Radiology’s Role in Population Health Management

Three Ways Imaging Can Take the Lead on Population Health

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Demystifying Population Health

Radiology-Led Initiatives to Advance Population Health Goals

Q&A
Death by Buzzwords?

Becoming Difficult to Sort Through the Noise

Remote Monitoring
- Multidisciplinary
- Readmission
  - Care Navigator
  - Transitions of Care
  - High-Risk
  - Handoffs

Health Coach
- Wellness & Prevention
- Patient-Centered Medical Home
  - Care Coordination
  - Risk Stratification
  - Care Plan
  - Seamless Care Management
- Population Health
  - Chronic Care
  - Outcomes
  - Top-of-License
  - Continuum of Care
- Outreach
- Follow-up

Seamless Handoffs

Source: Imaging Performance Partnership interviews and analysis.
What Is Population Health Management?

Bigger Than Just Hospital Care

“Population health has been defined as: ‘the art and science of preventing disease, prolonging life, and promoting health through organized efforts and informed choices of society, organizations (public and private) communities and individuals.’”

Dartmouth-Hitchcock Medical Center

“Population health resides at the intersection of three distinct health care mechanisms: increased prevalence of evidence-based preventive services and behaviors; improved care quality and patient satisfaction; advanced care coordination across the health care continuum.”

American Hospital Association

Value = Quality, Patient Outcomes

Cost of Care

The Market Realities Ahead

Three Fundamental Forces Driving Shift to Population Health

Driving Force #1: Complex Patient Population
- Burden of chronic disease and aging population driving cost growth
- Expanding pool of Medicare beneficiaries intensifying utilization

Driving Force #2: Resource Shortages
- Insufficient number of clinicians caregivers to meet growing demand
- High turnover among nurses, support staff across settings
- Unfavorable FFS¹ economics decreasing hospital reimbursement

Driving Force #3: The Great Risk Shift
- Efforts to reduce payment, rein in expenditures
- Emphasis on linking reimbursement to quality metrics and patient outcomes, jeopardizing operating margins
- Growth of risk-based delivery models such as bundled payments and ACOs²

¹) Fee for Service.
²) Accountable Care Organization.

Source: Imaging Performance Partnership interviews and analysis.
An Increasingly Comorbid Population

Small Segment of Patients Contribute Disproportionately to Costs

Driving Force #1

Percentage of Patients by Number of Chronic Conditions

Medicare Beneficiaries, 2012

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Percent of Beneficiaries</th>
<th>Percent of Spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>32%</td>
<td>80%</td>
</tr>
<tr>
<td>2-3</td>
<td>32%</td>
<td>19%</td>
</tr>
<tr>
<td>4-5</td>
<td>23%</td>
<td>81%</td>
</tr>
<tr>
<td>6+</td>
<td>14%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Medicare Spending on Top 20% Most Costly Beneficiaries

In the Midst of Declining Resources
Increasing Demand for Care, Looming Workforce Shortages

Projected Physician Supply and Demand
*Primary Care and Specialists, 2010-2020*

- **Physician Supply**
  - 2010: 723,400
  - 2015: 798,500
  - 2020: 851,300

- **Physician Demand**
  - 2010: 709,700
  - 2015: 735,600
  - 2020: 759,800

**Total shortage of 91,500 by 2020**

Hospitals Bearing the Brunt of Payment Cuts
*Reductions to Medicare Fee-for-Service Payments*

- **2013**: $(4B)
- **2014**: $(14B)
- **2015**: $(24B)
- **2016**: $(29B)
- **2017**: $(38B)
- **2018**: $(54B)
- **2019**: $(67B)
- **2020**: $(76B)
- **2021**: $(86B)
- **2022**: $(94B)

1) Registered nurse.

Providers on the Hook for Long-Term Quality, Costs
Changing Payer Incentives Increasing Cross-Continuum Accountability

Select Initiatives Expanding Responsibility Across the Continuum

- **Pre-Acute**
  - Readmissions Reduction Program
  - ACE\(^1\) Demonstration
  - BPCI\(^2\) Initiative

- **Inpatient Acute**

- **Post-Acute**
  - Accountable Care Organizations/Shared Savings Programs
  - National Pilot Program on Payment Bundling
  - Value-Based Purchasing

Source: Imaging Performance Partnership interviews and analysis.

1) Acute Care Episode.
2) Bundled Payments for Care Improvement.
Running or Walking, Many Providers Taking on Risk

Three Motivators for Providers to Assume More Risk

**Financial Advantage**
- Move away from faltering fee-for-service economics
- Secure financial reward for value

**Market Advantage**
- Attract preferred physician partners
- Secure attractive purchaser contracts

**Clinical Advantage**
- Align financial incentives with mission
- Support investments in better health

Providers “Inherent” Level of Risk Is Rising

Populations for Which Providers Are “At Risk”

Always Accountable

- Health system employees and dependents
- Self-pay patients
- Managed care patients

Newly Accountable

- Individuals shopping on health insurance exchanges
- Medicare patients subject to readmission penalties and VBP¹
- Mandatory joint bundled payment

Potential for Contracted Risk

- Medicare patients under shared savings and BPCI
- Commercially insured patients
- Employees of self-funded employers

¹) Value Based Purchasing.
Success Requires Risk Stratification

Segment Care Management Models Based on Patient Care Needs

Three Distinct Patient Populations and Care Strategies

- **High-Risk Patients**: 5% of patients; usually with complex disease(s), comorbidities. Move high-cost services for low-cost management.
- **Rising-Risk Patients**: 15-35% of patients; may have conditions not under control. Prevent patients from becoming high-risk.
- **Low-Risk Patients**: 60-80% of patients; any minor conditions are easily managed. Keep patients healthy, loyal to the system.

Balancing Dual Goals

Prioritizing Initiatives That Promote Quality and Lower Cost

Initiatives that both improve quality and lower cost of care prioritized under population health

Clinical Quality

- Clinical outcomes
- Patient safety

Low Cost

- Total cost management
- Care efficiency

Source: Imaging Performance Partnership interviews and analysis.
Imaging Initiatives to Support Various Risk Profiles

Population Health Risk Stratification

- **High-Risk Patients**: 5% of patients; usually with complex disease(s), comorbidities
- **Rising-Risk Patients**: 15-35% of patients; may have conditions not under control
- **Low-Risk Patients**: 60-80% of patients; any minor conditions are easily managed

Related Imaging Initiatives

- **High-Risk Patients**: Utilization management
- **Rising-Risk Patients**: Incidental findings management, Lung cancer screening, Clinical decision support
- **Low-Risk Patients**: Mammography, CT colonoscopy, Clinical decision support

Source: Imaging Performance Partnership interviews and analysis.
If You’re Not at the Table, You’re on the Menu

Rethinking Radiology’s Value Proposition Under Population Health

**PRESENT**

**VOLUME x PRICE**

**Fee-For-Service**
- Success measured by maximizing volumes and revenues
- Focus on individual scans and reads

**FUTURE**

1. Identify improvement opportunities across the continuum of care
2. Engage radiologists in consultative roles
3. Prioritize the right patients for the right clinical interventions

**Value-Based**
- Success measured by population health outcomes and total costs of care
- Multidisciplinary collaboration across care settings

“There is a risk, if we are not at the table, that our value is still measured in RVUs and the number of interpretations. In that case, when you put in a system that puts in some type of regulator on how many of those tests are done, there is no way to capture dollars for the additional activities that you are doing.”

Clifford J. Belden, MD
Dartmouth-Hitchcock Health System

Source: Imaging Performance Partnership interviews and analysis.
Radiology’s Role in Population Health Management

Radiology-Led Initiatives to Advance Population Health Goals

1. Right-size utilization
2. Leverage opportunities for imaging-led screening programs
3. Manage incidental findings

Infrastructure to Support Population Health Management

4. Invest in integrated data sharing platforms
5. Develop population health alignment models
6. Explore alternative payment structures

Source: Imaging Performance Partnership interviews and analysis.
1. Demystifying Population Health

2. Radiology-Led Initiatives to Advance Population Health Goals

3. Q&A
Utilization Management a Top C-Suite Priority

Percentage of C-Suite Executives Rating the Topic as a Critical Priority

<table>
<thead>
<tr>
<th>Topic</th>
<th>Rating</th>
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</thead>
<tbody>
<tr>
<td>Engaging physicians in minimizing clinical variation</td>
<td>52%</td>
</tr>
<tr>
<td>Redesigning health system services for population health</td>
<td>52%</td>
</tr>
<tr>
<td>Meeting the rising consumer expectations for service</td>
<td>47%</td>
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<tr>
<td>Patient engagement strategies</td>
<td>45%</td>
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<tr>
<td>Controlling avoidable utilization</td>
<td>44%</td>
</tr>
<tr>
<td>Improving ambulatory access</td>
<td>43%</td>
</tr>
<tr>
<td>Establishing sustainable acute care cost structures</td>
<td>43%</td>
</tr>
<tr>
<td>Non-merger partnership and affiliation models</td>
<td>41%</td>
</tr>
<tr>
<td>Tactics for strengthening PCP alignment</td>
<td>40%</td>
</tr>
<tr>
<td>Boosting outpatient procedural market share</td>
<td>40%</td>
</tr>
</tbody>
</table>

n = 209 C-suite executives

1) Percent of respondents giving the priority an “A” rating on the Health Care Advisory Board 2016 topic poll.

Source: Health Care Advisory Board 2016 topic poll; Imaging Performance Partnership interviews and analysis.
Imaging Provides Clear Opportunity for Savings

CPRM\(^1\) Uncovers Significant Variation in Medicare Imaging Spending

$22.90\(^2\) difference in imaging spending between well-managed and loosely-managed benchmarks

- **Setting Breakdown**
  - Physician Global Billing: 43%
  - Hospital-Based Imaging: 57%

- **Modality Breakdown**
  - Basic Imaging: 49%
  - CT: 27%
  - MRI: 19%
  - PET: 5%

5th Ranking of cost savings opportunity in imaging across all health care services

Source: Milliman; Crimson Population Risk Manager; Imaging Performance Partnership interviews and analysis.

1) Crimson Population Risk Manager.
2) Per member per month.

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The Impact of Well-Managed Imaging

Difference Between Loosely- and Well-Managed Benchmarks

Top 10 HCG PMPM Opportunities for Medicare, 2011

<table>
<thead>
<tr>
<th>Category</th>
<th>Loosely Managed</th>
<th>Well Managed</th>
<th>Difference</th>
<th>Cost Savings</th>
</tr>
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<tbody>
<tr>
<td>Prescription Drugs</td>
<td>$112.52</td>
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<td>$59.64</td>
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<td>SNF(^1)</td>
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<td>$22.90</td>
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<td>Imaging(^1)</td>
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<td>$20.60</td>
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<tr>
<td>Outpatient Surgery</td>
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<td></td>
<td>$12.69</td>
<td>$12.69</td>
</tr>
<tr>
<td>Non-hospital DME(^3), Supplies</td>
<td>$12.07</td>
<td></td>
<td>$7.36</td>
<td>$4.71</td>
</tr>
<tr>
<td>Physician Office/Home Visits</td>
<td>$7.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician Hospital Visits</td>
<td>$7.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician, Outpatient Surgery</td>
<td>$7.24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Company in Brief: Milliman
- Independent actuarial firm based in Seattle, WA
- Health care benchmarks include over 35 million lives, 2 billion claims across data sets from both public and private sector
- Difference between loosely-, well-managed benchmarks represent opportunity to reduce cost to payer

Technology in Brief: Crimson Population Risk Manager (CPRM)
- Performance technology solution to manage total cost and quality for defined populations
- Cost data informs risk-based contract negotiations with payers
- Represents risk portfolio of hospitals in various stages of population health management

Source: Milliman; Crimson Population Risk Manager; Imaging Performance Partnership interviews and analysis.

1) Skilled Nursing Facility.
2) Imaging savings opportunity calculated by summing all physician and hospital outpatient charges for CT, MRI, PET, and general radiology
3) Durable Medical Equipment.
Multiple Opportunities to Lead UM¹ Efforts

Radiologists Lead Efforts in Inpatient and Outpatient Settings

Three Approaches to Utilization Management

Referrer education
Teaching referrers about appropriate ordering, both before the point of order and when inappropriate orders are made

Clinical Decision Support
A computer-aided ordering system that checks physician orders for appropriateness and provides alternatives for inappropriate orders

Radiologist consultation
Providing a mechanism for referrers to receive order advice from radiologists

¹ Utilization management.

Source: Imaging Performance Partnership interviews and analysis.
Tackling Inpatient and ED Utilization Management

Referrer Education Around Exam Appropriateness

**St. Rita’s Inpatient MRI Review**

- Radiology Director and her team review data for all inpatient MRI orders from previous six months
- Team identifies top ordering clinicians, compares orders to ACR appropriateness criteria
- Medical Director or radiologist champion meets one-on-one with top ordering clinicians
- Initiative not punitive, focuses on educating ordering clinicians

**Lourdes ED MRI Order Form**

- Emergency Department clinicians required to submit paper form when ordering MRIs
- Ordering clinician answers questions about course of treatment, relevant patient history, and reason for order
- Form requires ordering clinician signature for accountability
- Radiologists review forms, contact providers for inappropriate MRI orders

Source: St. Rita’s Medical Center, Lima, OH; Lourdes Hospital Paducah, KY; Imaging Performance Partnership interviews and analysis.
Tackling Inpatient and ED Utilization Management

(Continued)

Case in Brief: St. Rita’s Medical Center

• Over 400-bed hospital in Lima, Ohio
• Health system tasked radiology directors with leading a UM initiative to educate ordering providers about appropriate imaging use before CDS rollout
• Decided to focus in inpatient utilization
• Radiology Director and her team review data for all inpatient MRI orders from previous six months
• Team identifies top ordering clinicians, compares orders to ACR appropriateness criteria
• Medical Director or radiologist champion meets one-on-one with top ordering clinicians to educate them on appropriateness

Case in Brief: Lourdes Hospital

• 197-bed hospital in Paducah, Kentucky
• Health system tasked radiology directors with leading a UM initiative to educate ordering providers about appropriate imaging use before CDS rollout
• Decided to focus on ED utilization
• Emergency Department clinicians required to submit paper form when ordering MRIs
• Ordering clinician answers questions about course of treatment, relevant patient history, and reason for order
• Form requires ordering clinician signature for accountability
• Radiologists review forms, contact providers for inappropriate MRI orders to educate around appropriateness

Source: St. Rita’s Medical Center, Lima, OH; Lourdes Hospital Paducah, KY; Imaging Performance Partnership interviews and analysis.
Additional Resources to Support UM Efforts

Common Scenarios
- Most common exams ordered
- Most common patient indications leading to imaging
- Most common patient diagnoses with inappropriate imaging performed

Established Guidelines
- Exams with clear appropriate use guidelines
- Exams/indications included in Choosing Wisely lists

Financial Barriers
- Exams with longest average lengths of stay
- Exams with highly variable lengths of stay
- Exams with highest average cost
- Frequently denied exams

Ordering Clinicians
- Top ordering referring physicians
- Top ordering referring specialties or practices
- Most frequently denied ordering physicians

Related Resources

How to Tackle Utilization Management in Imaging
- Webconference teaches how to find imaging cost savings opportunities by addressing inpatients, ED patients, and outpatients differently
- Presentation reveals how to modify clinical care pathways by assessing the downstream value of exams

Imaging Utilization Benchmark Generator
- Benchmarking tool generates imaging utilization benchmarks from Crimson national database
- Can customize data by region, case mix index, teaching status, and other metrics

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Source: Imaging Performance Partnership interviews and analysis.
Embedding Imaging Consultative Support in Primary Care

Brigham and Women’s Radiologist Consultation for Patient Centered Medical Homes

- Primary care providers log-in to a portal, where they submit questions about imaging exams
- Portal triages questions to the appropriate subspecialist
- Can provide support for ordering and results interpretation
- Primary questions around the right test and the right way to perform the test and how to interpret the report

Why Primary Care Is a Good Early UM Target

1. Critical component of any population health initiative
2. Order a broad range of imaging and order any given test with lower frequency than specialists
3. PCPs want and benefit from ordering support, which lends itself to the creation of a medical neighborhood

Why Imaging is a Good Partner for a Patient Centered Medical Neighborhood

1. Imaging frequently ordered by PCPs
2. Good opportunity to implement UM initiatives early in the care continuum

Source: Brigham and Women’s Hospital, Boston, MA; Imaging Performance Partnership interviews and analysis.

1) Primary care physician.
Case in Brief: Brigham and Women’s Hospital

- 793-bed teaching hospital in Boston, Massachusetts
- Established partnerships with three patient centered medical homes to provide radiologist consultation around medical management for primary care physicians and physician extenders
- Primary care providers can request radiologist consultation through an electronic portal
- Radiologists then call PCPs to answer requests within 15 minutes if urgent and 1 hour if not urgent
- Radiologists log information about the consult, including what advice they provided
- Medical homes selected based on interest in and receptiveness to the program
- Current results limited to improved referrer satisfaction
- Plan to analyze data on types of queries and advice given
- Anecdotally, majority of consults around the right test and right way to perform the test and how to manage the patient based on the radiologist’s report
- Plan to roll this model out to additional patient centered medical homes and hire a dedicated radiology extender to support the program
CDS\textsuperscript{1}: The Next Step for Outpatient UM

CDS Offers Utilization Guidance at Order, Reduces Radiologist Burden

CDS programs are used at the point of ordering, so orders are more appropriate from the beginning.

UM initiatives largely occur via the radiologist consultation after the order is placed, making the ordering process more time intensive.

Source: Imaging Performance Partnership interviews and analysis.
Tracking Changes in Ordering

**Percentage of Inappropriate Orders Canceled or Changed by Exam Type**

*All Conveners, MID\(^1\) Intervention Phase*

April 2012-September 2013

- **High ratio of canceled to changed indicates exam often ordered when no imaging is appropriate**

1) Medicare Imaging Demonstration.

Tracking Changes in Utilization

Utilization for All Advanced Imaging Exams at Brigham and Women’s

*Number of Exams Per 1000 Patient-Month*

Before and After CDS Implementation¹

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Institutional Changes in Exam Utilization After CDS Implementation

Virginia Mason

<table>
<thead>
<tr>
<th>Exam</th>
<th>Utilization Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI Lumbar for low back pain</td>
<td>↓ 23.4%</td>
</tr>
<tr>
<td>CT Sinus for sinusitis</td>
<td>↓ 26.8%</td>
</tr>
<tr>
<td>MRI Head for headache</td>
<td>↓ 23.3%¹</td>
</tr>
</tbody>
</table>

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2) Nuclear cardiology.
3) Head CT used as control.

Tying CDS to Quality Improvement

Higher Appropriateness Score\(^1\), Lower “Red Rate”\(^2\) After CDS Implementation

**Henry Ford Health System Average Appropriateness Score by Specialty\(^3\)**

*Baseline vs. Intervention\(^4\)*

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Baseline</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Care</td>
<td>6.9</td>
<td>7.4</td>
</tr>
<tr>
<td>Specialists</td>
<td>7.3</td>
<td>7.4</td>
</tr>
</tbody>
</table>

**Musk Healthcare\(^5\) Average Low Utility and Unrated Orders**

*2014 vs. 2013*

<table>
<thead>
<tr>
<th>Category</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Utility(^6)</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td>Not Rated(^7)</td>
<td>30%</td>
<td>25%</td>
</tr>
</tbody>
</table>

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1) Rating of exam appropriateness, from 0 to 10.
2) Exams rated in the red, or inappropriate, range.
3) Primary care includes family medicine, internal medicine, and hospitalist providers. Specialists include all other providers, encompassing 39 specialties including 10 subspecialties of internal medicine.
5) Pseudonym.
6) Exams rated as having low clinical value.
7) Exams not given a rating.

Connecting CDS to Cost Savings

Wake Forest’s Method for Calculating Cost Savings from CDS

1. Clinician submits order as is
   - No change in spending

2. Clinician modifies order
   - Potential spending cut
   - Cost savings equal to cost of original ordered exam
   - Example: Clinician changes imaging order from head MRI (cost $A) to head CT (cost $B)
   - Cost savings = $A - $B = $C

3. Clinician cancels order
   - Definite spending cut
   - Example: Clinician cancels order for spine MRI (cost $X)
   - Cost savings = $X

Source: Wake Forest Baptist Health, Winston-Salem, NC; Imaging Performance Partnership interviews and analysis.
Key Takeaways

Lesson #1: Right-Size Utilization

Role of Imaging Director

- Benchmark current inpatient utilization and compare to national averages using the Utilization Benchmark Generator
- Identify high priority UM targets
- Create working groups to tackle UM issues
- Participate in CDS implementation team
- Clean and analyze CDS and/or UM data
- Analyze utilization data and physician ordering patterns
- Evaluate the financial impact of UM and CDS
- Present impact of UM and CDS to C-suite
- Explore ways to compensate radiologists for time spent in consultative roles
- Identify clinician outliers and provide targeted appropriateness education

Opportunities for Radiologist Involvement

- Consult with referring physicians about exam appropriateness, either telephonically or electronically
- Present to referrer groups around appropriate utilization
- Help define utilization targets
- Participate in CDS implementation team
- Champion CDS to peers
- Participate in multidisciplinary committees to modify guidelines and provide utilization guidance

Source: Imaging Performance Partnership interviews and analysis.
Lesson #1: Right Size Utilization

Key Metrics

**Metrics to Track**
- Appropriate rate
- Red rate
- Overall CDS utilization
- CDS prompted modification
- Radiologist consultation for low value exams
- Savings from canceled orders
- Savings from modified orders
- Repeat rate

**Population Health Dashboard**
- Dashboard with lists of metrics imaging programs should assess to track the progress of population health initiatives
- Includes metrics, definitions, and suggested goals
- Available at: https://www.advisory.com/research/imaging-performance-partnership/tools/2014/imaging-metric-selection-tool
Lesson #2: Leverage Opportunities for Imaging-Led Screening Programs

Screening Improves Outcomes, Reduces Cost of Care

Five-Year Survival Rates, by Stage

*Breast Cancer*

<table>
<thead>
<tr>
<th>Stage</th>
<th>5-Year Survival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>93%</td>
</tr>
<tr>
<td>I</td>
<td>88%</td>
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<tr>
<td>IIA</td>
<td>81%</td>
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<td>IIB</td>
<td>74%</td>
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<td>67%</td>
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<tr>
<td>IIIB</td>
<td>41%</td>
</tr>
<tr>
<td>IIIC</td>
<td>49%</td>
</tr>
<tr>
<td>IV</td>
<td>15%</td>
</tr>
</tbody>
</table>

Average Treatment Cost for Breast Cancer

*Per Year*

- Early-stage Treatment: $14,000
- Late-stage Treatment: $61,000

$47,000 difference in costs

Source:
Taking Screening Initiatives to the Next Level

Four Tactics to Better Leverage Screening to Promote Population Health

1. Maximize **number of patients** screened to reach broader patient population

2. Engage in **multidisciplinary collaboration** to promote coordination of care

3. Implement **supportive care services** to extend benefits beyond disease surveillance to overall patient health

4. Track **impact** of screening initiatives to demonstrate impact on diagnosis and treatment

Source: Imaging Performance Partnership interviews and analysis.
Expanding Screening’s Reach

Using Radiology Care Managers to Increase Screening Compliance

Radiology Care Manager
• Non-physician with the skill sets of a nurse navigator
• Background as a nurse or social worker
• Begin with one care manager for a patient pool of 5,000-10,000 and then expand as needed

- Identify ACO patients who meet screening criteria
- Schedule patients’ mammography appointments
- Confirm that patients attended their appointments
- Ensure that patients’ results were delivered
- Maintain screening database
- Interact with patients on day of appointment; ask high risk patients to remain at clinic

Source: Brigham and Women’s Hospital, Boston, MA; Imaging Performance Partnership interviews and analysis.
Expanding Screening’s Reach

(Continued)

Case in Brief: Brigham and Women’s Hospital

- 793-bed teaching hospital in Boston, Massachusetts
- Hiring a Radiology Care Manager to increase screening mammography compliance of women covered by their Pioneer ACO
- Care Managers will identify patients who meet screening criteria, schedule their appointments, confirm that patients attended their appointments, and ensure that patients and PCPs\(^1\) receive the results
- Care Managers will obtain PCP approval to contact patients
- Anticipate fewer no shows and appointment cancellations

\(^1\) Primary care physician.

Source: Brigham and Women’s Hospital, Boston, MA; Imaging Performance Partnership interviews and analysis.
Imaging Directs Resources Based on Patient Risk Profile

Asheville Radiology’s Multidisciplinary High Risk Breast Clinic

**Six questions** related to lifetime risk of breast cancer asked at time of screening mammogram to determine risk level

- If low risk, proceed with normal screening guidelines
- If high risk, patient and referrer receive a letter that they may be at increased risk and provide high risk clinic phone number

**High risk clinic:**
- Collaboration between mammographers, gynecologists, breast surgeon, and clinical oncologist
- Patients can receive additional diagnostic imaging and treatment in same location

Source: Asheville Radiology, Asheville, NC; Imaging Performance Partnership interviews and analysis.
Improving Care Quality Through Collaboration

(Continued)

Case in Brief: Asheville Radiology Associates

• 44-radiologist independent radiology group with 4 joint-ventured imaging facilities in Asheville, North Carolina

• Hospital partner’s gynecology practice and ARA\(^1\) were competing for mammography volumes

• Once ARA entered into a JV\(^2\) with the hospital for imaging, the lead mammographer and gynecologists were able to collaborate to create a multidisciplinary breast program

• Developed a multidisciplinary high risk clinic and hired a breast surgeon and a medical oncologist to support the program

• Patients will be asked six additional questions related to their lifetime risk of breast cancer when they receive screening mammography

• If these questions put them in a high risk category, the patient and physician will receive a letter saying they may be at increased risk for breast cancer and providing the number of the high risk clinic for additional screening and treatment options

• Program has removed competition between ARA and the gynecology program, which had previously eroded 10-20% of ARA’s market share

• Will be tracking cancer detection rate, callback rate, and size of cancers detected

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1) Asheville Radiology Associates.
2) Joint venture.

Source: Asheville Radiology, Asheville, NC; Imaging Performance Partnership interviews and analysis.
Benefits Beyond the Screening Episode

Smoking Cessation Programs Support Broader Population Health Aims

Lahey’s Rescue Lung, Rescue Life Screening Program

- Created a formal LUNG-RADS system for follow-up, similar to BI-RADS for mammography
- Developed a database to track all recommended follow-up for patients
- Hired a program coordinator to coordinate care, help manage the database, report quality metrics to the team, and consult with patients
- Integrated smoking cessation program for all patients, regardless of cancer diagnosis
  - Includes online resources, meetings and groups, and telephone counseling
  - Quit rates **three times higher** than the general population

Impacts of Smoking Cessation

- Reduced risk of cancer
- Reduced risk of heart disease, stroke, peripheral vascular disease
- Reduced risk for infertility
- Reduced respiratory symptoms
- Reduced risk of lung disease
- Reduced readmission rates
- Shorter hospital lengths of stay

Source: Lahey Hospital and Medical Center, Burlington, MA; “Smoking & Tobacco Use,” Centers for Disease Control and Prevention, http://www.cdc.gov/tobacco/data_statistics/fact_sheets/cessation/quitting/; Imaging Performance Partnership interviews and analysis.

1) National Comprehensive Cancer Network.
Tracking Lahey’s Success

Quality Metrics after Four Years of Program Implementation

Percentage of Cancers Diagnosed at Stage 1

- Lahey: 69%
- Nationwide average: 50%

Other Metrics Tracked:
- Cancer detection rate
- False positive rate
- Group 1 and group 2 diagnosis rates
- Number of referrals weekly
- Proportion of appropriate referrals
- Documentation for shared decision making

3,595 Total number of patients receiving a screening exam
86% Compliance rate
46% Current smokers in treatment

Source: Lahey Hospital and Medical Center, Burlington, MA; Imaging Performance Partnership interviews and analysis.
Case in Brief: Lahey Hospital and Medical Center

- 327-bed hospital located in Burlington, Massachusetts
- Developed a low dose CT lung cancer screening program in 2011
- Multidisciplinary steering committee met every 2-3 weeks to plan for the program, followed by convening a radiology working group to start the program
- Screening program targets high-risk patients using NCCN category 1a and 2b criteria
- Educated referring physicians on the guidelines and equipped schedulers to walk patients through qualification questions before scheduling a scan
- Created a formal LUNG-RADS system for follow-up, similar to BI-RADS for mammography
- Set up a database to track all recommended follow-up for patients
- Hired a nurse navigator to coordinate care, help manage the database, report quality metrics to the team, and consult with patients

Source: Lahey Hospital and Medical Center, Burlington, MA; Imaging Performance Partnership interviews and analysis.
Quantifying Potential Cost Savings

Model of Lahey’s Cost Savings after Implementing Lung Cancer Screening

<table>
<thead>
<tr>
<th>Stage at Diagnosis, Before Screening</th>
<th>Cost Savings Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1: 27</td>
<td>Total costs saved by diagnosing patients at stage 1 versus stages 2-4</td>
</tr>
<tr>
<td>Stage 2: 10</td>
<td>$1,718,056</td>
</tr>
<tr>
<td>Stage 3: 24</td>
<td>Additional patients diagnosed at stage 1</td>
</tr>
<tr>
<td>Stage 4: 39</td>
<td>46</td>
</tr>
</tbody>
</table>

Stage at Diagnosis, After Screening:

| Stage 1: 73 | Stage 2: 8  | Stage 3: 11 | Stage 4: 8 |

Key Takeaways

Lesson #2: Leverage Opportunities for Imaging-Led Screening Programs

Role of Imaging Director

- Build the infrastructure for a screening program
- Explore options for multidisciplinary screening programs
- Hire Case Managers to maximize screening compliance
- Calculate cost savings and quality improvements associated with screening programs
- Explore ways to compensate radiologists for time spent in consultative roles

Opportunities for Radiologist Involvement

- Work with primary care providers to evaluate patient eligibility and ensure screening adherence
- Provide recommendations for follow-up diagnostics
- Deliver results to referrers or directly to patients

Source: Imaging Performance Partnership interviews and analysis.
Lesson #2: Leverage Opportunities for Imaging-Led Screening Programs

Key Metrics

Metrics to Track

- Call back rate
- Cancer detection rate
- Stage at diagnosis
- Percentage of false positive
- Time from diagnosis to treatment
- Adverse events
- Patient compliance rate
- Patient retention rate

Population Health Dashboard

- Modifiable dashboard with lists of metrics imaging programs should assess to track the progress of population health initiatives
- Includes metrics, definitions, and suggested goals
- Available at: https://www.advisory.com/research/imaging-performance-partnership/tools/2014/imaging-metric-selection-tool

Source: Imaging Performance Partnership interviews and analysis.
Lesson #3: Manage Incidental Findings

Preventing Patient Risk Escalation

Radiology Uniquely Positioned to Monitor Incidental Findings

**Why Incidental Findings?**

Early diagnosis can:

- Improve patient outcomes
- Reduce cost of care
- Manage patients’ risk profiles

**Why Imaging?**

Diagnostic imaging provides a baseline view of patients’ health beyond the suspected diagnosis

- Opportunity for comparison with previous images to track change
- Advances in imaging technology have made incidental findings more common
- Radiologists’ consultative role can provide recommendations for follow-up

Source: Imaging Performance Partnership interviews and analysis.
Owning Incidental Findings Management

Opportunities Throughout Entire Incidental Findings Process

Radiology’s Role in Each Step of Incidental Findings Management

Detect

- Radiology exams provide a broad picture of patients’ health
- Detection of incidental findings leads to earlier cancer detection, with reduced costs and improved patient outcomes

Report to Referrer

- Highlight incidental findings in report
- Provide recommendations to referrers

Ensure Follow-Up

- Radiology uniquely positioned to determine when and how follow-up should occur
- Requires balance of overutilization with inadequate follow-up

Monitor

- Radiology can track changes in incidental findings across patient’s lifetime
- Leverage radiology data to monitor change over time

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Standard Incidental Findings Documentation</strong></td>
<td>Standardized radiology reports with incidental findings at the top</td>
</tr>
<tr>
<td>- Inconsistent reporting patterns</td>
<td></td>
</tr>
<tr>
<td>- Non-standardized reports</td>
<td></td>
</tr>
<tr>
<td><strong>Insufficient Guidelines for Follow-Up Recommendations</strong></td>
<td>Utilize existing guidelines or develop new ones where they do not exist</td>
</tr>
<tr>
<td>- Follow-up guidelines not well-developed</td>
<td></td>
</tr>
<tr>
<td>- Can lead to overutilization of or insufficient imaging</td>
<td></td>
</tr>
<tr>
<td><strong>Inconsistent Referrer Follow-Up</strong></td>
<td>Automate a referrer notification and follow-up process</td>
</tr>
<tr>
<td>- Average PCP(^1) receives 20 radiology reports weekly</td>
<td></td>
</tr>
<tr>
<td>- Physicians fail to follow-up on as many as 36% of radiology reports</td>
<td></td>
</tr>
</tbody>
</table>


\(^1\) Primary care physician.
Redesigning Reports to Highlight Incidental Findings

Two Strategies to Draw Referrer Attention to Incidental Findings

Mayo Clinic Highlights
Conclusions at Top of Report

- Noticed referring physicians were missing incidental findings buried in body section of reports
- Reorganized radiology reports to isolate all findings at top of template
- Changed radiologist workflow to dictate conclusions first

Aurora BayCare Aggregates
Recommendations for Follow Up

- Efficiency concerns in Aurora BayCare ED prompted collaborative initiative with Aurora BayCare Medical Center to highlight recommendations for follow-up care on radiology reports
- Moved recommendations from findings to impressions section so all necessary action steps could be seen in one place
- Kept impressions at bottom of report as per referrer request; no change to radiologist workflow involved

Source: Mayo Clinic, Rochester, MN; Aurora BayCare, Green Bay, WI; Imaging Performance Partnership interviews and analysis.
Redesigning Reports to Highlight Incidental Findings

(Continued)

Case in Brief: Mayo Clinic

- A nonprofit medical practice and medical research group based in Rochester, Minnesota
- Referrers were overlooking incidental findings because they were within the body of the radiology report
- Redesigned report template to isolate incidental findings at top of report
- Changed radiologist workflow to dictate conclusions first

Case in Brief: Aurora BayCare

- 167-bed hospital in Green Bay, Wisconsin
- Noticed efficiency concerns in ED
- Collaborated with Aurora BayCare Medical Center to highlight recommendations for follow-up care in radiology reports
- Moved recommendations to impressions section of report from findings section so all necessary action steps were located together
- Kept impressions at bottom of report as per referrer request
- No change to radiologist workflow involved

Source: Mayo Clinic, Rochester, MN; Aurora BayCare, Green Bay, WI; Imaging Performance Partnership interviews and analysis.
Standardizing Incidental Findings Guidelines

Radiology Partners’s Development of Best Practice Guidelines for Incidental Thyroid Nodules on Chest CTs

1. Selected three physicians and a program manager to lead the project
2. Spent two months developing guidelines around management of incidental thyroid nodules on chest CTs
3. Trained radiologists on guidelines using a video on how to measure and manage nodules
4. Compared performance on 3,600 cases before and after new guidelines

Results

76%
Nodule detection rate

7%
Frequency with which ultrasounds were recommended for insignificant lesions

93%
Rate of adherence to best practice guidelines overall

$ 917,000
Savings by one hospital partner from reducing unnecessary ultrasounds, biopsies, surgeries

Standardizing Incidental Findings Guidelines

(Continued)

Case in Brief: Radiology Partners

- Radiology group with 205 locations and 294 full-time radiologists based in El Segundo, CA
- Developed best practices around management of incidental thyroid nodules in chest CTs
- Focused on these nodules because 20% of chest CTs have incidental nodules, with 8-10% of nodules being malignant, and they are usually poorly managed
- For two months, three radiologists dedicated half of their time to this project, and they employed a full-time program manager
- Trained radiologists on new guidelines using a video that showed examples of nodules and how to measure them
- Assessed 3,600 cases and compared performance before and after guideline implementation
- Provided quarterly reports to all hospital partners on compliance rates, number of lesions detected, number of avoided unnecessary ultrasounds, biopsies, surgeries, and associated cost savings
- Nodule detection rate increased from 34% to 76%, ultrasounds recommended for insignificant lesions decreased from 35% to 7%, and adherence to best practice guidelines overall increased from 56% to 93%
- One hospital calculated a savings of $917,000 from reducing unnecessary ultrasounds, biopsies, and surgeries

ACR’s Standardized Incidental Findings Guidelines

Incidental Findings with Management Recommendations

CT or MRI Abdomen/Pelvis:
• Adrenal Lesions
• Pancreatic Cystic Lesions
• Renal Lesions
• Liver Lesions, no risk of HCC
• Liver Lesions, risk of HCC (LI-RADS)
• Splenic Lesions
• Lymph Node Findings
• Adnexal Lesions
• Gallbladder and Biliary Lesions

Ultrasound:
• Cystic Adnexal Lesions
• Other Adnexal Lesions
• Thyroid Nodules

Chest:
• Solid Pulmonary Nodules
• Subsolid Pulmonary Nodules

Vascular:
• Abdominal Aortic or Iliac Aneurysms
• Penetrating Aortic Ulcers
• Splenic or Renal Aneurysms
• Other Abdominal Vascular Findings

ACR Incidental Findings Guidelines

Guidelines for all incidental findings listed to the left available at:

EHR Template Ensures Systematic Case Detection

Nurse Navigator Follows Up with All Patients

Identification of Incidental Nodule Cases at Gundersen Health System

Development of Template

- Radiology group planning quality improvement projects
- Pulmonologists offer to help with nodule management
- Groups develop an EHR template to identify nodules

***** PULMONARY NODULE ALERT *****

- Number of pulmonary nodules: Two
- Size of largest nodule: 7mm
- Size range of nodules: 2-7
- Location of pulmonary nodules: Left lower lobe
- Nodule margins: Well-circumscribed
- Nodule type: Solid
- Nodule calcification: None

Incidental Nodule Case Identification Process

1. Radiologist describes nodule on standard report
2. Nurse navigator uses EHR template daily to retrieve reported nodules
3. Nurse navigator contacts patients, notifies referring providers

Saving Lives Through Better Management

Clinic Volumes Increasing Over Time

Cases Managed by Nodule Clinic
Approximate Number of Managed Patients

<table>
<thead>
<tr>
<th>October 2014</th>
<th>February 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,500</td>
<td>2,100</td>
</tr>
</tbody>
</table>

Stage I Lung Cancer Diagnoses at Gundersen Health System
Percentage of Newly Diagnosed Lung Cancer Patients

18% Year prior to clinic
26% Year clinic established

Patient Volumes
Average number of new patient cases seen per month
108

Source: Gundersen Health System, La Crosse, WI; Imaging Performance Partnership interviews and analysis.
Saving Lives Through Better Management

(Continued)

Case in Brief: Gundersen Health System

• Fully-integrated, multidisciplinary community-academic health system based in La Crosse, Wisconsin

• Radiology group planning to pursue multiple quality improvement projects including improving nodule management; pulmonologists offered to partner with them

• Pulmonologist found via case review that only 19% of incidental pulmonary nodule cases from December 2011 to July 2013 were managed appropriately

• Pulmonologists, radiology group collaborated to develop template to retrieve nodule cases identified in radiology reports and developed lung nodule clinic

• Dedicated nurse navigator collects nodule cases reported by radiology and manages scheduling and case preparation; navigator records and manages data in database, retrieves lung cancer outcomes from lung cancer clinic database in order to track downstream impact of nodule clinic

• Five rotating pulmonologists and two physician assistants evaluate the patients, arrange for appropriate follow-up testing, and refer to the multidisciplinary lung cancer clinic as appropriate; pulmonologists tailored Lung-RADS guidelines and leveraged validated risk calculators from Mayo Clinic and the Department of Veterans Affairs

• Nodule clinic increased the proportion of Stage I diagnoses from 18% to 26%
Leveraging Technology to Ensure Follow-Up

Software Program Hardwires Referrer and Patient Follow-Up

**University of Chicago’s Automatic Incidental Findings Follow-Up Process**

**Without automated process**
- Radiologist documents incidental finding in report
- Referrer must notice incidental finding in report and follow-up
- Only 30% of findings received follow-up

**With automated process**
- Report flagged for referrer follow-up
- If no follow up occurs, patient receives a letter detailing the finding and recommended next steps

Complete Automation Streamlines Process

An Efficient, High Quality Method for Incidental Findings Management

Components of an Incidental Findings Management Program

1. Discovery and documentation of incidental finding by radiologist
2. Assessment of patient’s clinical history and risk factors
3. Physician recommendations for follow-up in concordance with clinical guidelines

University of Chicago’s PACS Tool for Automated Reports

1. Identifies that the radiologist is looking at a nodule and which part of the body it is in
2. Pulls the patient’s clinical background from the EMR
3. Provides appropriate follow-up recommendations based on both the finding and the clinical background


1) Electronic medical record.
Case in Brief: University of Chicago Medicine

- Academic health system located in Chicago, Illinois
- Created a database of incidental findings found in radiology reports
- Prior to database implementation, only 30% of incidental findings were followed up on
- With database, if a recommended test is not ordered, database automatically escalates finding, first by bringing it to the attention of the referrer, up to the point of sending a letter to the patient directly that details the finding and recommended next steps
- Next iteration of the database will involve a PACS measuring tool that is contextually aware, knowing which part of the body the radiologist is reading
- For example, this tool will identify that a radiologist is reading in the lung and measured a nodule, will check the patient’s clinical history and incorporate it into the report, and will offer appropriate follow-up recommendations
- Success will be measured in the number of nodules correctly detected and followed-up on from baseline, corresponding cost savings

Key Takeaways

Lesson #3: Manage Incidental Findings

Role of Imaging Director

- Create committees to develop standardized report templates that highlight incidental findings
- Create committees to develop incidental findings guidelines where they do not exist
- Investigate IT initiatives that can automate the incidental findings process
- Integrate the radiology PACS and health system EMR to facilitate incidental findings tracking

Opportunities for Radiologist Involvement

- Be involved in creation of standardized report templates
- Incorporate patient history into reports
- Participate in committees to develop incidental findings guidelines
- Provide feedback and recommendations to referring physicians around incidental findings
- Follow-up with referrers to ensure incidental findings were followed up on

Source: Imaging Performance Partnership interviews and analysis.
Key Metrics

Lesson #3: Manage Incidental Findings

Metrics to Track
- Follow-up case tracking rate
- Care management success rate
- Referrer follow-up rate
- Report turnaround time
- Critical results reporting – ED/inpatient
- Critical results reporting – outpatient
- Template adherence
- Interpretation error rate

Population Health Dashboard
- Modifiable dashboard with lists of metrics imaging programs should assess to track the progress of population health initiatives
- Includes metrics, definitions, and suggested goals
- Available at: https://www.advisory.com/research/imaging-performance-partnership/tools/2014/imaging-metric-selection-tool

Source: Imaging Performance Partnership interviews and analysis.
1. Demystifying Population Health

2. Radiology-Led Initiatives to Advance Population Health Goals

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**Raise Your Hand**
- This will notify the presenter that you wish to ask a question using audio. The presenter will unmute you and ask you to speak.
- *You must enter your #Audio PIN# for this function to work!
  *You must have a microphone, if you are using “Mic & Speakers”
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