Implementing Clinical Decision Support

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Objectives

What is imaging clinical decision support?

Does it work?

How should it be implemented?

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Appropriate Imaging

- Cross-sectional imaging most important development in medicine in the 20th century*
- Overutilization of imaging can worsen outcomes and increase costs
- Clinical decision support may improve appropriate use of imaging

*Fuchs VR, Sox HC, Health Affairs 2001;20:30-42

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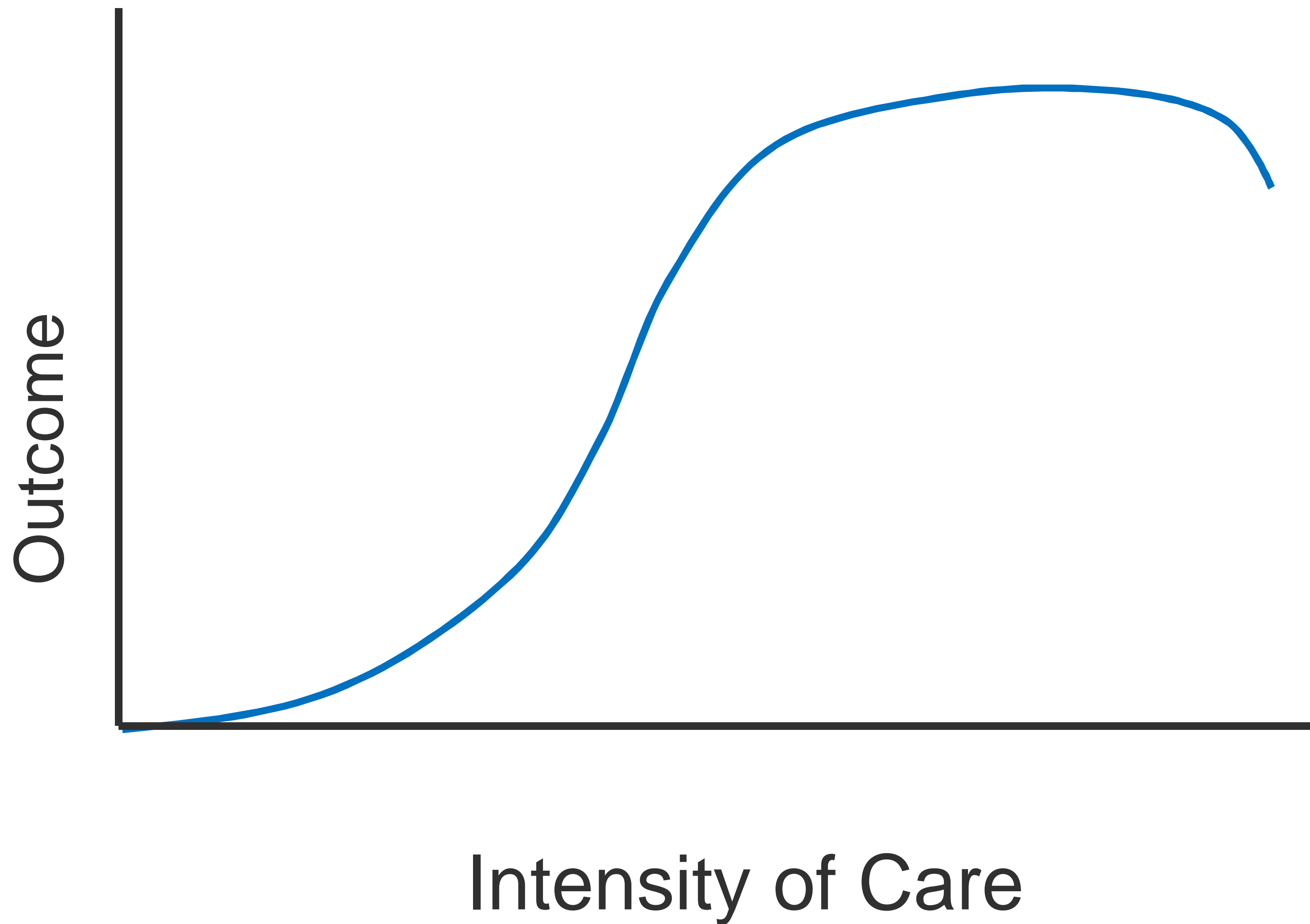
Quality of Care



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US Healthcare

U.S. over 17% of GDP for health care:

– 2X developed country avg. of 8.3%
– 50% higher than #2 Switzerland
– Finland #18

WHO report, 2003 – U.S.:

– 37th health care in world (Finland 31st)
– Ranks 47th in life expectancy
– Ranks 42nd in infant mortality
– Worse than all Nordic countries

Commonwealth Fund 2012

-Worst among developed nations

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Health Care vs % GDP

18,0
16,0
14,0
12,0
10,0
8,0
6,0
4,0
2,0
0,0

1950 1960 1970 1980 1990 2000 2010 2020

Radiation

- CT now largest source of medical radiation
  - CT most rapidly rising
- Over 50% variation in imaging in US
- Increasing awareness and scrutiny
  - 26% inappropriate utilization
- Emergency radiology perceived as a major source of overutilization

Parker, AJR 2008,
Bree, JACR 2010

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Growth in Imaging Procedures

Millions of Procedures

500
400
300
200

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Millions of Procedures	267	268	281	299	323	349	374	401	430	450	471

Increasing Utilization

Federal Medicare

Cross-sectional imaging

- 260-478 per 1000 enrollees

CT 14% per year

MRI 26% per year

Cost $229-$463 per year per enrollee

Smith-Bindman, Health Affairs, 2008

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Current State

Cottage industry

- Prior to industrial revolution
- Individual artisans
- Customized care
- Fragmented
- Only 50% evidence supported care
- 20% of provided care unnecessary

Swensen, NEJM 2010

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Clinical Decision Support

- Evidence-based guidance on appropriate use of imaging provided at point of order
- Computer order entry
- May or may not include barrier to inappropriate imaging
- Based on defined criteria for appropriate imaging

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MRI Back Exam

Exam Requested*

- ☐ mr cspine
- ☐ mr tspine
- ☐ mr lspine
- ☐ mr cspine w/ w/o contrast
- ☐ mr tspine w/ w/o contrast
- ☐ mr lspine w/ w/o contrast

Current Weight* ☐ ◉ lbs ○ kg Max Table Weight 200 kg/441 lbs

ICD9 Code(s) ☐

Indications (select all that apply):*

- ☐ Motor deficit (781.99)
- ☐ Unremitting pain despite 6 weeks of appropriate therapy
  (appropriate therapy is defined as 2 weeks of NSAIDs AND advice to stay active AND documentation of lack of improvement)
  Document in relevant history field and apply appropriate ICD 9 code
- ☐ Strong suspicion of systemic disease
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- ☐ Cauda Equina(344.60)
- ☐ Upper motor neuron findings: use myelopathy codes
  - ☐ Unspecified Region (722.70)
  - ☐ Cervical (722.71)
  - ☐ Thoracic (722.72)
  - ☐ Lumbar (722.73)
- ☐ Significant trauma or fall
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- ☐ Consult has been performed by physical medicine.

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Additional Information (Rule Out, History, Symptoms)

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National Initiatives

- Medicare Imaging Demonstration Project (MID)
- Protecting Access to Medicare Act (PAMA) 2013
- ESR iGuide

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What is imaging clinical decision support?

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Can clinical decision support decrease unnecessary/inappropriate imaging?

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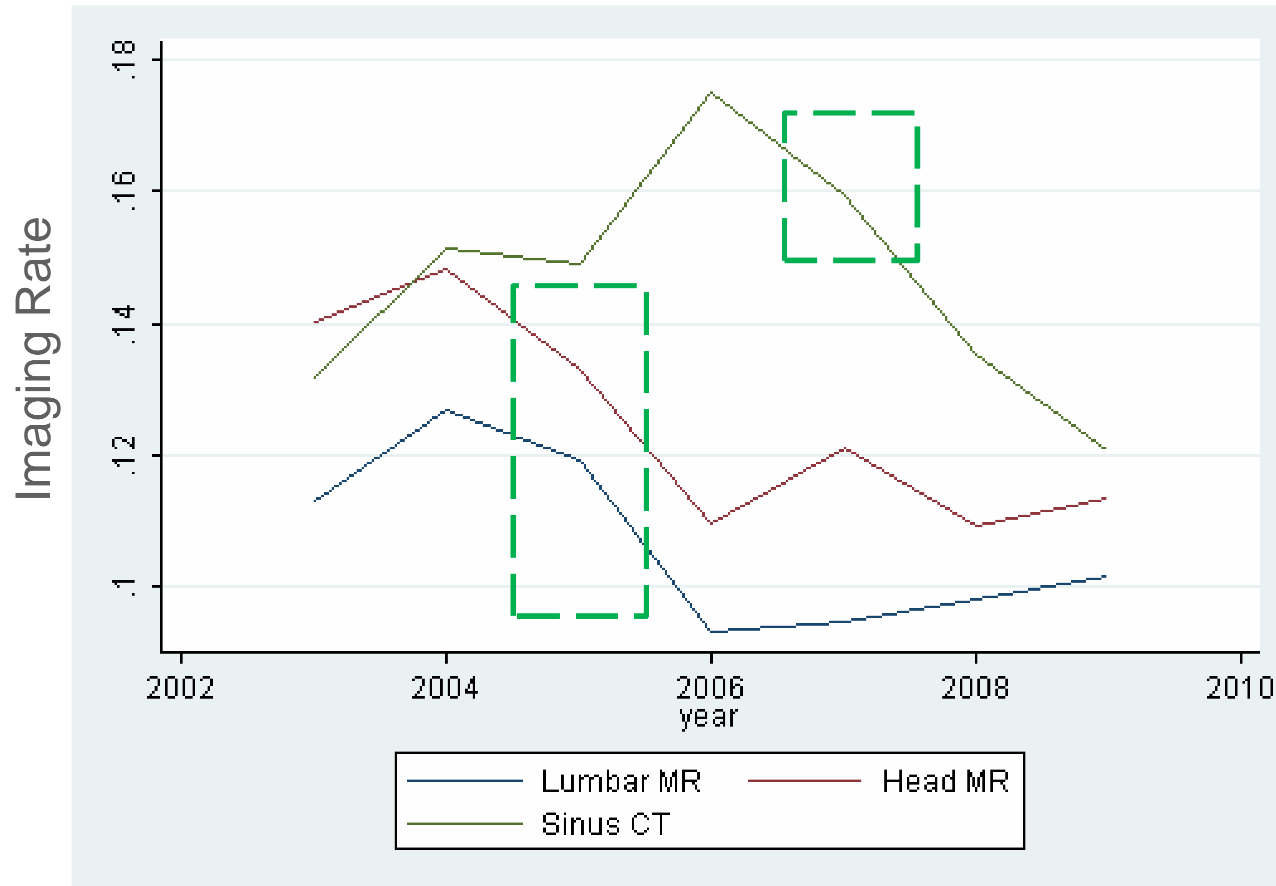
Virginia Mason Results



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

Intervention

Blackmore, et al. JACR 2011;8:19-25

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Virginia Mason Results

Coupled with Lean clinical value streams

Comprehensive care pathway

Quality improvement intervention

Multispecialty collaboration

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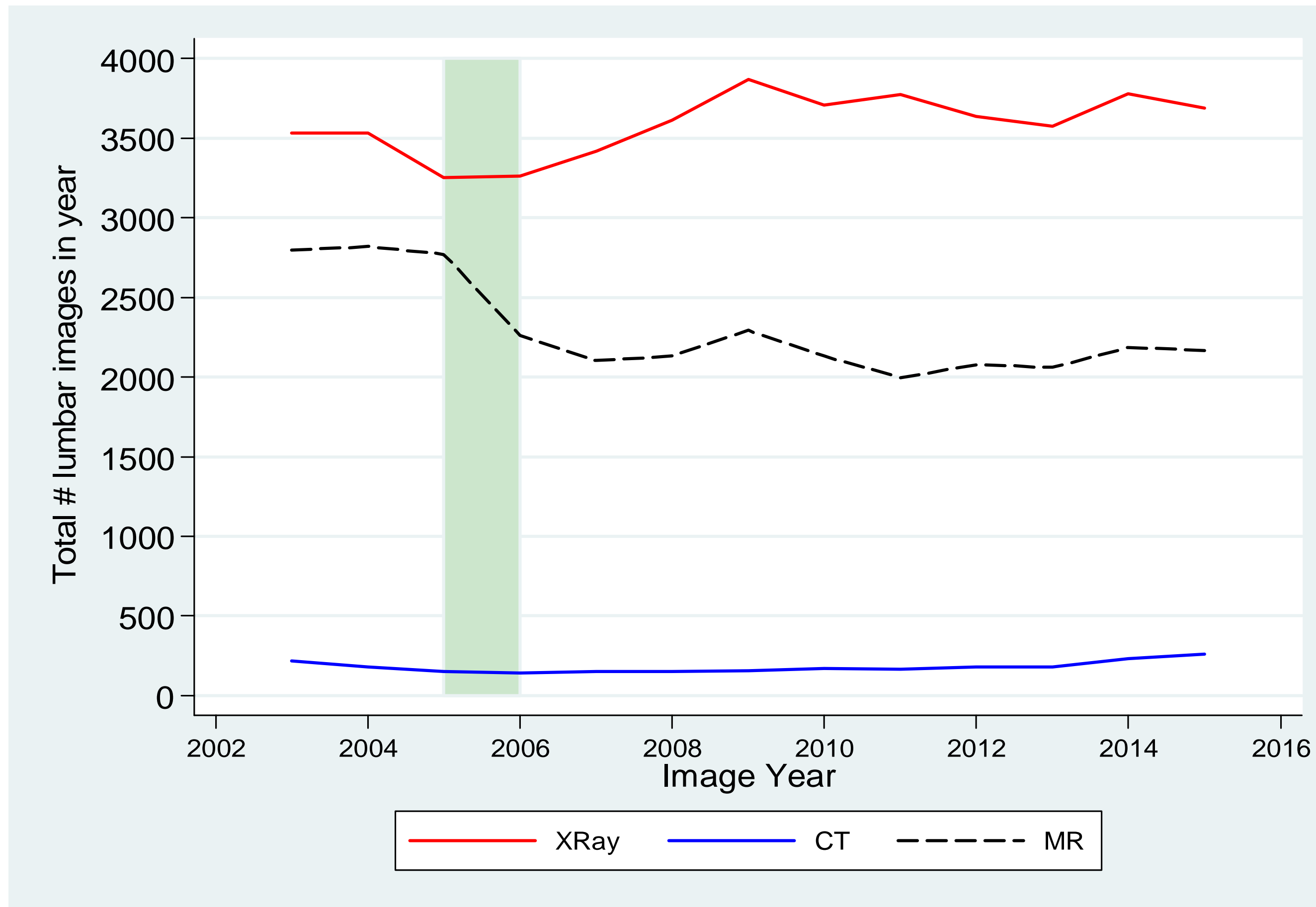
Lumbar Imaging Volumes



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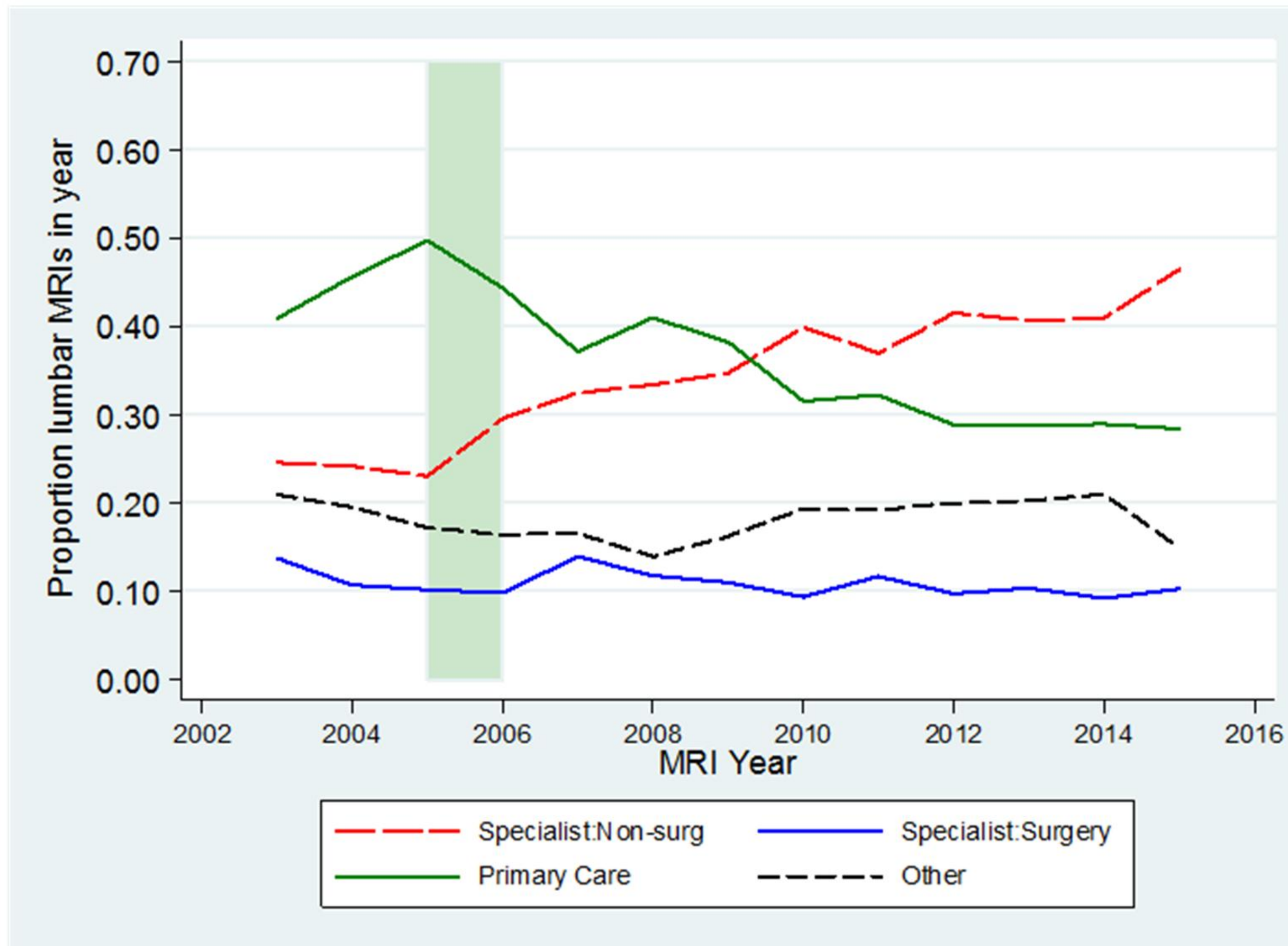
Lumbar Imaging Specialty



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Financials

Decrease in MRI volumes

- Inappropriate care

Exempt from pre-authorization

- Major commercial payers
- Washington State health plans
- Medicaid, state employees

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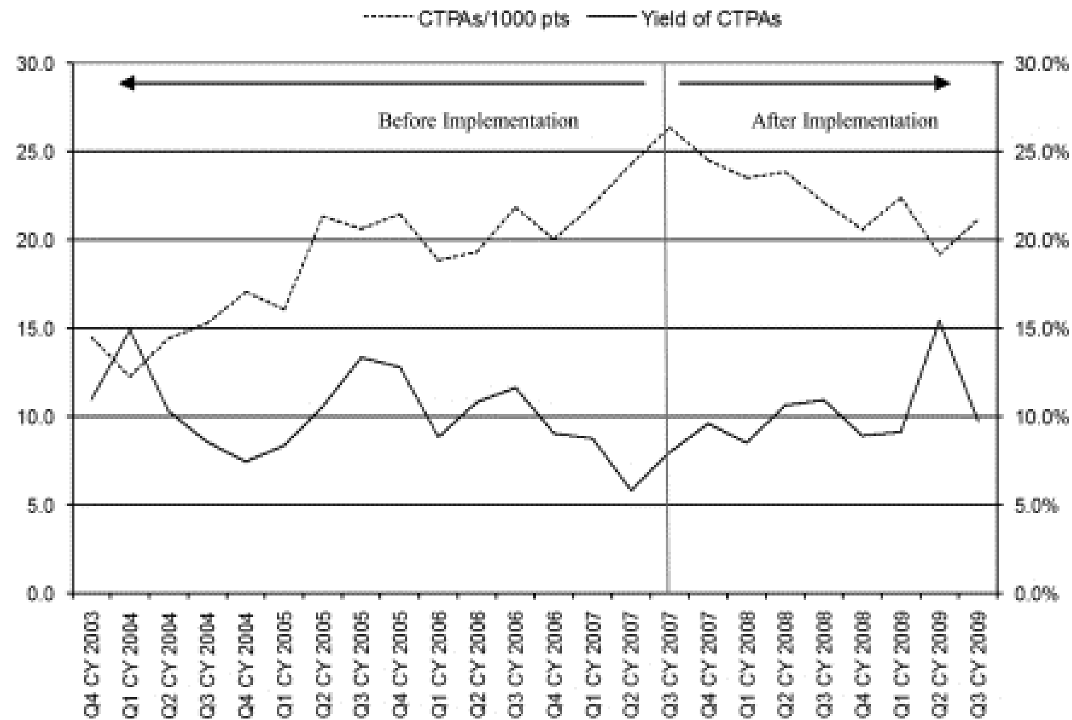
Brigham and Women's Results

CT Pulmonary Angiography



Raja, Radiology 2012;262:468-472

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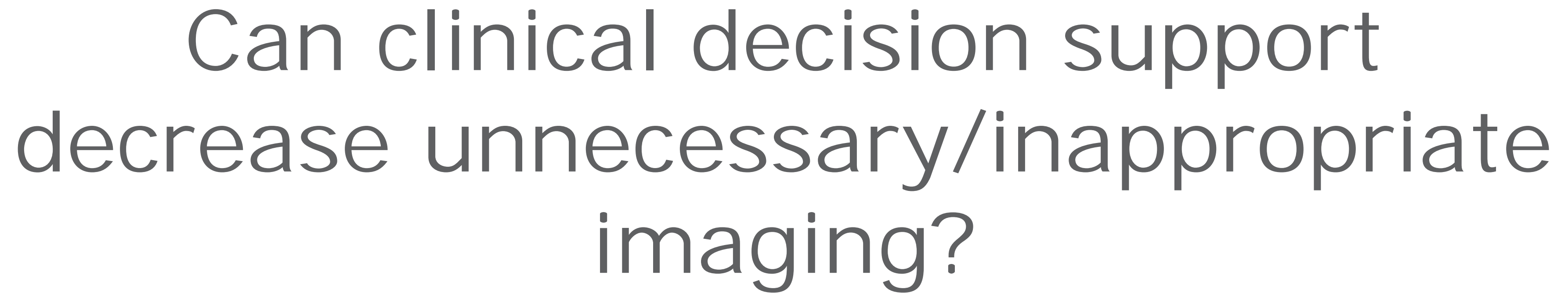

Can clinical decision support decrease unnecessary/inappropriate imaging?

YES!!!

(Sometimes)

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Lessons Learned

- Targeted clinical decision support
  - Strong evidence of value of imaging (or lack of value)
  - Defined criteria for when imaging is appropriate
- Hard stop

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Criteria Based Imaging

- Need data on criteria not to image
- Validated clinical prediction rules
- Proven to work

- Ottawa ankle rules
- Cervical spine
  - NEXUS
  - Canadian C-Spine rules
- Head CT
  - New Orleans
  - Canadian Head CT
  - CHIP
- Lumbar MRI
- Headache CT/MRI
- Sinus CT
- Thoracolumbar spine
- Pulmonary CTA
  - Wells criteria

Top Imaging Studies

Imaging Study	*%*	*Number*
MRI BRAIN +/- contrast	15.0	2,648
CT ABDOMEN + contrast	12.9	4,153
MRI JNT OF LWR EXTRE	10.4	2,785
MRI LUMBAR SPINE +/- con	10.3	2,549
CT PELVIS + contrast	8.4	3,139
CT THORAX + contrast	4.6	1,475
MRI JOINT UPR EXTREM	4.6	1,242
MRI NECK SPINE	4.5	1,282
CT HEAD/BRAIN	4.2	2,323
CT ABDOMEN	3.3	1,574
CT MAXILLOFACIAL	3.3	1,818
CT PELVIS	3.2	1,574
	37.3%	

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- When evidence is weak?
- (When to image, not how)

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Criteria Based Imaging

- No data-cannot define "Appropriateness"
- What to image with, not when to image
- American College of Radiology Appropriateness Criteria (ACRAC):
  - Knee MRI (nontrauma pain) score= 9
    - "If … imaging is necessary"

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ACR AC Abdominal Pain

Fever/abscess

Pancreatitis

Mesenteric ischemia

LLQ suspect diverticulitis

RLQ suspect appendicitis

RUQ pain

SBO

HOW not WHEN!!!

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Non-Criteria Based Imaging

When to image?

- Change management?
- Are you worried?
- Is it bad?
- Reliable clinical follow-up?

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Strength of Evidence

Sampling of existing recommendations

Oxford Centre for Evidence Based Medicine

Level 1:9 (8%)

Level 2:7 (6%)

Level 3:2 (2%)

Level 4:3 (3%)

Level 5: 99 (82%)

Lacson, JAMIA, 2016

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Options

If no criteria based imaging

Other approaches

- Restricting who can order imaging
- Require treatment/tests/imaging

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Clinical Decision Support

Target to High Value Areas

- Strong evidence for when to image
- High cost/variability
- High interest
  - Choosing Wisely
  - Clinical champion
  - Quality improvement
  - Outside pressure

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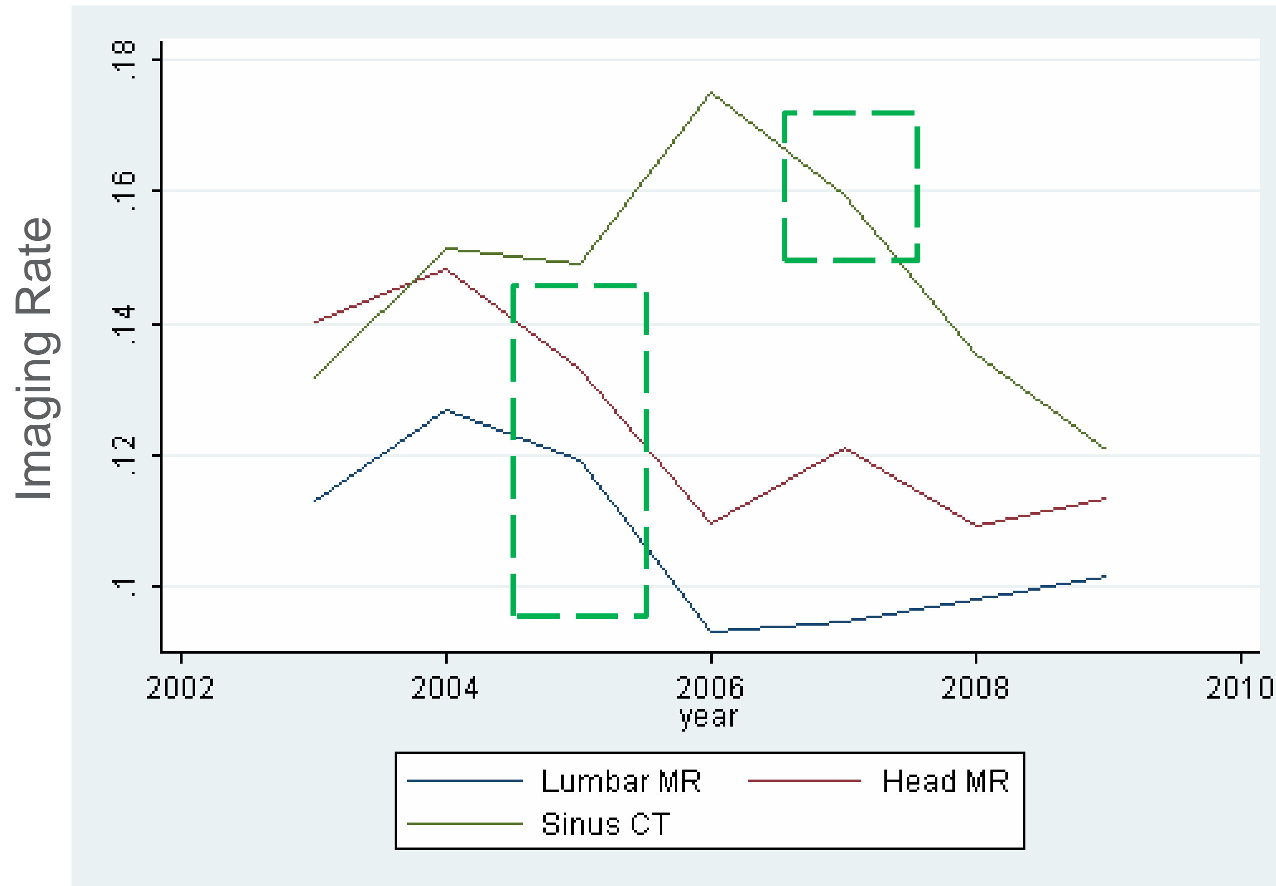
Clinical Decision Support



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Intervention

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Broad CDS Systems

Massachusetts General Hospital

Minnesota-ICSI Project

Winnipeg, Canada Children's Hopsital

Medical Imaging Demonstration Project (MID)

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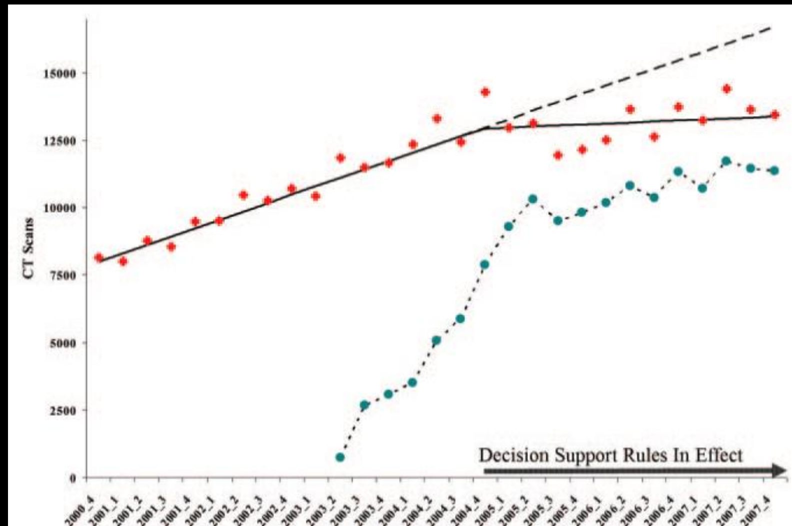
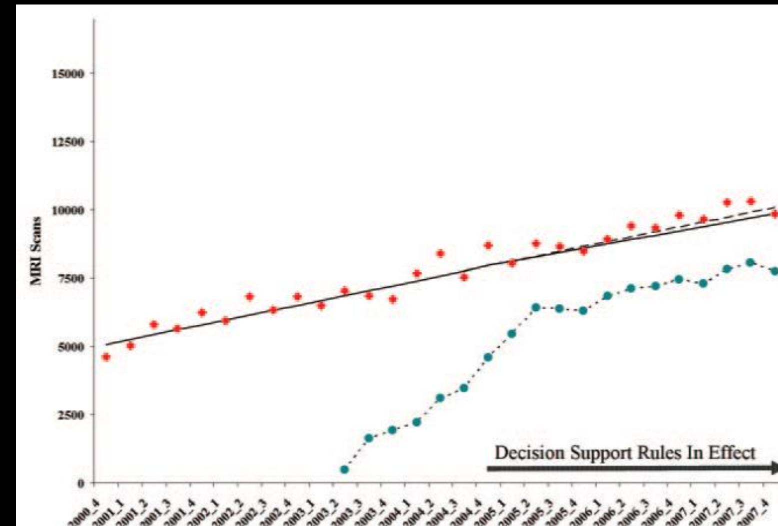
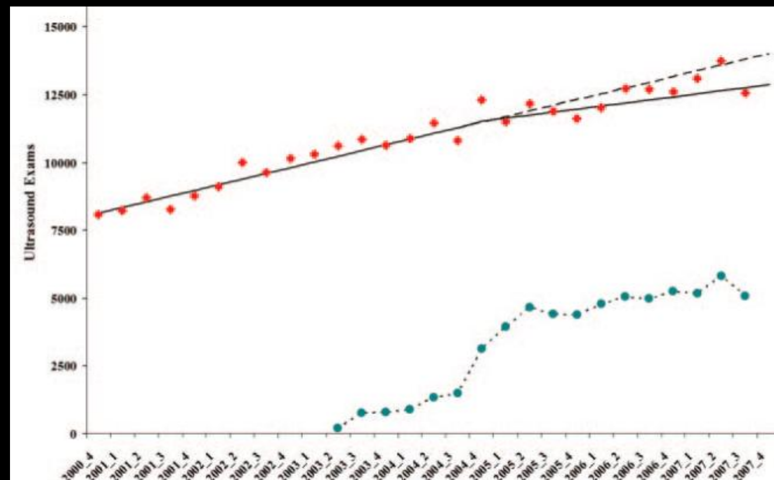
MGH Results





CT Scan

MRI



Control Group (US)

From Sistrom et al, Radiology , 2009

Minnesota Decision Support Pilot Program

AI Utilization per 1000 members

50

40

30

2003 2005 2007 2009

Projected

Actual

Source: ICSI Decision Support White Paper

Minnesota Decision Support Pilot Program

AI Utilization per 1000 members

50

40

30

Projected

Actual

Pre-Auth Implementation

CDS Implementation

2003 2005 2007 2009

Source: ICSI Decision Support White Paper

Medicare Imaging Demonstration Project (MID)

- Multicenter federal funded trial of imaging CDS
- Non-randomized 2011-2013
- Medicare (over age 65)
- 3,916 physicians
- 363 practice sites
- 139,757 imaging procedures

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MID

All advanced imaging orders

- Not all had AUC

American College of Radiology Appropriateness Criteria

- 1-9 scale

No block of inappropriate imaging

- Education only

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Medicare Imaging Demonstration Project (MID)

NO effect on imaging utilization

Delayed work flows

- 3.9 to 7.2 minutes

Conflict with local standards of care

- Specialty societies may be biased

CDS incomplete

- Guidelines often don't exist
- Rating system confusing

"Appropriateness scores" improved

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PAMA

- Protecting Access to Medicare Act
- Appropriate Use Criteria (AUC) for advanced imaging
- Clinical decision support Jan 1, 2018
- Effect payment under Medicare
- High priority clinical areas
- Identify outliers 2020

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PAMA Priority Clinical Areas

- Suspected pulmonary embolism
- Headache
- Hip pain
- Low Back Pain
- Shoulder pain
- Cancer of the lung
- Cervical or Neck Pain
- Coronary artery disease

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Objectives

What is imaging clinical decision support?

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Implementation of CDS

- Reconcile success at Virginia Mason, Brigham and Women's and others vs. failure of MID
- Lessons for implementation

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CDS Users

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Lessons Learned

Provider Buy-in

Imaging CDS isn't about radiology

- Users of the system
- Different training
- Different societies
- Different incentives

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CDS Implementation

- Provider workflow is key!
  - Make it easy
  - Mouse clicks are bad
- Presentation of information
  - Simple is better
- Local buy-in

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Clinical Decision Support

Local buy-in requires local involvement

Not “off-the-shelf” criteria

- Starting point

Different resources

Provider buy-in

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Provider Buy-In

Multidisciplinary collaborative

- Radiology
- Clinical specialists (i.e. neurology, emergency medicine, neurosurgery)
- Primary care
- (Insurers)

AGREE on criteria

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PAMA Rules

Provider led entities can establish AUC

- Local entities (healthcare organizations)
- National organizations (ACR, NCCN)

Quality improvement

- AUC from different PLE
- Couple to local quality improvement

Vendor cooperation

Provider buy-in?

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Lessons Learned

Do you allow inappropriate imaging?

- Hard stop
  - Appeal process
  - Requires buy-in
- Soft stop
  - Possible but more work
- Educational
  - Data to drive behavior change

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PAMA

Requires review of AUC

- does not require barrier to imaging

Benchmark and penalize outliers

Compliance versus success

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Combined Pathway

Local development/control

- Provider led entity (PAMA)
- Buy-in
- Hard stop
- Effective, but limited

National vendor

- Ease of implementation (?)
- PAMA compliant
- Effective (?)

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Objectives

Experience with implementing clinical decision support

-Results

-Virginia Mason lessons learned

-Relate to PAMA

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Conclusions

- CDS has great potential
- Implementation is key
  - Workflow
  - Provider buy-in
- Hard stop
- Understand where there is evidence
- Need evidence on appropriateness

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