Value of Multidisciplinary Lecture Series in Appropriate Use of Imaging Studies
There remains a lack of understanding by ordering physicians on what is the optimal imaging study to assess specific pathologies.

The correct imaging study allows for:
- Appropriate analysis of the suspected pathology
- As low as reasonably achievable radiation dose to the patient
- Reduction of unnecessary health care cost

The purpose of the project:
- Identify areas of misunderstanding among ordering health care professionals at Beaumont Health
- Provide educational lectures to improve understanding/appropriate ordering of imaging
A lecture series was created in 2010 as part of institutional wide radiation dose reduction program.

The series was given to various residencies at our institution:
- Emergency Medicine, Surgery, Internal Medicine, Pediatrics, Family Medicine

Each lecture is tailored to the specific specialty’s patient demographics with examples as how to handle commonly encountered imaging scenarios.

Information regarding the differences in imaging protocols is discussed including when/why a protocol would be preferred over another.

Detailed information regarding the use of contrast media, radiation dose reduction techniques, and imaging during pregnancy.

Participants complete a short pretest before the lecture and a short post test after the lecture.
Fig 1. Slides from lecture given to Emergency Medicine Residents with focus on Body Imaging Protocols.
**Neuro-Imaging Protocols Pre-test**

1. A 26 yr F construction worker presents to the EC with penetrating trauma to the left eye. A&O x3 with no focal neurological deficits, no signs of gross head trauma or other injury. What is the most appropriate study to order?
   a. MRI head with and without gadolinium
   b. CT Orbits with IV contrast
   c. CT Head without IV contrast
   d. CT Orbits without IV contrast
   e. Skull radiograph

2. 84 yr M presents with AMS, found down in nursing home. Patient was down for unknown duration and has had decreased urine output since being found down. What is the most appropriate study to order?
   a. CT perfusion study
   b. CT head with and without IV contrast
   c. CT head without IV contrast
   d. CT angiography

3. Concern for retropharyngeal abscess in a dialysis patient. What is the appropriate action?
   a. CT neck without IV contrast
   b. CT Neck with IV contrast, limit contrast dose
   c. CT neck with IV contrast, give IV hydration
   d. CT neck with IV contrast, give oral hydration

4. Which of the following is the preferred pre-medication protocol for patients with a history of an allergic reaction to iodinated contrast?
   a. 48-hour steroid taper
   b. 13 hour prep with steroid given at 13, 7, and 1 hour and benadryl given at 1 hour prior to study.
   c. 6 hour prep with steroid given at 6 and 1 hour and benadryl given at 5 minutes prior to study
   d. Steroid and Benadryl given immediately prior to study

5. Which of the following is not an indication for CT head without contrast?
   a. Trauma
   b. Evaluate for metastases
   c. Acute CVA
   d. Sudden onset severe headache

6. Which of the following regarding radiation is true?
   a. While CT accounts for the majority of radiological exams performed, it accounts for less than 10% of radiation dose
   b. There is zero risk of cancer associated with CT examinations
   c. Radiation exposure is effected by elevation and air travel
   d. MRI delivers more radiation dose than does CT

**Body Imaging Protocols Pre-test**

1. For a patient on dialysis, which of the following precautions should be taken prior to a CT study with iodinated contrast?
   a. Limit the amount of contrast to 80cc
   b. Do not perform the examination
   c. Proceed with the study as ordered
   d. Give a 2 L bolus of NS prior to iodinated contrast

2. In patients with nonspecific GI symptoms, bowel obstruction, or suspicion for pyelonephritis, the most appropriate CT protocol would be:
   a. CT abdomen and pelvis without
   b. CT abdomen and pelvis with
   c. CT abdomen with and without
   d. CT abdomen and pelvis with and without

3. True of false: High resolution CT is preferred over standard CT chest with contrast for evaluation of a lung mass?
   a. True
   b. False

4. Which of the following regarding radiation is TRUE?
   a. While CT accounts for the majority of radiological exams performed, it accounts for less than 10% radiation dose
   b. There is zero risk of cancer associated with CT examinations
   c. Radiation is thought to be most damaging to the fetus in the first trimester
   d. MRI is associated with a small increase in risk of cancer over a lifetime

5. Which of the following is TRUE regarding MRI?
   a. MRI cannot be performed on a claustrophobic patient
   b. Patient must be able to hold their breath for 20-30 seconds
   c. In a 15 week pregnant patient with pelvic pain with nonspecific findings on US, CT of the pelvis is preferred over MRI
   d. Titanium prosthesis are a contraindication to MRI

---

Fig 2a and 2b. Pretest quiz given to Internal Medicine Residents prior to lecture focusing on appropriate ordering of Neuro-imaging (a) and Body Imaging (b).
Materials and Methods

- A printed ordering guide booklet was provided to the participants following lecture
  - Contains all available radiological studies and the appropriate clinical indications
- A follow-up survey will be sent to the participants 3-4 months after the lectures to assess for:
  - Retention of material
  - Perceived utility of this service
  - Degree to which the lecture changed daily practices.
Fig 3. Select images from Imaging Ordering Guide given to residents/ordering providers following lecture series.
Results

- General lack of knowledge regarding appropriate ordering of imaging studies in Internal Medicine, Emergency Medicine, Pediatric and Family Medicine residencies
  - Average pretest score of 61.5%
- After the lecture, drastic improvement was seen across all groups tested
  - Average posttest score of 86.4%
Improvement in scores following lecture

Average of Combined Residencies

Pretest %  Post test %
Effect of consecutive lectures

- Annual lecture series
  - Some participants may have seen the original lecture more than one time, and completed the same pretest and post test on both occasions.
  - Evaluation of these scores demonstrated poor recall of the material covered,
    - Similar pretest scores of ~50%
  - However, the degree of improvement from pretest to post test was substantial
    - Post test score of 64% in year 1
    - Post test score of 90% in year 2
Pre/post Tests Over Consecutive Years

Year 1
- Pretest %
- Post test %

Year 2
Further interest from ordering providers

- The ordering guide lecture series was initially designed by the Radiology Department at Beaumont Health.
- Over time, ordering providers began to contact the radiologists associated with this lecture series to give additional lectures associated with appropriate imaging.
  - Conferences
  - Grand Rounds
- Demonstrates the interest and importance of sufficient knowledge of appropriate imaging by ordering providers
Conclusion

- Providing educational lectures to the clinicians at our institution increases awareness of the appropriate imaging study to order.
- This allows for improved patient care, reduction of unnecessary radiation, and decrease of health care costs.
- The lack of recall from year to year underscores the importance of regularly refreshing our colleagues’ knowledge on the subject matter.
- Evidence of significant interest of appropriate imaging as demonstrated by several invitations to present at conferences, Grand Rounds, etc.
- We hope that by continuing to educate ordering physicians on these topics we can ensure ongoing efficacious use of radiology and optimal patient care.