Overuse of Imaging: Identifying Waste and Inefficiency

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Disclosures

Book royalties; “Evidence Based imaging: Optimizing Imaging for Patient Care,” Springer

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Outline

• What is Waste?
• What is Lean?
• Lean Methods for Imaging
• Informatics Tools for Imaging in Healthcare
“The system is designed perfectly to get the results it gets.”
- Paul Bataldin, MD
Geographic Variation Among Medicare Enrollees, 2002 - 2003

Standardized Discharge Ratio (Log scale)

Source: Dartmouth Atlas Project.
Defining Radiology Quality

IOM 2001 “Crossing the Quality Chasm”

- Safe
- Effective
- Patient-centered
- Timely
- Efficient
- Equitable
Worldwide “Insatiable Appetite” for Imaging

3.6 billion exams/year
(UNSCEAR 2008)
CT/MRI most important innovation in medicine in the 20th century*

*Fuchs V and Sox HC, Health Affairs 2001;20:30-42
Growth in Imaging Procedures

Lee DW, Levy F. Health Aff 2012;31:1-9
Value of Imaging?
Value of Imaging?
Lean Healthcare

• Elimination of all tasks or items that do not add value
• Value is defined by the customer – Patients, payers, employers
• Opposite of Lean is waste
• Tool to improve quality
Lean Objectives

• Framework for effectiveness of imaging in health care
  • Using imaging for medical decision making
• Quality in imaging
Cultural History

Lee Lusted, MD– SMDM
Society for Medical Decision Making

SHSHR, now RASHR
Radiology Alliance in Health Services Research

SIDM:
Society to Improve Diagnosis In Medicine
Hierarchy of Efficacy

- Technical: adequate image
- Accuracy: sensitivity, specificity
- Diagnostic certainty: disease probability
- Decision making: change in management
- Outcome: patient-centered outcome
- Societal value: cost-effectiveness

Hierarchy of Efficacy

- Technical: adequate image
  - Image without artifacts
  - Signal to noise
- Accuracy: sensitivity, specificity
- Diagnostic certainty: disease probability
- Decision making: change in management
- Outcome: patient-centered outcome
- Societal value: cost-effectiveness
Hierarchy of Efficacy

• Technical: adequate image
• **Accuracy:** sensitivity, specificity
  – Ability of test to identify normal and abnormal
• Diagnostic certainty: disease probability
• Decision making: change in management
• Outcome: patient-centered outcome
• Societal value: cost-effectiveness
Why Perform Diagnostic Test?

- Test results will change suspicion
  - increase or decrease certainty
  - change post-test probability
- Bayes’ Theorem
Hierarchy of Efficacy

• Technical: adequate image
• Accuracy: sensitivity, specificity
• Diagnostic certainty: disease probability
• Decision making: change in management
  – Potential to change management
  – Treatment threshold
• Outcome: patient-centered outcome
• Societal value: cost-effectiveness
Hierarchy of Efficacy

- **Technical**: adequate image
- **Accuracy**: sensitivity, specificity
- **Diagnostic certainty**: disease probability
- **Decision making**: change in management
- **Outcome**: patient-centered outcome
- **Societal value**: cost-effectiveness
Societal efficacy

• Cost-effectiveness
  • Is CT for appendicitis worth expending societal resources?

• Efficiency
  • Are the minimum resources expended to achieve a given aim
Societal Value

• Effectiveness (Does it work in the real world?)
• Efficiency (Does it work in the ideal world?)
• Equitability (Access and fairness)
Lean Thinking

Waste

Processing
Unnecessary processes and operations
Traditionally accepted as necessary

Defects
Waste related to costs for inspection of defects in materials and processes, customer complaints and repairs

Inventory
• Maintaining excessive amounts of supplies, materials, or information for any length of time.
• Having more on hand than what is needed and used.

Motion
• Unnecessary movement or movement that does not add value.
• Movement that is done too quickly or slowly.

Overproduction
Producing what is unnecessary, when it is unnecessary, and in unnecessary amounts

Transportation
Conveying, transferring, picking up, setting down, piling up and otherwise moving unnecessary items.

Time
• Waiting for people or services to be provided.
• Time when processes, people or equipment are idle.

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Lean Thinking

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"Choosing Wisely"

**ACR**
- Imaging for uncomplicated headache
- CTPA for low pre-test probability of PE
- CT in pediatric appendicitis prior to US

**ACEP**
- CT head in minor head injury
- CT head for syncope
- CTPA for low pre-test probability of PE
- Lumbar imaging for non-traumatic back pain
- CT if known kidney stones
Computer Decision Support with Hard Stop

Reduction in imaging

- Headache: -23%
- Low back pain: -23%
- Sinusitis: -27%

Blackmore, JACR. 2011
Radiology Informatics
ADVANCING SOPHISTICATION OF IMAGING INFORMATICS


CDS

DIGITAL MODALITIES

RIS

PACS

EHR

AUTOMATION

COMMUNICATION

INTERPRETATION

INFORMATION

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Traditional Radiology Reporting

Interpretation

- Image Data
- Exam Data
- Patient Data

Speech Recognition

Information

Radiology Report
Narrative Component

Communication

EHR/PHR

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FROM MANY TO MANY

MEDICAL LITERATURE REFERENCES

CLINICAL IMAGING GUIDELINES

CLINICAL SCENARIOS

INDICATIONS

EXAMS

EHRs

HOSPITALS

ORDERING PHYSICIAN

MEDICAL IMAGING DECISIONS

PATIENTS

CDS

10,000’s

1,000’s

100’s

10’s

1,000’s

10,000’s

100,000’s

1,000,000’s

10,000,000’s

100,000,000’s
SUCCESSFUL CDS REQUIRES MORE THAN JUST A SOFTWARE

- REFERENCED MEDICAL LITERATURE
- CLINICAL IMAGING GUIDELINES
- CLINICAL SCENARIOS
- INDICATIONS
- EXAMS
- EHRs
- HOSPITALS
- ORDERING PHYSICIAN
- MEDICAL IMAGING DECISIONS
- PATIENTS

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Summary:

- Systems Engineering
- Training at all levels in Lean and the Fryback & Thornbury Model
- Informatics Tools
  - Clinical Decision Support at POC and Performance Feedback
Thank You!

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Timeline for AUC Implementation

- **November 15, 2015**: CMS must specify eligible AUCs.
- **April 1, 2016**: CMS must identify eligible CDS mechanisms.
- **January 1, 2017**: CMS will no longer pay TC for advanced imaging unless CDS has been consulted.
- **January 1, 2020**: Pre-auth for outliers.