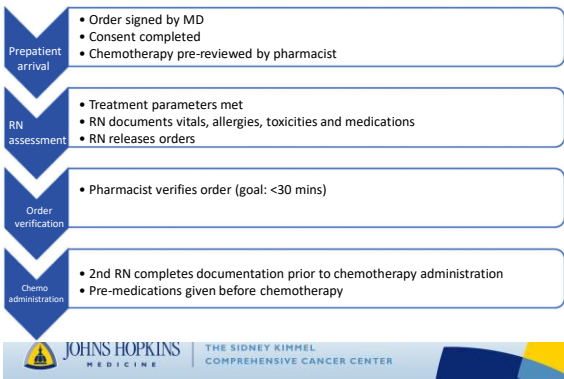


The Mt. Sinai Experience

- Tisch Cancer Institute evaluated their transition to Epic's Beacon electronic chemotherapy ordering platform
- This transition to electronic chemotherapy ordering offers an opportunity to develop an electronic conduit for evidence-based oncology practice, standardization of supportive care, and enhancement of patient safety
- Utilized the "rate of evidence-based adherence (REBA)"



Beacon Workflow



Tips for Successful Implementation

- o “REBA” significantly increased with defined workflow in EMR
- o Extensive involvement of oncology leadership
- o Use of a chemotherapy council to enforce evidence-based practice
- o On-going collaboration between clinical operations and information technology



Oncologic Follow-up Guidelines

- o The majority of cancer patients receive multi-disciplinary cancer care with coordinated efforts from radiation oncology, medical oncology, and surgery
- o After active cancer treatment is completed, multi-disciplinary follow-up is challenging yet important
- o Follow-up treatment plans generally include:
 - o Regular physical exams with overview of history
 - o Monitoring for early detection of new or returning cancers
 - o Management of cancer and treatment-related side effects
 - o Lifestyle coaching and tips to help reduce cancer risk
 - o Referrals to community resources/support groups



National Comprehensive Cancer Network
NCCN Guidelines Version 2.018
 Extremity/Superficial Trunk, Head/Neck

[NCCN Guidelines Index](#)
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[Discussion](#)

PRIMARY TREATMENT

Stage II (T1, N0, M0, G2-3)^a
 or
 Stage II, III Resectable with acceptable functional outcomes

Surgery¹ to obtain oncologically appropriate margins
 or
 Surgery¹ to obtain oncologically appropriate margins → R1² (category 1)
 or
 Preoperative RT³ → Surgery¹ to obtain oncologically appropriate margins

Surgery¹ to obtain oncologically appropriate margins
 or
 Preoperative RT³ (category 1) → Surgery¹ to obtain oncologically appropriate margins → R1² (category 1)
 or
 Surgery¹ to obtain oncologically appropriate margins → R1² + adjuvant chemotherapy⁴ (category 2B)

Surgery¹ to obtain oncologically appropriate margins
 or
 Preoperative chemotherapy⁴ (category 2B) → Surgery¹ to obtain oncologically appropriate margins → R1² (category 1)
 or
 Surgery¹ to obtain oncologically appropriate margins → R1² + adjuvant chemotherapy⁴ (category 2B)

FOLLOW-UP


• Evaluation for rehabilitation (OT, PT)
 • Continue until maximal function is achieved
 • H&P every 3-6 mo for 2-3 y, then every 6 mo for next 2 y, then annually
 • Chest imaging⁵
 • Obtain postoperative baseline and periodic imaging of primary site⁶ based on estimated risk of locoregional recurrence^{7,8}

If recurrence, See [Recurrent Disease \(EXTSARC-6\)](#)

^aSee Principles of Imaging (SARC-1)

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**National
Comprehensive
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**NCCN Guidelines Version 1.2018
Invasive Breast Cancer**

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Discussion

SURVEILLANCE/FOLLOW-UP

- History and physical exam 1–4 times per year as clinically appropriate for 5 y, then annually
- Periodic screening for changes in family history and referral to genetic counseling as indicated, see NCCN Guidelines for Genetic/Familial High-Risk Assessment: Breast and Ovarian
- Educate, monitor, and refer for lymphedema management
- Mammography every 12 mo††
- Routine imaging of reconstructed breast is not indicated
- In the absence of clinical signs and symptoms suggestive of recurrent disease, there is no indication for laboratory or imaging studies for metastases screening
- Women on tamoxifen: annual gynecologic assessment every 12 mo if uterus present
- Women on an aromatase inhibitor or who experience ovarian failure secondary to treatment should have monitoring of bone health with a bone mineral density determination at baseline and periodically thereafter‡‡
- Assess and encourage adherence to adjuvant endocrine therapy
- Evidence suggests that active lifestyle, healthy diet, limited alcohol intake, and achieving and maintaining an ideal body weight (20–25 BMI) may lead to optimal breast cancer outcomes
- See NCCN Guidelines for Survivorship

[See Recurrent Disease \(BINY-17\)](#)



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Survivorship – Invasive Breast Cancer


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Note: Measurements may continue to change in a woman for a 10-year life expectancy and so as to optimize the world best the diagnosis, evaluation or treatment of any identified problem.

†† 3D mammography is preferred over 2D mammography. 3D mammography is preferred over 2D mammography. 3D mammography is preferred over 2D mammography.

‡‡ Tamoxifen users should have a bone mineral density determination at baseline and periodically thereafter.



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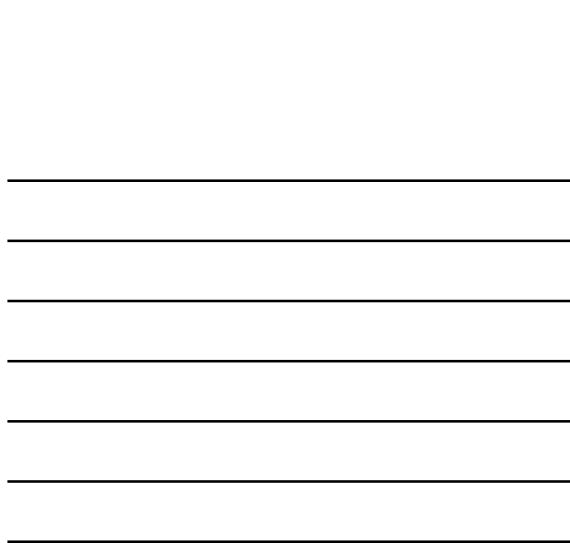


Development of a Clinical Care Pathway for Oncologic Follow-up

- Create a general clinical care pathway (or “workflow”) for multi-disciplinary care with oncology and surgery
- Pilot the general pathway with the breast cancer program
- Roll-out “programmatic” clinical care pathways across solid tumor multi-disciplinary groups (e.g. thoracic, sarcoma, pancreatic, etc.)



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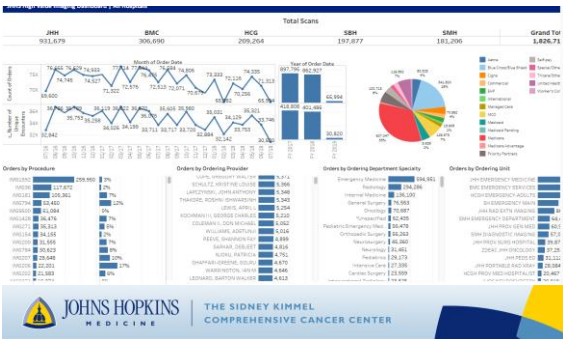


Goals of a Clinical Care Pathway

- Reduction in redundant/duplicate imaging orders
- Reduction in redundant/duplicate lab orders
- Follow-up visits with multi-D providers at appropriate time intervals
- Reduction in drop-off rate for follow-up/survivorship appointments



Quality Dashboard



Software Interface





Automated Communication between Systems

- Capability of electronic systems to communicate
- Ability to foster the clinical tie between patient on treatment visit and blood test values
- Automated data pull-in of complete blood count (CBC) to match symptoms recorded during on treatment visit

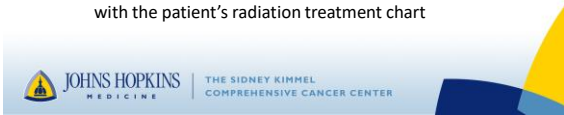


Flowsheet	Clinician Worksheet	Laboratory	Vital Signs	Assessments	Graphs	Pt. Education	Checklists	Dose Eval	External Assessment
Date	9/2/15	12/9/15	12/23/15	12/23/15	12/28/15	12/28/15	12/28/15	12/28/15	12/28/15
Time	8:53 AM	9:36 AM	9:01 AM	10:48 AM	10:30 AM	10:30 AM	10:30 AM	10:30 AM	10:30 AM
Medications									
Metoclopr									
Lorazepam (nausea)									
Prochlorperaz									
Ondansetron									
Dolasetron									
Dexamethasone									
Nausea Management									
Bowel Management									
Loperamide									
Senokot S									
Docusate									
Bisacodyl									
Lactulose									
Fleets Enema									
Miralax									
Mk of Magnesia									
BMs/Day									
Approved By									
Chemotherapy									
Chemo (Ady/veA) mg/kg									
Chemo Dose w/RT									
IV Fluids									
Weight Loss									
Anemia CTC4									
WBC 1000/mcL		4.24 L	1.89 L		2.00 L		1.83 L		
ANC 1000/mcL									
Abs Lympho 1000/mcL									
Platelet count decreased									



Pitfalls of the Interface

- Clinical information may not translate between the two systems
 - Communication between oncology and rad onc
 - Consents
 - Treatment consents obtained prior to initiation of therapy
 - Scanned paper consents in Mosaic and electronic consents in Epic
 - Electronic consents adopted hospital wide do NOT connect with the patient's radiation treatment chart



Recommendations for EMR use

- Establish adverse event reporting system for health IT and voluntary reporting
- Develop and disseminate an educational campaign on the safe and effective use of EMR
- Standardize and allow for interoperability of EMR systems
 - Complete the medical record
 - Take into account usability concerns
 - Improve quality and communication between multi-disciplinary teams



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Thank You



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