Developing Meaningful Key Performance Indicators to Objectivize Radiographer Performance Management and Drive Quality Improvement

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Research

Clinical Care

Education

A member of the NUHS

Background

Department of Diagnostic Imaging

- 4 Imaging Centres
  - Diagnostic Imaging @ Main Building, Level 2
  - Functional Imaging Centre @ Main Building, Level 1
  - Kent Ridge Wing Imaging Centre @ Kent Ridge Wing, Level 3
  - Diagnostic Imaging @ Medical Centre, Level 4
- 3 Integrated Centres
  - Breast Care Centre
  - Emergency
  - Dental
- 300 staff (140 Radiographers)
- Approximately 360,000 exams / year

Total Performance Management

Key Performance Indicators

- ❖ Competency Checklists → subjective, dependent on supervisor-supervisee relationship & observation duration
- ❖ International audit standards → broad & high-level
- ❖ Limited literature regarding radiographer-specific KPIs

Core Competencies

- Teamwork
- Respect
- Integrity
- Compassion
- Excellence

Leadership Competencies

- Embrace Change
- Influence & Lead
- Think Strategically
- Develop Others

Why include Key Performance Indicators in Radiographers' total performance management ?

- Accountability
  - *is the obligation of an individual, team or organization to account for its activities, accept responsibility for them, and to disclose the results in a transparent manner*
- Objectivize performance evaluation
  - *in relation to the notion of equity or fairness*

Reference: http://www.businessdictionary.com/definition/accountability.html

Purpose

Meaningful key performance indicators (KPIs) in Radiographers' performance management

- **Increases Objectivity** to complement existing subjective clinical competency assessment
- Meaningful, all rounded KPIs that are **measurable**
- To meet departmental, hospital, national and international **quality standards**
- **Reflects quality** of work/contributions
- Drive and monitor **quality improvement**

Materials & Methods

Key Performance Indicators

Considerations:

1. What is important to the organization (ie NUH)?
2. What defines healthcare quality?
3. What motivates staff?
4. What is the personality profile of Diagnostic Radiographers like?
5. Types of accountability

What is important to NUH?

What defines healthcare quality?

Six Domains of Health Care Quality

Safe: Avoiding harm to patients from the care that is intended to help them.

Effective: Providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and misuse, respectively).

Patient-centered: Providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions.

Timely: Reducing waits and sometimes harmful delays for both those who receive and those who give care.

Efficient: Avoiding waste, including waste of equipment, supplies, ideas, and energy.

Equitable: Providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.

Reference: Institute of Medicine (IOM). Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, D.C: National Academy Press; 2001.

What motivates staff?

Based on studies done at MIT and other universities

- higher pay / bonuses → better performance ONLY if the task consisted of basic, mechanical skills
- If the task involved cognitive skills, decision-making, creativity, or higher-order thinking, higher pay → poorer performance

So what motivates staff?

- ❖ Purpose: Desire to do something meaningful and important
- ❖ Autonomy: Desire to be self-directed rather than being directed
- ❖ Mastery: Opportunity to develop into an expert in what one truly cares about

Reference: Pink, D.H. "Drive: The Surprising Truth About What Motivates Us"

Personality Profile of Diagnostic Radiographers & Preference of Objective Assessment

The **Holland Codes** or the **Holland Occupational Themes (RIASEC)** refers t
a theory of careers and vocational choice based upon personality types

References:
Holland Codes https://en.wikipedia.org/wiki/Holland_Codes
Radiologic Technologist Career https://www.mymajors.com/career/radiologic-technologists/skills/

Types of Accountability

- Individual vs Team-based
- Clear roles, team leadership and individual ownership facilitate accountability

"Individual accountability forms the building blocks to successful teams. Otherwise, there can never be team accountability."
- Paul Lim, CEO, Secura Group

"Individual accountability often contributes to competition within the team, but can also be used to strengthen a team's performance."
- Sabby Gill, Executive VP, Epicor International

"Accountability, whether at an individual or team level, is essential to maintain a certain standard of work."
- Linda Teo, Country Manager, Manpower Group

References
- Which is more important: Individual or team accountability? *http://www.todayonline.com/business/which-more-important-individual-or-team-accountability*
- *7 Ways to Build Accountable Organizations* http://www.forbes.com/sites/ccl/2012/02/28/7-ways-to-build-accountable-organizations/#93da4ee6336d

Evolution of KPIs over 6 years

2010: Competency Checklist

6 Key Performance Indicators

set based on Institute of Medicine's (IOM) 6 Domains of Quality framework

1. Clinical Competency Checklist
2. Safety: Patient Identification documentation compliance
3. Safety: Hand hygiene
4. Workflow Competency: Unspecified images, PACS reject rates, RIS error rate
5. Portfolio/responsibilities
6. Other contributions

Note: KPIs nos. 2-4 were measured by individual compliance rates, compliance rate targets were set. Total workload data was also evaluated. Core Competencies and Leadership Competencies were separate categories

Today:
- Competency Checklist
- 11 Key Performance Indicators
- Total Workload, Patient centered & Timely indicators
- Core and Leadership competencies

2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016

5 Key Performance Indicators:

1. Clinical Competency Checklist
2. Workflow Competency
3. Core Competencies
4. Portfolio/responsibilities
5. Other contributions

Note: Grading on a scale of 1-5 for each KPI

9 Key Performance Indicators building on IOM's framework, departmental/hospital/international targets

1. Clinical Competency Checklist
2. Safety: Patient Identification documentation compliance
3. Safety: Hand hygiene compliance
4. Safety: General X-ray Reject Rates
5. Effectiveness: General X-ray & Modality Image Quality Score
6. Modality Indicator: ie. Recall rates (Efficiency), Procedure specific documentation compliance
7. RIS-PACS Workflow Competency: Unspecified images, PACS reject rates, RIS error rate
8. Training Indicator: Training hours,
9. Training Indicator: continuing education attendance rate

Note: KPIs nos. 2-8 were measured by individual compliance rates, compliance rate targets were set. Total workload data was also evaluated. Core Competencies, Leadership Competencies, Compliment:Complaint Ratio, Appointment turn-around-times, were separate categories

The new standard: 2016 Key Performance Indicators for Radiographers

Institute of Medicine's Quality Domains	Team Based (by Section)	Individual
Safe	2-Patient Identification Documentation Compliance	
	Hand hygiene compliance	Medication documentation compliance
	Last menstrual period (LMP) documentation compliance	
Effective	Patient Recall rate *(Advanced modalities)*	Clinical competency checklist
		X-ray reject rate *(General section)*
		Image quality score
		Training hours
		Continuing education attendance
Efficient		RIS/PACS Workflow competency: a) RIS error rates b) PACS reject rates c) Unspecified images
Timely	Appointment turnaround time a) Inpatient urgent b) Outpatient full paying c) Outpatient subsidized	
Patient Centeredness	Patient Compliment to Complaint ratio *(Department-wide)*	

Key Performance Indicators (KPI) Targets

Other Hospital and departmental targets for:

- ✓ Patient-Centered (Compliment:Complaint Ratio)
- ✓ Timely (Turn around times)
- ✓ Training hours
- ✓ meeting attendance rate
- ✓ financial health of department
- ✓ safety (adverse events)
- ✓ quality improvement projects
- ✓ research

The Data Collection

Hand hygiene audit: Monthly audits by Infection Control trained senior radiograp-hers (140 moments of hand hygiene observed/ month)

Image Quality audit: 5% of General X-ray workload (n=560/month)

Modality Quality audit:
- Reject analysis
- Modality Image quality audit
- Recall rates

Documentation audit: 5% (n=1300) of monthly workload (quarterly interval) audited

PACS Administrati on team: 100% audit of RIS-PACS error

Training & Patient Service teams: Monitor data from human resource information system & hospital patient satisfaction surveys

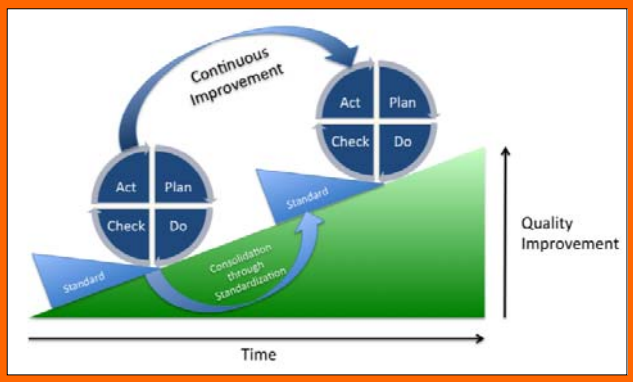
The Methodology and Discussion

- Different teams from departmental level audit teams to modality audit performed data collection & analysis
- Performance data obtained through
  - Audits
  - System-generated data
  - External department generated data
- The audits that had 100% sampling rate were reject rates, RIS-PACS errors, recall rates.
- 80% Senior Radiographers performed the image quality audits.
- The senior radiographers who performed the audits did so during the low patient load periods of the workday, increasing the manpower productivity during these periods, which were typically at the beginning and end of the day.

Quality Improvement achieved through

- Feedback
  - Radiographers' meetings
  - Email
  - Section team meetings
  - Open appraisal
- Quality Improvement Projects
- Review of quality data once a month at Departmental Management Meetings

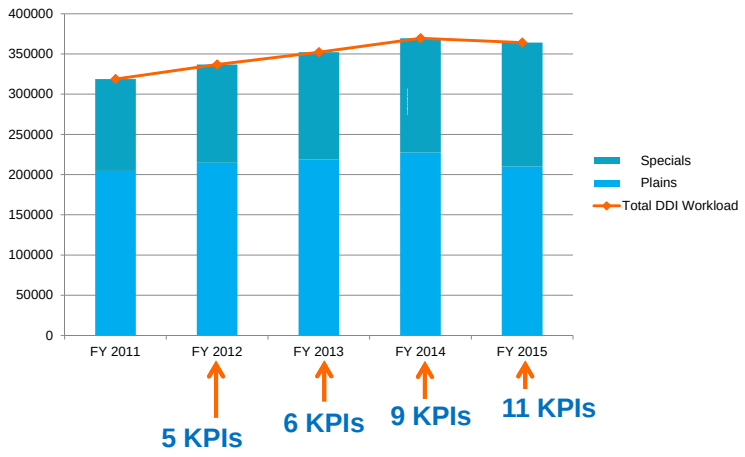
Results



The following slides describe a few indicators where quality improvement is seen through data monitoring and initiatives put in over the years

Results

- Tracked progressively over a 5-year period from 2011-2015 against a backdrop of increasing workload



Quality and Safety Results

a) Hand Hygiene Compliance

b) 2-Patient Identification Documentation Compliance

c) RIS-PACS error rates

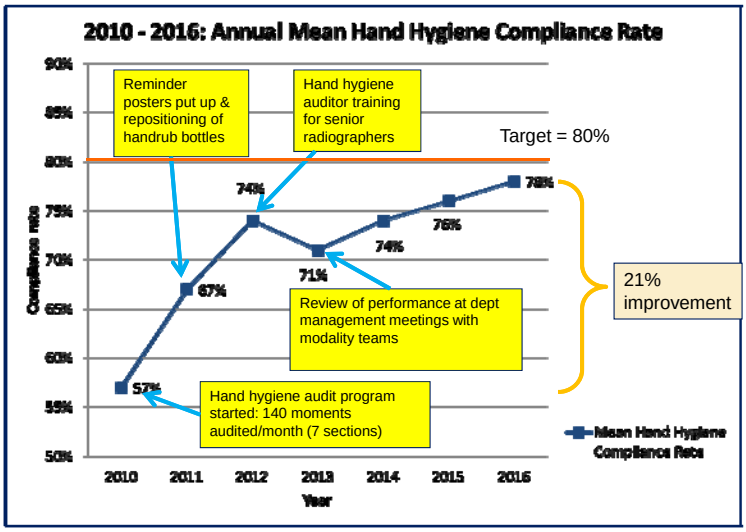
d) General X-ray Image Reject Rate

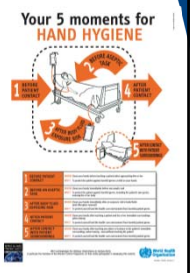
e) Last menstrual Period Documentation Compliance

f) Patient Compliment to Complaint Ratio

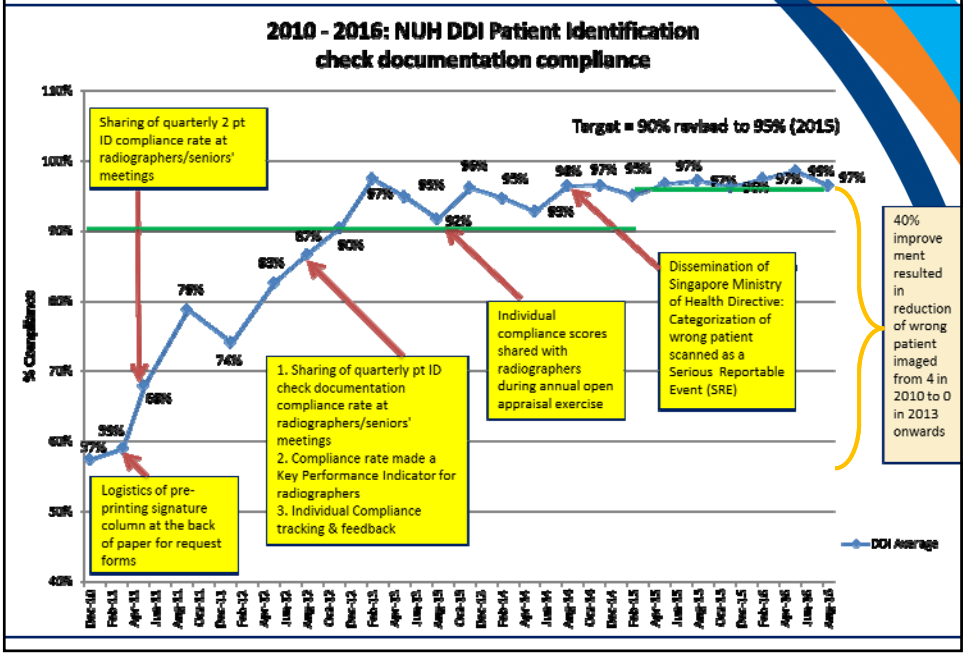
a) Hand Hygiene Compliance

- Hand hygiene is the most important measure to avoid the transmission of harmful germs and prevent health care-associated infections.
- The compliance target is based on the hospital's target of 75%



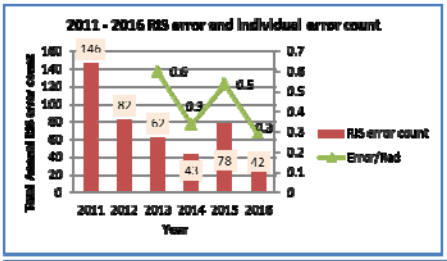


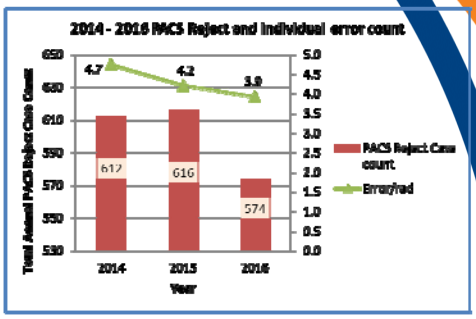
b) Patient Identification Documentation Compliance

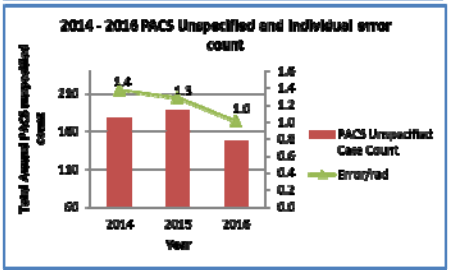


c) Radiological Information System – Picture Archival and Communications System (RIS-PACS) errors

- To reduce risk of high number of errors impacting patient safety and treatment
- To increase efficiency by reducing manpower and time wastage from correcting errors





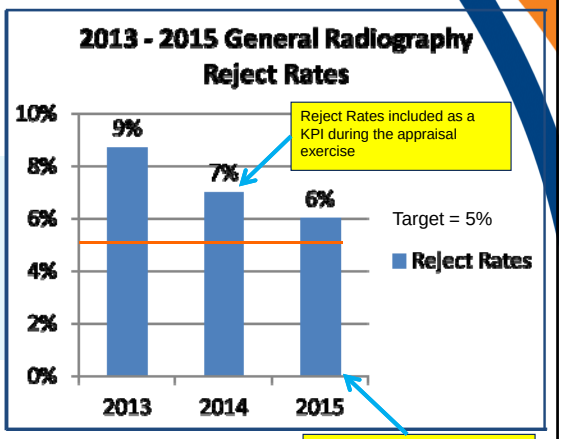


Note:
- No benchmark target information available
- Target set after observing baseline data
- RIS error individual target: 3/radiographer
- PACS reject individual target: 5/radiographer
- PACS unspecified individual target 5/radiographer

d) General X-ray Image Reject Rates

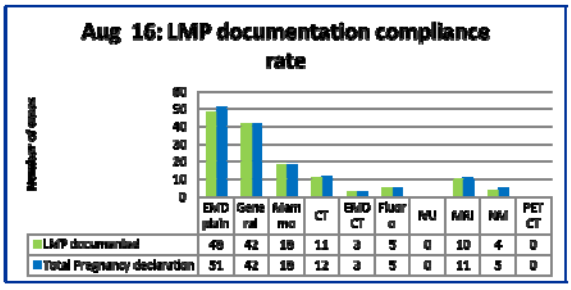
- To ensure First Time Quality, low Reject Rates is required
- Literature[7-8] shows that reject rates for Direct Digital Radiography is between 8 -12%

Note:
- At the end of 2013, all end of life Computed Radiography (CR) x-ray equipment were progressively being replaced with Direct Radiography (DR) units and it was observed that with DR, reject rates were higher than the CR reject rates.
- The CR reject rates failed to include images that were unassigned at the CR terminal, and therefore, was artificially low.



e) Last Menstrual Period (LMP) Documentation compliance

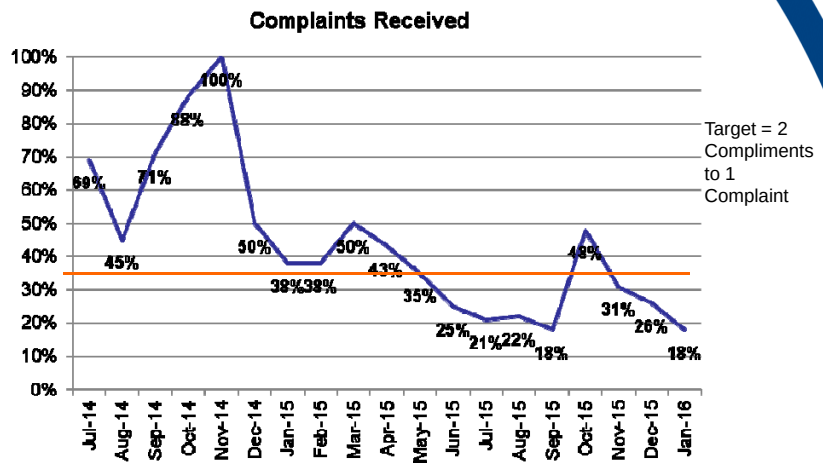
- To ensure women of child bearing age are not pregnant, part of 28 day rule workflow (American College of Radiology, Royal College of Radiologists, IAEA)



	Feb-16	May-16	Aug-16	
CT	70%	86%	92%	↑
EMD CT	100%	100%	100%	
EMD Plain	60%	89%	94%	↑
Fluoro	83%	70%	100%	↑
General	51%	89%	100%	↑
IVU	-	-	-	
Mammo	70%	100%	100%	
MRI	70%	100%	91%	↓
NM	70%	67%	80%	↑
PET CT	0%	50%	-	

f) Patient Compliment to Complaint Ratio

- Monthly data generated by Quality Improvement and Patient Experience department
- 2016 average: compliments (73%) to complaints (23%)



Conclusion

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- Performance measurement and monitoring creates a wave of reflection in action, and enables
  - quantitative measurements for performance tracking and sharing
  - Tracking of progress towards organizational and professional goals;
  - Reduces waste from re-work
- Meaningful key performance indicators have:
  - improved the objectivity of radiographers' performance management;
  - provides tangible goals to strive towards;
  - improved overall performance of radiographers; and
  - yielded quality improvement for the department.
- Objectivity in performance appraisal increases radiographers' satisfaction and provides tangible goals to strive towards.

Thank you

References

1. Kohn LK, Corrigan JM, Donaldson MS, eds. To err is human: building a safer health system. Washington, DC: National Academy Press, 2000.

2. Institute of Medicine. Crossing the quality chasm: a new health system for the 21st century. Washington, DC: National Academy Press, 2001.

3. Accreditation Council for Graduate Medical Education Web site. http://www.acgme.org. Accessed October 4, 2004.

4. Institute of Medicine. Health professions education: a bridge to quality—report of the Institute of Medicine. Washington, DC: National Academy Press, 2003.

5. http://www.auntminnie.com/index.aspx?sec=ser&sub=def&pag=dis&ItemID=87577 Accessed on 26 Sept 2016
http://www.slideshare.net/thomasmason037/interventional-radiology-technologist-performance-appraisal
https://www.asrt.org/docs/default-source/practice-standards-published/ps_rad.pdf?sfvrsn=2

6. http://www.who.int/patientsafety/solutions/patientsafety/PS-Solution2.pdf accessed on 10 October 2016

7. Andersen ER, Jorde J, Taoussi N, Yaqoob SH, Konst B, Seierstad T. Acta Radiologica 2012 Mar 1;53(2):174-8. doi: 10.1258/ar.2011.110350. Epub 2012 Jan 27.

8. Hofmann B, Rosanowsky TB, Jensen C, Hong CWK. Reject analysis in direct digital radiography - Image rejects in general direct digital radiography. Acta Radiologica Open **October 2015,** vol. 4 no. 10 2058460115604339

9. Muhogora WE, Nyanda AM, Kazema RR. Experiences with the European guidelines on quality criteria for radiographic images in Tanzania. Journal of Applied Clinical Medical Physics, Vol. 2, No. 4, Fall 2001