A Quality Improvement Initiative to Reduce Unnecessary Follow-up Imaging for Adnexal Lesions

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Our objective was to improve the quality of pelvic ultrasound reports and decrease the number of physiologic and benign adnexal lesions unnecessarily referred for follow-up. We performed a prospective cohort study of 2 quality improvement interventions: academic detailing with education for the ultrasound radiologists and sonographers, and implementation of a national consensus guideline on adnexal cysts. Our primary quality outcome measure was the proportion of pelvic ultrasound exams in which follow-up was recommended for an adnexal lesion.

Baseline data collection in January 2006 identified 252 pelvic ultrasound exams, of which 58 (23%) reported an adnexal lesion and 31 (12%) recommended follow-up. Retrospective review revealed that 17 of 31 (55%) reported adnexal lesions with follow-up recommended were physiologic or benign. After intervention 1, 59 of 214 (28%) pelvic ultrasound exams from January 2008 reported an adnexal lesion, with 18 (8%) recommending follow-up. After intervention 2, 64 of 296 (22%) pelvic ultrasound exams from January 2011 reported an adnexal lesion, with 16 (5%) recommending follow-up. Follow-up recommendations decreased 58% (12% versus 5%, $P = .004$), with significant increase in the proportion characterized as physiologic or benign ($P = .001$).

Through a quality initiative aimed at appropriate description and follow-up recommendations for adnexal cystic lesions identified at ultrasound, we effectively reduced unnecessary imaging referrals. We conclude that: (1) acceptance of an expert consensus guideline was important to add credibility, (2) accessible image-rich charts are invaluable tools at point of use, and (3) elimination of some unnecessary imaging is under the control of the radiologist.

Key Words: Adnexal cysts, imaging appropriateness, quality improvement

J Am Coll Radiol 2014;11:373-377. Copyright © 2014 American College of Radiology

INTRODUCTION

Overuse of medical imaging is a major component of increasing health care costs in the United States. An estimated 35% of all advanced imaging studies may be unnecessary [1,2], causing potential harm to patients by leading to unnecessary treatment [3]. The ACR and others have focused attention on self-referral by nonradiologist owners of imaging equipment as a major driver of inappropriate utilization, with utilization and costs more than 4 times higher when self-referring physicians own imaging equipment [4-6]. However, radiologists may also contribute to overutilization of medical imaging through recommendations for unnecessary follow-up examinations [7]. Such nonstandard follow-up is a form of repeat imaging [8] that represents an opportunity for quality improvement within the control of radiologists.

Pelvic ultrasonography is the imaging modality of choice for evaluation of gynecologic symptoms and abnormalities because of its excellent delineation of female pelvic organs, real-time imaging, low cost, and lack of exposure to ionizing radiation [9-12]. In female patients, adnexal cysts are common findings in pelvic ultrasound examinations [10,13]. The vast majority of incidentally detected adnexal cysts are benign [9,10,14-16]. In premenopausal women, the majority of cysts are physiologic and typically less than 2.5 cm [11]. However, it is

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Disclosures: Dr Kramer reports institutional research funding from U-Systems. Dr Blackmore receives book royalties from Springer Medical Publishing for "Evidence Based Imaging." Dr Hashimoto reports institutional research funding from U-Systems and revenue as equipment consultant for GE Healthcare, and Dr Coy reports institutional research funding from MITA.

1546-1440/14/$36.00 • http://dx.doi.org/10.1016/j.jacr.2013.07.002

not unusual for a woman of menstrual age to have larger cysts that are physiologic [11]. In postmenopausal women, small, nonneoplastic, simple ovarian cysts are also common [14,15]. In a study involving more than 15,000 asymptomatic women 50 years or older, 18% had a finding of a unilocular ovarian cyst of 10 cm or less [14]. In both premenopausal and postmenopausal women, the malignant potential of a small simple unilocular cyst measuring less than 5 cm is exceptionally low, at less than 1% in premenopausal women and 1.6% in postmenopausal women [16]. Sonographic reporting of ovarian cysts commonly directs the clinical care of the affected woman.

At our institution, we identified variability in the ultrasound reporting of adnexal cysts as an important quality concern, and as a cause for unnecessary imaging. Follow-up recommendations from our ultrasound section varied widely, with frequent recommendations for sonographic follow-up of physiologic or benign ovarian findings. This lack of consistent management criteria decreased the quality of imaging services and led to increased patient anxiety, needless additional imaging, unnecessary gynecologic referrals, and potential unwarranted clinical or surgical management. The purpose of this project was to reduce unnecessary imaging by improving the quality of our ultrasound reports and to eliminate inappropriate sonographic follow-up imaging.

METHODS

Setting

The project was conducted at Virginia Mason Medical Center, a 336-bed integrated health system in the Pacific Northwest. A total of 250,000 imaging examinations are performed each year, including approximately 29,000 ultrasound studies. Our practice is a multispecialty group including 29 ABR-certified staff radiologists, 19 of whom interpret pelvic ultrasounds performed at the main hospital and 6 satellite clinics. During the 5-year study period, the faculty was unchanged except for the addition of one new ABR-certified radiologist in 2010. We train 12 radiologists in an accredited radiology residency program. Our institution embraces Lean production principles, a management method designed to eliminate waste and inefficiency in the delivery of health care, focusing on value from the perspective of the patient [17-20]. The project was reviewed by the institutional review board and determined to be exempt.

Technical Parameters

Female pelvic ultrasound parameters are based on the *Practice Guideline for the Performance of Pelvic Ultrasound Examinations* established by the American Institute of Ultrasound in Medicine and ultrasounds are performed with commercially available equipment (Sequoia, Siemens, Mountain View, CA; LOGIQ E9, GE Healthcare, Milwaukee, WI). Our patients are 18 years of age or older, and are examined with curvilinear transabdominal (2-MHz to 5-MHz) and transvaginal (5-MHz to 9-MHz) transducers. Examinations are conducted by credentialed, registered diagnostic medical sonographers. All examinations are reviewed by the radiologist before patient discharge from the clinic.

All solid, complex, or cystic pelvic masses are documented with grayscale and color Doppler sonography. If ovarian torsion is suspected, pulsed wave Doppler imaging of the ovaries is also performed.

Intervention

The project included 2 separate interventions, dividing 3 data collection periods (January 2006, January 2008, and January 2011). Intervention 1 consisted of educational efforts for ultrasound radiologists and sonographers. Two of the study authors initiated teaching sessions with sonographers and radiologists at the quarterly ultrasound section meeting. Case examples, including normal corpus luteum cysts and collapsed corpus luteum, were reviewed [11]. The pelvic ultrasound imaging protocol was modified to exclude formal measurements of physiologic cystic lesions less than 2.5 cm in diameter. These teaching examples were saved to a PACS workstation digital folder to facilitate review by all radiologists. Additionally, a set of ultrasound adnexal quiz cases was distributed to the ultrasound radiologists. The radiologists were asked to review the quiz cases and submit answers on whether the ultrasound cases findings were physiologic, probably benign but warranted follow-up imaging, or requiring gynecologic referral. Answers were determined based on majority opinion of an expert panel of 3 fellowship-trained radiologists and follow-up imaging confirmation.

In intervention 2, the previous educational program was supplemented using the Society of Radiologists in Ultrasound (SRU) Consensus Statement (2010) white-paper, *Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at Ultrasound.* This statement provides a standard for the characterization and imaging triage of asymptomatic adnexal cysts [21]. The SRU guidelines were distributed to all attending radiologists, residents and sonographers. Education was reinforced at resident and radiologist conferences, with radiologists individually agreeing to the SRU standard. The white-paper was saved on the PACS station desktops and posted in radiology reading rooms as a readily available reference.

Study of the Intervention

To study the effectiveness of the interventions, we conducted a retrospective review of all pelvic ultrasound radiology reports to identify all examinations with an adnexal lesion included in the "Impression" of the report. The project included 3 data collection periods (January 2006, January 2008, and January 2011), separating the 2 interventions. The January 2006 data collection period served as the preintervention baseline. For each adnexal lesion, we collected the sonographic