



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

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Seattle, WA

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To be the Quality Leader and transform health care

**Mission:**  
To improve the health and well-being of the patients we serve

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- Quality:** We relentlessly pursue the highest quality outcomes of care
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## Disclosures

- C. Blackmore receives book royalties from Springer Publishing for “Evidence Based Imaging” textbook series.



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## Purpose

- In female patients, cysts are common findings at pelvic ultrasound, but follow-up recommendations from our ultrasound section varied widely, with frequent recommendations for follow-up of physiologic or benign ovarian findings
- Lack of consistent management criteria may lead to:
  - Increased patient anxiety
  - Un-indicated additional imaging
  - Unnecessary gynecological referrals
  - Potentially unnecessary clinical or surgical treatment



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## Purpose

The goal of this project was to improve the quality of our institution's radiology reports by decreasing the number of adnexal lesions inappropriately referred for follow-up imaging



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## Methods

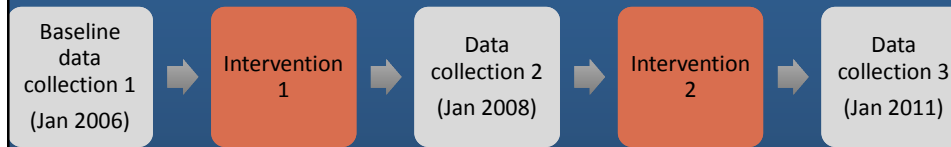
- The project was conducted at Virginia Mason Medical Center (VMMC), a 336-bed integrated health system in the Pacific Northwest
- We perform approximately 29,000 ultrasound studies/year and interpret approximately 250,000 total radiology studies/year
- Our practice is a multispecialty group comprised of 29 radiologists, 19 of whom interpret ultrasounds
- We are a fully accredited ACGME radiology residency program training 12 total residents



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## Methods: Timeline



- Our study included 3 data collection periods separated by 2 improvement-oriented interventions
- Project duration of 5 years
  - The 19 ultrasound faculty was unchanged except for the addition of 1 radiologist in 2010



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## Methods: Outcome Measures

- We retrospectively reviewed pelvic ultrasound reports to identify all with an adnexal lesion included in the Impression
- For each patient with an adnexal lesion, we collected:
  - Ultrasound characterization
  - Follow-up and referral recommendations
  - Results of follow-up imaging
  - Outcomes of consultation or surgery



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## Methods: Outcome Measures

- Our primary outcome measure was the proportion of pelvic ultrasound reports in which follow-up imaging was recommended for an adnexal lesion
- Statistical analysis was performed using the chi-square statistic of sample proportions with a 95% confidence level considered statistically significant



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## Methods: Intervention 1

- Two of the study authors initiated teaching sessions with the sonographers at the quarterly ultrasound section meeting
  - Case examples of normal corpus luteum cysts and collapsed corpus luteum were provided
  - The pelvic ultrasound protocol was modified to exclude formal measurement of physiologic cystic lesions less than 2.5 cm in diameter
- Teaching examples were saved to a PACS folder to facilitate review by all radiologists



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## Methods: Intervention 1

- Additionally, 3 fellowship trained ultrasound radiologists conducted expert review of the cases to determine if follow-up recommendations were appropriate
- A set of adnexal cyst “quiz” cases was distributed to the ultrasound radiologists
  - Radiologists were quizzed on which lesions were physiologic, benign, probably benign but warranted follow up imaging, or required gynecologic referral
  - Answers were distributed based on expert review and follow-up imaging confirmation



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## Methods: Intervention 1

- Following Intervention 1, the continued variability in adnexal lesion characterization necessitated further improvement
- Radiologists were still hesitant to characterize adnexal lesions as appropriately physiologic or benign without accepted consensus criteria



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## Methods: Intervention 2

- In Intervention 2, the VMMC ultrasound section accepted the Society of Radiologists in Ultrasound (SRU) Consensus Conference Statement whitepaper (2010) *Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at Ultrasound* as the standard for characterizing and reporting ovarian cysts and other adnexal lesions
- The whitepaper provided several image-rich charts with examples of various adnexal lesions and suggested follow-up recommendations, if necessary



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## Methods: Intervention 2

**Radiology**

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### Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at US: Society of Radiologists in Ultrasound Consensus Conference Statement<sup>1</sup>

The Society of Radiologists in Ultrasound convened a panel of specialists from gynecology, radiology, and pathology to arrive at a consensus regarding the management of ovarian and other adnexal cysts imaged sonographically in asymptomatic women. The panel met in Chicago, IL, on October 27-28, 2009, and drafted this consensus statement. The recommendations in this statement are based on analysis of current literature and common practice strategies, and are thought to represent a reasonable approach to asymptomatic ovarian and other adnexal cysts imaged at ultrasonography.

<sup>1</sup> SRU, 2010



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Normal Appearance:		Follow-up*	Comments:
<b>Normal ovary appearance:</b> Reproductive age Follicles <ul style="list-style-type: none"> <li>• Thin and smooth-walled</li> <li>• Round or oval</li> <li>• Antral</li> <li>• Size &lt; 3 cm</li> <li>• No blood flow</li> </ul>		Not needed	Developing follicles and dominant follicle < 3 cm are normal findings.
<b>Normal ovary appearance:</b> Reproductive age Corpus luteum <ul style="list-style-type: none"> <li>• Diffusely thick wall</li> <li>• Peripheral blood flow</li> <li>• Size &lt; 3 cm</li> <li>• +/- internal echoes</li> <li>• +/- associated appearance</li> </ul>		Not needed	Large volume < 3 cm & 4 normal finding
<b>Normal ovary appearance:</b> Postmenopausal <ul style="list-style-type: none"> <li>• Small</li> <li>• Homogeneous</li> </ul>		Not needed	Normal postmenopausal ovary is simple without follicles
<b>Abnormally intraluminal:</b> Postmenopausal Single cyst < 1 cm <ul style="list-style-type: none"> <li>• Thin wall</li> <li>• Antral</li> <li>• No flow</li> </ul>		Not needed	Small simple cysts are common; 90%-95% 1 cm or smaller clinically insignificant

Rebecca Smith-Watson, MD

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Asymptomatic Inexal Society of and Consensus

Increased concern a panel radiology, and pathology the management of is managed nonsurgically in and met in Chicago, IL, on called this consensus state- in this statement are based ure and common practice represent a reasonable ap- and other adnexal cysts

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Normal Appearance:		Follow-up*	Comments:
<b>Normal ovary:</b> Reproductive age Follicles <ul style="list-style-type: none"> <li>• Thin &amp;</li> <li>• Round</li> <li>• Antral</li> <li>• Size &lt; 3 cm</li> <li>• No flow</li> </ul>		Reproductive age: < 5 cm: Not needed > 5 cm: 2-6 weeks Postmenopausal (PM): < 1.8 x 7 cm: 6-12 weeks Any age > 7 cm: further imaging in 6-12 weeks or surgical evaluation	Single cysts, regardless of age of patient, are almost invariably benign. For cysts < 3 cm in women of reproductive age, it is at the discretion of the managing physician whether to describe them in imaging report.
<b>Abnormally intraluminal:</b> Reproductive age Corpus luteum <ul style="list-style-type: none"> <li>• Diffuse</li> <li>• Peripheral</li> <li>• Size &lt; 3 cm</li> <li>• +/- internal echoes</li> <li>• +/- associated appearance</li> </ul>		Reproductive age: < 5 cm: Not needed > 5 cm: 6-12 week follow-up to assess resolution Early PM: Any size: follow-up to assess resolution Late PM: Consider surgical evaluation	For cysts < 3 cm in women of reproductive age, it is at the discretion of the managing physician whether to describe them in imaging report.
<b>Abnormally intraluminal:</b> Postmenopausal Endometriomas <ul style="list-style-type: none"> <li>• Heterogeneous low-level internal echoes</li> <li>• No solid component</li> <li>• +/- Septations, fat to wall</li> </ul>		Any age: Initial follow-up 6-12 weeks, then if not surgically removed, follow-up yearly	For cysts < 3 cm in women of reproductive age, it is at the discretion of the managing physician whether to describe them in imaging report.
<b>Abnormally intraluminal:</b> Postmenopausal Single cyst < 1 cm <ul style="list-style-type: none"> <li>• Thin wall</li> <li>• Antral</li> <li>• No flow</li> </ul>		Any age: If not surgically removed, follow-up yearly to assess stability	For cysts < 3 cm in women of reproductive age, it is at the discretion of the managing physician whether to describe them in imaging report.

Rebecca Smith-Watson, MD


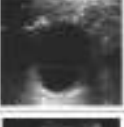

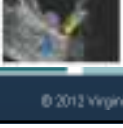
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Asymptomatic Inexal Society of and Consensus

Increased concern a panel radiology, and pathology the management of is managed nonsurgically in and met in Chicago, IL, on this consensus state- statement are based ul common practice met a reasonable ap- and other adnexal cysts




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Normal Appearance	Follow-up*	Comments	
<b>Normal ovaries</b> Follicles: • Thin • Round • Smooth • Size < 10 mm • No ML	<b>Cysts with benign characteristics:</b> Simple cysts (follicular or antral)	Follow-up*	
<b>Reproductive</b> • Age • Menstrual history • Pain • Bleeding	<b>Cysts with indeterminate, but probably benign, characteristics:</b> Findings suggestive of, but not diagnostic for hemorrhagic cyst, endometrioma or dermoid	Follow-up* Reproductive age: 6-12 week follow-up to assess resolution. If the index is unchanged, then hemorrhagic cyst is unlikely, and continued follow-up with either ultrasound or MRI should then be considered. If dermoid is not confirmed as endometrioma or dermoid, then surgical evaluation should be considered. Postmenopausal: Consider surgical evaluation	
<b>Normal ovaries</b> Follicles: • Thin • Round • Smooth • Size < 10 mm • No ML	Hemorrhagic cyst • Irregular • Internal echoes • +/- Solid components • No internal septations	 Thin-walled cyst with single thin septation or focal echification in the wall of a cyst	Follow-up based on size and menopausal status, same as simple cyst described above
<b>Reproductive</b> • Age • Menstrual history • Pain • Bleeding	Endometrioma • Irregular • Internal echoes • No ML or +/- Septa	 Multiple thin septations (or fused)	Consider surgical evaluation
<b>Normal ovaries</b> Follicles: • Thin • Round • Smooth • Size < 10 mm • No ML	Dermoid • Focal or complex • Hyperechoic • Antral • Multiple	 Multiple thin septations (or fused)	Consider surgical evaluation
<b>Reproductive</b> • Age • Menstrual history • Pain • Bleeding	Endometrioma • Irregular • Internal echoes • No ML or +/- Septa	 Nodule (non-epithelial) without flow	Consider surgical evaluation or MRI
<b>Normal ovaries</b> Follicles: • Thin • Round • Smooth • Size < 10 mm • No ML	Hemorrhagic cyst • Irregular • Internal echoes • +/- Solid components • No internal septations	Multiple thin septations (or fused)	Multiple septations suggest a neoplasm, but if thin, the neoplasm is likely benign
<b>Reproductive</b> • Age • Menstrual history • Pain • Bleeding	Endometrioma • Irregular • Internal echoes • No ML or +/- Septa	Nodule (non-epithelial) without flow	Solid nodule suggests neoplasm, but if no flow (and not etiologic) as would be seen in a dermoid, then likely benign neoplasm such as a cystadenoma

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Normal Appearance	Follow-up*	Comments	
<b>Normal ovaries</b> Follicles: • Thin • Round • Smooth • Size < 10 mm • No ML	<b>Cysts with benign characteristics:</b> Simple cysts (follicular or antral)	Follow-up*	
<b>Reproductive</b> • Age • Menstrual history • Pain • Bleeding	<b>Cysts with indeterminate, but probably benign, characteristics:</b> Findings suggestive of, but not diagnostic for hemorrhagic cyst, endometrioma or dermoid	Follow-up* Reproductive age: 6-12 week follow-up to assess resolution. If the index is unchanged, then hemorrhagic cyst is unlikely, and continued follow-up with either ultrasound or MRI should then be considered. If dermoid is not confirmed as endometrioma or dermoid, then surgical evaluation should be considered. Postmenopausal: Consider surgical evaluation	
<b>Normal ovaries</b> Follicles: • Thin • Round • Smooth • Size < 10 mm • No ML	<b>Cysts with characteristics worrisome for malignancy</b> Thick (> 3 mm) irregular septations	 Any age: Consider surgical evaluation	Comments
<b>Reproductive</b> • Age • Menstrual history • Pain • Bleeding	Hemorrhagic cyst • Irregular • Internal echoes • +/- Solid components • No internal septations	 Nodule with blood flow	Any age: Consider surgical evaluation
<b>Normal ovaries</b> Follicles: • Thin • Round • Smooth • Size < 10 mm • No ML	Endometrioma • Irregular • Internal echoes • No ML or +/- Septa	Multiple thin septations (or fused)	Multiple septations suggest a neoplasm, but if thin, the neoplasm is likely benign
<b>Reproductive</b> • Age • Menstrual history • Pain • Bleeding	Dermoid • Focal or complex • Hyperechoic • Antral • Multiple	 Multiple thin septations (or fused)	Consider surgical evaluation or MRI
<b>Normal ovaries</b> Follicles: • Thin • Round • Smooth • Size < 10 mm • No ML	Hemorrhagic cyst • Irregular • Internal echoes • +/- Solid components • No internal septations	Nodule (non-epithelial) without flow	Solid nodule suggests neoplasm, but if no flow (and not etiologic) as would be seen in a dermoid, then likely benign neoplasm such as a cystadenoma
<b>Reproductive</b> • Age • Menstrual history • Pain • Bleeding	Endometrioma • Irregular • Internal echoes • No ML or +/- Septa	Nodule with blood flow	Any age: Consider surgical evaluation

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## Methods: Intervention 2

- The SRU whitepaper was distributed department-wide to all attending radiologists, residents, and sonographers
- Education was reinforced at the quarterly ultrasound section meeting and resident noon conferences
- Radiologists were asked to save the whitepaper to their desktops for quick reference



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## Results: Timeline



- Our study included 3 data collection periods with each data collection separated by an improvement-oriented intervention



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## Results: Baseline Data Collection 1

	Total pelvic ultrasounds	Number of ultrasound reports documenting an adnexal lesion	Number of patients recommended for follow-up imaging
Baseline Data Collection 1	252	58 (23%)	31 (12%)

- We reviewed 252 pelvic ultrasounds
  - 58 (23%) reported an adnexal mass
  - Follow-up ultrasound was recommended in 31 (12% of total)



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## Results: Baseline Data Collection 1

- Expert review revealed that 16 of the ultrasound cases (28%) were misclassified as indeterminate or concerning, rather than as benign or physiologic
- Of the 31 patients for whom follow-up was recommended, 13 patients (42%) failed to undergo recommended follow-up or had the follow-up recommendation overturned at the time of gynecologic consultation



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## Results: Data Collection 2

	Total pelvic ultrasounds	Number of ultrasound reports documenting an adnexal lesion	Number of patients recommended for follow-up imaging
Baseline Data Collection 1	252	58 (23%)	31 (12%)
Data Collection 2 (Following Intervention 1)	214	59 (27%)	18 (8%)

- Following Intervention 1, we reviewed 214 pelvic ultrasounds
  - No significant change in reporting of adnexal lesions (23% v 27%,  $p=0.26$ ) or follow-up recommendations (12% v 8%,  $p=0.17$ )



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## Results: Data Collection 3

	Total pelvic ultrasounds	Number of ultrasound reports documenting an adnexal lesion	Number of patients recommended for follow-up imaging
Baseline Data Collection 1	252	58 (23%)	31 (12%)
Data Collection 2 (Following Intervention 1)	214	59 (27%)	18 (8%)
Data Collection 3 (Following Intervention 2)	296	64 (22%)	16 (5%)

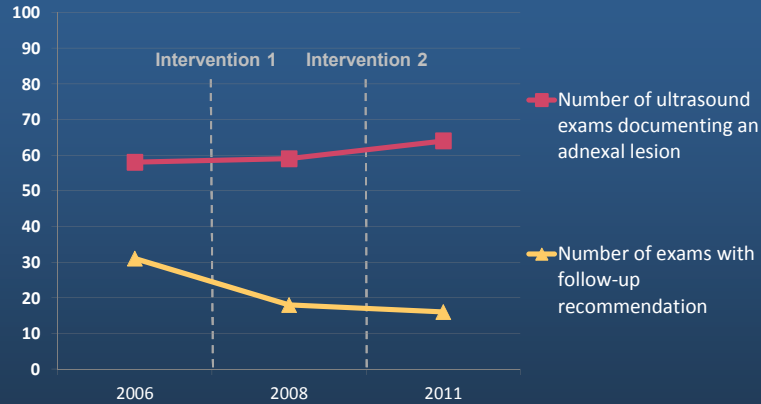
- Following Intervention 2, we reviewed 296 pelvic ultrasounds
  - 64 (22% of total) reported an adnexal lesion, not statistically different compared to baseline (23% v 22%,  $p=0.70$ )
  - However, follow-up was recommended in 16 patients (5% of total), significantly decreased compared to baseline (12% v 5%,  $p=0.004$ )



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Figure 1: Number of documented adnexal lesions and follow-up recommendations



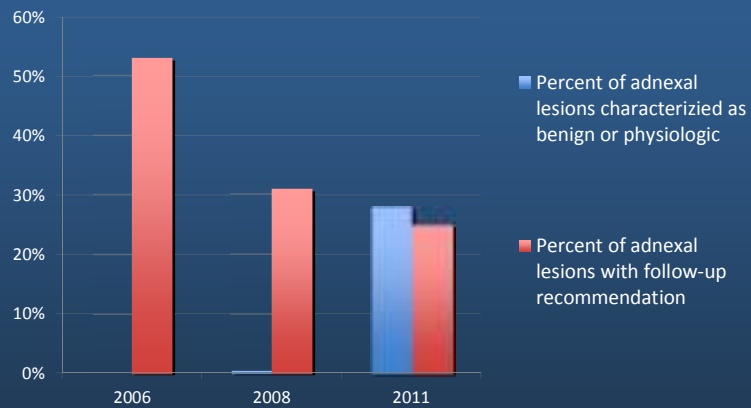
While the number of adnexal lesions documented on ultrasound remained relatively stable during each data collection phase, the number of exams with follow-up recommended decreased significantly following Intervention 2



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Figure 2: Percent of adnexal lesions described as physiologic or benign in the radiology report compared to percent of lesions with follow-up recommended



Following the implementation of educational intervention and SRU guidelines (Intervention 2), there was an increase in adnexal lesions described as physiologic or benign and corresponding decrease in adnexal lesions with follow-up recommended



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## Conclusions

- Through implementation of SRU consensus guidelines with radiologist buy-in, and radiologist and sonographer education, we reduced unnecessary follow-up imaging at VMMC and increased confidence in characterizing certain lesions as physiologic or benign



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## Conclusions

- Lessons learned:
  - Acceptance of a consensus guideline was important for consistent reporting
  - Guidelines created by an expert consensus committee added more credibility of reference
  - Image-rich charts served as invaluable examples for radiologist reporting
  - Posting of guidelines at point of use in the reading room and workstation desktop was helpful
  - Successful implementation required active engagement of radiology attendings, residents, and sonographers



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## Conclusions

- Elimination of some unnecessary imaging is under the control of the radiologist through the reporting of radiologic findings and recommendations made



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## Conclusions

- We reduced variability through acceptance of a standard process of reporting in ultrasound studies
- Additionally, we hope to have reduced unnecessary patient anxiety, work-up, and cost



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