Management of a suspicious adnexal mass: a clinical practice guideline

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ABSTRACT

Questions

What is the optimal strategy for preoperative identification of the adnexal mass suspicious for ovarian cancer?

What is the most appropriate surgical procedure for a woman who presents with an adnexal mass suspicious for malignancy?

Perspectives

In Canada in 2010, 2600 new cases of ovarian cancer were estimated to have been diagnosed, and of those patients, 1750 were estimated to have died, making ovarian cancer the 7th most prevalent form of cancer and the 5th leading cause of cancer death in Canadian women. Women with ovarian cancer typically have subtle, nonspecific symptoms such as abdominal pain, bloating, changes in bowel frequency, and urinary or pelvic symptoms, making early detection difficult. Thus, most ovarian cancer cases are diagnosed at an advanced stage, when the cancer has spread outside the pelvis. Because of late diagnosis, the 5-year relative survival ratio for ovarian cancer in Canada is only 40%. Unfortunately, because of the low positive predictive value of potential screening tests (cancer antigen 125 and ultrasonography), there is currently no screening strategy for ovarian cancer.

The purpose of this document is to identify evidence that would inform optimal recommended protocols for the identification and surgical management of adnexal masses suspicious for malignancy.

Outcomes

Outcomes of interest for the identification question included sensitivity and specificity. Outcomes of interest for the surgical question included optimal surgery, overall survival, progression-free or disease-free survival, reduction in the number of surgeries, morbidity, adverse events, and quality of life.

Methodology

After a systematic review, a practice guideline containing clinical recommendations relevant to patients in Ontario was drafted. The practice guideline was reviewed and approved by the Gynecology Disease Site Group and the Report Approval Panel of the Program in Evidence-based Care. External review by Ontario practitioners was obtained through a survey, the results of which were incorporated into the practice guideline.

Practice Guideline

These recommendations apply to adult women presenting with a suspicious adnexal mass, either symptomatic or asymptomatic.

Identification of an Adnexal Mass Suspicous for Ovarian Cancer

Sonography (particularly 3-dimensional sonography), magnetic resonance imaging (MRI), and computed tomography (CT) imaging are each recommended for differentiating malignant from benign ovarian masses. However, the working group offers the following further recommendations, based on
their expert consensus opinion and a consideration of availability, access, and harm:

- Where technically feasible, transvaginal sonography should be the modality of first choice in patients with a suspicious isolated ovarian mass.
- To help clarify malignant potential in patients in whom ultrasonography may be unreliable, MRI is the most appropriate test.
- In cases in which extra-ovarian disease is suspected or needs to be ruled out, CT is the most useful technique.
- Evaluation of an adnexal mass by Doppler technology alone is not recommended. Doppler technology should be combined with a morphology assessment.
- Ultrasonography-based morphology scoring systems can be used to differentiate benign from malignant adnexal masses. These scoring systems are based on specific ultrasound parameters, each with several scores base on determined features. All evaluated scoring systems were found to have an acceptable level of sensitivity and specificity; the choice of scoring system may therefore be made based on clinician preference.
- As a standalone modality, serum cancer antigen 125 is not recommended for distinguishing between benign and malignant adnexal masses.
- Frozen sections for the intraoperative diagnosis of a suspicious adnexal mass is recommended in settings in which availability and patient preference allow.

Surgical Procedures for an Adnexal Mass Suspicious for Malignancy

To improve survival, comprehensive surgical staging with lymphadenectomy is recommended for the surgical management of patients with early-stage ovarian cancer.

Laparoscopy is a reasonable alternative to laparotomy, provided that appropriate surgery and staging can be done. The choice between laparoscopy and laparotomy should be based on patient and clinician preference. Discussion with a gynecologic oncologist is recommended.

Fertility-preserving surgery is an acceptable alternative to more extensive surgery in patients with low-malignant-potential tumors and those with well-differentiated surgical stage I ovarian cancer. Discussion with a gynecologic oncologist is recommended.

KEY WORDS

Adnexal mass, identification, ultrasonography, surgery

1. QUESTIONS

What is the most appropriate strategy for preoperative identification of an adnexal mass suspicious for ovarian cancer?

2. BACKGROUND

In Canada in 2010, 2600 new cases of ovarian cancer were estimated to have been diagnosed, and of those patients, 1750 were estimated to have died, making ovarian cancer the 7th most prevalent form of cancer and the 5th leading cause of cancer death in Canadian women1. Women with ovarian cancer typically have subtle, nonspecific symptoms such as abdominal pain, bloating, changes in bowel frequency, and urinary or pelvic symptoms2, making early detection difficult. Thus, most ovarian cancer cases are diagnosed at an advanced stage, when the cancer has spread outside the pelvis3. Because of late diagnosis, the 5-year relative survival ratio for ovarian cancer in Canada is only 40%1. Unfortunately, because of the low positive predictive value of potential screening tests [cancer antigen 125 (CA125) and ultrasonography], there is currently no screening strategy for ovarian cancer4.

The purpose of the present document is to identify evidence that can inform optimal recommended protocols for the identification and surgical management of adnexal masses suspicious for malignancy.

3. METHODS

3.1 Guideline Development

The evidence-based series guidelines developed by Cancer Care Ontario’s Program in Evidence-based Care (PEBC) use the methods of the practice guidelines development cycle5. For the present project, the core methodology used to develop the evidentiary base was an update of two previously published systematic reviews: the Agency for Healthcare Research and Quality (AHRQ) report, 20063, and the Australian Cancer Network Clinical Practice Guideline, 20046. Evidence was selected and reviewed by 5 members of the PEBC Gynecology Disease Site Group (DSG) and 1 methodologist.

This practice guideline is a convenient and up-to-date source of the best available evidence on the management of an adnexal mass suspicious for malignancy. It was developed by systematic review, data synthesis, internal review by a clinician and a methodologist, and external review by clinical experts and Ontario practitioners. The systematic review evidence (manuscript under development) forms the basis of the recommendations developed by the Gynecology DSG. The systematic review and companion recommendations are intended to promote evidence-based practice in Ontario, Canada. The PEBC is supported by the Ontario Ministry of
Health and Long-Term Care through Cancer Care Ontario. All work produced by the PEBC is editorially independent of its funding source.

3.2 Literature Search Strategy

As a first step, an Internet search of Canadian and international health organizations and the National Guidelines Clearinghouse was conducted for existing guidelines and systematic reviews relevant to the research question. Guidelines were included if they had been published since 1999 in English. This initial environmental scan yielded eleven practice guidelines; however, one guideline was excluded because the full guideline was available only in French, and another guideline was excluded because only the National Guidelines Clearinghouse summary was available. One evidence report and technology assessment and one clinical practice guideline identified through the environmental scan were deemed to be the most appropriate to answer the guideline questions. The 2006 AHRO report3 addresses the identification question concerning an adnexal mass suspicious for malignancy. The 2004 Australian Cancer Network Clinical Practice Guideline6 addresses the surgical management question concerning an adnexal mass suspicious for malignancy.

The literature search from the AHRO report was updated using MEDLINE (Ovid: January 2004 through week 3, March 2009). Because an exact search strategy for the Australian Cancer Network report was not available, an update of that literature search (using the key words provided in the report) was approximated using MEDLINE (Ovid: January 2004 through week 3, April 2009). This literature search combined disease-specific terms (“pelvic mass,” “adnexal mass,” “pelvic neoplasms,” “ovarian cancer,” “ovarian neoplasm,” “ovarian carcinoma,” “epithelial ovarian cancer,” “borderline ovarian tumours,” and “tumours of low malignant potential”) with surgery-specific terms (“intraoperative pathological examination,” “frozen section,” “debunking surgery,” “fertility sparing,” “surgical staging,” “bilateral salpingo-oophorectomy,” “total hysterectomy,” “node or nodal dissection,” “surgical management,” “treatment,” “cytoreduction,” “secondary cytoreduction,” “interval cytoreduction,” “laparotomy,” and “laparoscopy”) for all study designs.

Relevant articles and abstracts were selected and reviewed by 2 reviewers. The reference lists of included studies, together with the personal reference lists of the guideline working group, were searched for additional studies.

4. RESULTS

Four meta-analyses7–10 and sixty-seven primary studies pertaining to the identification of an adnexal mass suspicious for malignancy met the inclusion criteria and were included in the review. A total of 1809 articles were identified in the updated search for the most appropriate surgical procedure, of which sixteen met the inclusion criteria.11–26.

5. DSG CONSENSUS PROCESS

The draft guideline and systematic review were circulated to the Gynecology DSG for review and approval. The DSG consists of medical oncologists, radiation oncologists, surgical oncologists, and a methodologist.

6. INTERNAL REVIEW

Before submission of this evidence-based series draft report for external review, the report was reviewed and approved by the PEBC Report Approval Panel, which consists of 2 members, including an oncologist with expertise in clinical and methodology issues. The key issues raised by the Report Approval Panel are noted below. Modifications to the guideline were made accordingly.

- If pathology is still the “gold standard,” what is the role of the other diagnostic technologies?
- The authors’ first recommendation concludes that 3-dimensional ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) are “all recommended,” with considerations of more “local factors” then suggested as determinants of the modality of choice. The authors should reconsider whether they have missed an opportunity to make a more definitive recommendation that accounts for the “equality” in diagnostic efficacy and what can be reasonably assumed about cost, access, harm (for example, radiation exposure), and patient inconvenience.
- The authors consider various diagnostic tools separately (for example, imaging, CA125). Is there a risk that, in practice, these modalities are used in combination and in doing so, diagnostic properties are changed? Related to this theme, are there important differences in the eligibility of patients included in any analysis of a single modality in which a second-modality criterion was required for inclusion?
- In contrast to the diagnostic efficacy section, the section that deals with “therapy” does not include conventional guideline methodology or reporting. The authors should reconsider their approach to that question.
- The authors might wish to clarify whether the post-diagnostic therapeutic pathway includes multiple modalities that require systematic review to assess linkage.

7. EXTERNAL REVIEW

The PEBC external review process is two-pronged and includes a targeted peer review that is intended to
obtain direct feedback on the draft report from a small number of specified content experts, and a professional consultation that is intended to facilitate dissemination of the final guidance report to Ontario practitioners.

7.1 Methods

7.1.1 Targeted Peer Review
During the guideline development process, 2 targeted peer reviewers from Ontario and 1 from the United States considered to be clinical or methodological experts (or both) on the topic were identified by the working group. Several weeks before completion of the draft report, the nominees were contacted by e-mail and asked to serve as reviewers. The 3 reviewers agreed, and the draft report and a questionnaire were sent by e-mail for review. The questionnaire consisted of items evaluating the methods, results, and interpretive summary used to inform the draft recommendations and whether the draft recommendations should be approved as a guideline. Written comments were invited. The questionnaire and draft document were sent April 8, 2011. Follow-up reminders were sent at 2 weeks (e-mail) and at 4 weeks (telephone call). One reviewer of the invited 3 provided a response to the questionnaire. A score of 5 out of 5 was assigned to the guideline by that reviewer on all 8 questions.

7.1.2 Professional Consultation
Feedback was obtained through a brief online survey of health care professionals who are the intended users of the guideline. Gynecologists and gynecologic oncologists in the PEBC database were contacted by e-mail to inform them of the survey. Participants were asked to rate the overall quality of the guideline (Section 1) and whether they would use and recommend it. Written comments were invited. Participants were contacted by e-mail and directed to the survey Web site, where they were provided with access to the survey, the guideline recommendations (Section 1), and the evidentiary base (Section 2). The notification e-mail was sent April 13, 2011. The consultation period ended June 10, 2011. The working group reviewed the results of the survey.

7.2 Results

7.2.1 Summary of Written Comments from the Targeted Peer Review
Of the 3 invited reviewers, 1 provided a response. The responding reviewer advised that references by L. Cohen and A. Fleischer be added to the evidence base. The authors were not able to gather more information from the reviewer regarding exactly which publications had been missed. The authors examined whether references by Cohen and Fleischer (independently or together) had been considered at any time during the guideline development process. Cohen et al. (2001) was considered by the AHRQ review and reported in Section 2 under “Other Scoring Systems.” One Fleischer paper (Wilson et al., 2006) was included in the evidence base for the guideline. In the end, no modifications to the evidence base were made on the basis of the reviewer’s comment.

7.2.2 Summary of Written Comments from the Professional Consultation
As a result of the professional consultation, 60 responses were received. Table 1 summarizes key results of the feedback survey. Modifications to the guideline were made accordingly.

Of the 60 responders, 20 provided additional written comments. Most indicated that the document was of high quality and would be of use to practitioners. Suggestions for improvements or additions to the document included several comments relating to the scoring systems described in the report. The feedback generally indicated that many practitioners in the province are not aware of the scoring systems. A direct link from the recommendations to the scoring systems was requested. It was also suggested that the guideline recommend one scoring system that would be the most reliable. Other comments related to scoring systems include making the Risk of Malignancy Index (RMi) available as an appendix to the guideline. There was also a request for an appendix setting out the ultrasonography features of malignancy and the definitions of resistance index, pulsatility index, and peak systolic velocity.

8. Practice Guideline

The present report integrates the feedback obtained through the external review process, with final approval given by the Gynecology DSG and the Report Approval Panel of the PEBC.

8.1 Recommendations and Key Evidence

8.1.1 Identification of an Adnexal Mass Suspicious for Ovarian Cancer

Recommendation: Sonography (particularly 3-dimensional sonography), magnetic resonance imaging (MRI), and computed tomography (CT) imaging are each recommended for differentiating malignant from benign ovarian masses. However, the working group offers the following further recommendations, based on their expert consensus opinion and a consideration of availability, access, and harm:

- Where technically feasible, transvaginal sonography should be the modality of first choice in patients with a suspicious isolated ovarian mass.
- To help clarify malignant potential in patients in whom ultrasonography may be unreliable, MRI is the most appropriate test.
In cases in which extra-ovarian disease is suspected or needs to be ruled out, CT is the most useful technique.

This recommendation is based on results of a meta-analysis of six cohort studies that investigated 3-dimensional sonography and indicated an enhanced sensitivity of 93.5% and a specificity of 91.5% with 3-dimensional technology. Furthermore, a meta-analysis of twenty-two cohort studies with 24 datasets that investigated the effectiveness of MRI in the diagnosis of adnexal masses and found an overall sensitivity of 91.9% and a specificity of 88.4%. Finally, a meta-analysis of seven studies with 8 datasets considering CT technology yielded an overall sensitivity of 87.2% and a specificity of 84.0%.

**Recommendation:** Evaluation of an adnexal mass by Doppler technology alone is not recommended. Doppler technology should be combined with a morphology assessment. This recommendation is based on the results of several meta-analyses on Doppler indices, but not on direct comparisons between them. Rather, the summary data from the meta-analyses were inspected, and reasonable sensitivities and specificities were noted. A meta-analysis of the resistance index included thirty-five cohort studies with 42 datasets and yielded an overall sensitivity of 77.2% and a specificity of 89.8%. A meta-analysis of twenty-one cohort studies with 22 datasets that evaluated the pulsatility index found an overall sensitivity of 80.6% and a specificity of 79.9%. A meta-analysis of the peak systolic velocity included seven cohort studies with 15 datasets, which used a cut-off of 200 as indicative of malignancy, and found an overall sensitivity of 80.0% and a specificity of 84.2%.

**Qualifying Statement:** Assessment of an adnexal mass by colour Doppler technology using the resistance, pulsatility, and peak systolic velocity indices was neither as sensitive nor as specific as simple ultrasonography. Furthermore, because of the overlap of vascular parameters between malignant and benign masses, a firm diagnosis based on Doppler evaluation alone can be problematic.

**Recommendation:** Ultrasonography-based morphology scoring systems can be used to differentiate benign from malignant adnexal masses. These scoring systems are based on specific ultrasound parameters, each with several scores based on determined features. All evaluated scoring systems were found to have an acceptable level of sensitivity and specificity; the choice of scoring system may therefore be made based on clinician preference. More information on the characteristics of these scoring systems can be found in Appendix A.

Ultrasonography-based morphology scoring systems were not directly compared in this review. Instead, the assessment was based on summary data of the sensitivity and specificity obtained from the meta-analyses. The meta-analyses found summary sensitivities ranging from 83.5% (Finkler et al. 95) to 91% (DePriest et al. 92) and specificities ranging from 63% (Lerner et al. 94) to 85.9% (Ferrazzi et al. 93). The Risk of Malignancy Index (RMI) is a clinical prediction rule that includes CA125 and menopausal status in addition to ultrasonography-based morphology. In a meta-analysis of data from the thirteen RMI studies with 15 datasets, which used a cut-off of 200 as indicative of malignancy, the summary sensitivity and specificity were 79.2% and 91.7% respectively. The newer versions of this tool, RMI2 and RMI3, have comparable levels of sensitivity and specificity. The choice of RMI version should be based on clinician preference.

**Recommendation:** As a standalone modality, serum cancer antigen 125 is not recommended for...
distinguishing between benign and malignant adnexal masses.

This recommendation is based on a meta-analysis of forty-nine cohort studies and two case-control studies with a total of 52 datasets that found, at a threshold of 35 U/mL, an overall sensitivity of 78.7% and a specificity of 77.9%.

**Qualifying Statement:** Elevated serum CA125 has been reported in a variety of benign conditions. Because the incidence of ovarian cancer relative to benign gynecologic conditions is lower in premenopausal women, serum CA125 is of limited use in that population. Serum CA125 is elevated in only 50% of early-stage ovarian cancers. Caution should be used in interpreting values in such patients.

**Recommendation:** Frozen sections for the intraoperative diagnosis of a suspicious adnexal mass is recommended in settings in which availability and patient preference allow.

This recommendation is based on a meta-analysis of frozen section diagnoses that included fifteen cohort studies and yielded an overall sensitivity of 89.2% and a specificity of 97.9%.

### 8.1.2 Surgical Procedures for an Adnexal Mass Suspicious for Malignancy

**Recommendation:** To improve survival, comprehensive surgical staging with lymphadenectomy is recommended for the surgical management of patients with early-stage ovarian cancer.

This recommendation is based on the results of five retrospective cohort studies that considered patients with early-stage ovarian cancer. Two large population-based studies found improved 3-year (p < 0.001) and 5-year disease-specific survival (p < 0.001) for surgical staging with lymphadenectomy compared with staging procedures without lymphadenectomy. Okssefjell et al. reported a statistically significant improvement in 5-year overall survival rates in patients that underwent lymphadenectomy compared with those that did not (87% vs. 64%; p = 0.02). Survival analyses performed by both Skirnisdottir et al. and Hornung et al. demonstrated a statistically significant benefit in disease-free survival (p = 0.004 and p = 0.0007 respectively) for patients that underwent lymphadenectomy compared with patients that did not. Hornung and colleagues also considered overall survival and reported a statistically significant difference (p = 0.0008) between the groups in favour of the patients undergoing a lymphadenectomy. The one randomized controlled trial that was identified reported no statistically significant effect of lymphadenectomy on progression-free survival (hazard ratio: 0.72; 95% confidence interval: 0.46 to 1.14) or overall survival (hazard ratio: 0.85; 95% confidence interval: 0.49 to 1.47). However, the study was underpowered to detect a difference in survival, the study’s secondary outcome. Rather, the sample size calculation was undertaken to detect a difference in the prevalence of lymph node positivity. The study was deemed inadequate to inform the recommendation.

**Recommendation:** Laparoscopy is a reasonable alternative to laparotomy, provided that appropriate surgery and staging can be done. The choice between laparoscopy and laparotomy should be based on patient and clinician preference. Discussion with a gynecologic oncologist is recommended.

This recommendation is based on the results of six retrospective cohort studies. In the three studies that considered patients with early epithelial ovarian cancer, no statistical difference in survival rates was detected between patients undergoing laparoscopy and those undergoing laparotomy. In the management of patients with early borderline ovarian tumours, Romagnolo et al., Park et al., and Desfeux et al. found that the surgical approach—laparoscopic or laparotomic—did not appear to influence survival rates.

**Recommendation:** Fertility-preserving surgery is an acceptable alternative to more extensive surgery in patients with low malignant-potential tumours and those with well-differentiated surgical stage I ovarian cancer. Discussion with a gynecologic oncologist is recommended.

This recommendation is based on two cohort studies that compared the impacts of conservative fertility-sparing surgeries and more radical surgical approaches. Yinon et al. specifically compared rates of recurrence in 40 patients who underwent unilateral salpingo-oophorectomy with those in 22 patients who underwent cystectomy only. No statistical difference in recurrence rates was detected (27.5% vs. 22.7%, p = 0.8). Similarly, in a larger study of 360 women with low malignant-potential tumours, Park et al. found no difference in disease-free survival between patients who underwent radical or fertility-sparing surgery (p = 0.651).

**Qualifying Statement:** The Gynecology Cancer DSG acknowledges that, despite definitions and criteria, it is unrealistic to expect that 100% of ovarian cancers will be identified as suspicious preoperatively. Pathology remains the clinical standard.

### 9. CONFLICT OF INTEREST DISCLOSURES

The authors declare that there are no financial conflicts of interest.

### 10. REFERENCES

MANAGEMENT OF A SUSPICIOUS ADNEXAL MASS


## APPENDIX A
### SCORING SYSTEMS FOR DISTINGUISHING BENIGN FROM MALIGNANT ADNEXAL MASSES

#### Ultrasonography-Based Morphology Scoring Systems

<table>
<thead>
<tr>
<th>Scoring system</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sassone et al., 1991</strong></td>
<td></td>
</tr>
<tr>
<td>Morphology</td>
<td></td>
</tr>
<tr>
<td>Inner wall structure (mm)</td>
<td>Smooth</td>
</tr>
<tr>
<td>Wall thickness (mm)</td>
<td>Thin (≤3)</td>
</tr>
<tr>
<td>Septa (mm)</td>
<td>None</td>
</tr>
<tr>
<td>Echogenicity</td>
<td>Sonolucent</td>
</tr>
<tr>
<td>Cut-off suggestive of malignancy: &gt;9</td>
<td></td>
</tr>
</tbody>
</table>

| **DePriest et al., 1993** |       |
| Morphology       |       |
| Cystic wall structure (mm) | Smooth (<3 thick) | Smooth (>3 thick) | Papillary projection (<3) | Predominately solid (≥3) | — |
| Volume (cm³) | <10 | 10 to 50 | >50 to 200 | >200 to 500 | >500 |
| Septa structure (mm) | None | Thin septa (<3) | Thick septa (3 to 10) | Solid area (≥10) | Predominately solid |
| Cut-off suggestive of malignancy: ≥5 |

| **Ferrazzi et al., 1997** |       |
| Morphology       |       |
| Wall (mm) | ≤3 | >3 | — | Irregular, mostly solid | Irregular, NA |
| Septa (mm) | None | ≤3 | >3 | — | — |
| Vegetations | None | — | — | ≤3 | >3 |
| Echogenicity | Sonolucent | Low echogenicity | With echogenic areas | Heterogeneous echogenic areas | Solid |
| Cut-off suggestive of malignancy: >9 |

| **Lerner et al., 1994** |       |
| Morphology       |       |
| Wall structure (mm) | Smooth or small irregularities (<3) | — | Solid or NA (<3) | Papillarities (≥3) | — |
| Shadowing | Yes | No | — | — | — |
| Septa (mm) | None or thin (<3) | Thick (≥3) | — | — | — |
| Echogenicity | Sonolucent or low-level echo or echogenic core | — | Mixed or high | — | — |
| Cut-off suggestive of malignancy: ≥3 |
Table A.ii Finkler ultrasonography-based morphology scoring system

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear cyst and smooth borders, or fibroid (ovaries normal), or tubular cyst such as hydrosalpinx</td>
<td>1</td>
</tr>
<tr>
<td>Clear cyst with slightly irregular border; cyst with smooth walls but low-level echoes (that is, endometrioma)</td>
<td>2</td>
</tr>
<tr>
<td>Cyst with low-level echoes with slightly irregular border but no nodularity (that is, endometrioma); clear cyst in postmenopausal patient</td>
<td>3</td>
</tr>
<tr>
<td>Equivocal, nonspecific appearance: solid ovarian enlargement or small cyst with irregular borders and internal echoes (hemorrhagic cyst or benign ovarian tumour)</td>
<td>4–6</td>
</tr>
<tr>
<td>Multiseptate or irregular cystic mass consistent in appearance with ovarian tumour ( (7 = \text{less nodularity}; \ 8–9 = \text{more nodularity}) )</td>
<td>7–9</td>
</tr>
<tr>
<td>Pelvic mass as above, with ascites</td>
<td>10</td>
</tr>
</tbody>
</table>

1 = benign; 10 = malignant; \( \geq 7 = \text{indicative of probable malignancy} \).

Table A.iii Risk of Malignancy Index (rmi)

The rmi is a clinical prediction rule that calculates a numeric score based on the tumour marker cancer antigen 125 (CA125), which may be elevated in the blood of some cancer patients, multiplied by a menopausal score (M) and an ultrasonography-based morphology score (U). The most common threshold for probability of malignancy is 200. Scores are calculated as follows:

\[
\text{rmi} = U \times M \times \text{CA125}
\]

where U is 0, 1, or 3 (see explanation, next); M is 1 (premenopausal) or 3 (postmenopausal); and CA125 is the serum CA125 in units per millilitre.

The transabdominal ultrasound imaging is scored 1 point for each of these characteristics:

- Multilocular cyst
- Evidence of solid areas
- Evidence of metastases
- Presence of ascites
- Bilateral lesions

If the score is 0, then \( U = 0 \); if the score is 1, then \( U = 1 \); if the score is 2 or more, then \( U = 3 \).

The rmi2 is calculated in the same way as the original rmi, except that the U and M components are differently weighted:

- M is 1 (premenopausal) or 4 (postmenopausal).
- If the transabdominal ultrasound imaging score is 0 or 1, then \( U = 1 \); if the score is 2 or more, then \( U = 4 \).

The rmi3 further refines the rmi and rmi2, using the same definitions, but adjusting the U and M components:

- M is 1 (premenopausal) or 3 (postmenopausal).
- If the transabdominal ultrasound imaging score is 0 or 1, then \( U = 1 \); if the score is 2 or more, then \( U = 3 \).