# Pathways to the diagnosis of epithelial ovarian cancer in Australia

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## ABSTRACT

**Objective:** To describe the diagnostic pathways experienced by a large, representative group of Australian women with ovarian cancer, and to document the time between first presentation to a medical professional and clinical diagnosis.

**Design, setting and participants:** 1463 women with epithelial ovarian cancer from an Australia-wide population-based study (2002–2005) completed a telephone interview in which they described the events that led to the diagnosis of their cancer.

**Main outcome measures:** Number and type of doctors consulted, investigations performed, referral patterns and the time from first presentation to diagnosis.

**Results:** Of the 1463 women, 145 had their cancer diagnosed incidentally and were excluded from analysis. Most of the remaining 1318 women (1222, 93%) presented first to their general practitioner. As a result of their first medical consultation, 75 women (6%) were given a diagnosis, and 484 (37%) were referred to a gynaecologist, gynaecological oncologist or oncologist for further assessment. Overall, 85% of women visited three or fewer doctors before their cancer was diagnosed; 66% of cancers were diagnosed within 1 month of the initial presentation, and 80% were diagnosed within 3 months. For 12% of women, the diagnostic process took longer than 6 months; this was more likely for women residing in remote Australia, those with lower incomes, and those presenting with abdominal pain or bowel symptoms, or with more than one symptom.

**Conclusions:** Despite anecdotal suggestions to the contrary, most women with ovarian cancer in Australia are investigated and diagnosed promptly. The diagnostic process is more protracted for a minority of women, and the factors we found to be associated with diagnostic delay warrant further investigation.

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Ovarian cancer, the sixth most common cause of cancer death among Australian women,[1] has a poor prognosis, mainly because about 75% of cancers are diagnosed at an advanced stage when treatment is unlikely to be curative.[2] The symptoms of ovarian cancer are often non-specific,[3,4] and delays in diagnosis may, in part, explain why the disease has so often spread beyond the ovaries at diagnosis.[5] Anecdotally, there is a perception that the journey from first presentation to diagnosis is often long and circuitous for women with ovarian cancer.

Few international and no Australian studies have attempted to formally document the diagnostic experience of women with ovarian cancer.[5-7] While some have endeavoured to estimate diagnostic delays, estimates of time from first presentation to diagnosis are varied, with British and Swedish studies reporting that most women are diagnosed within 1 month,[6,8,9] while others from the United States[5] and Norway[7] found that 40%–45% of women experienced delays of 3 or more months. As health system differences between countries probably explain some of this variation, it is important for Australian clinicians and policymakers to have access to information from the Australian setting.

Our aims were to describe the diagnostic pathways experienced by a large, representative group of Australian women with ovarian cancer and to document the time between their first presentation to a medical professional and clinical diagnosis.

## METHODS

The Australian Ovarian Cancer Study was an Australia-wide population-based study. Eligible participants were women aged 18–79 years with suspected invasive or borderline epithelial ovarian, fallopian tube or primary peritoneal cancer who were identified between January 2002 and June 2005 through gynaecological oncology units and state-based cancer registries.[10] A total of 3550 women were identified; of these, 307 (8.6%) died before contact could be made, 194 (5.5%) could not be contacted, and the treating doctor refused contact with 133 (3.7%). A further 171 (4.8%) were excluded because they could not complete the questionnaires in English (70), could not give informed consent (35) or were too sick (66). The remaining 2745 women were invited to participate (most before surgery) and, of these, 2319 (84% of those approached) agreed to take part. After surgery, a further 634 women were excluded: 608 because their final diagnosis was not epithelial ovarian cancer, 25 because their cancer was diagnosed before the study period, and one because she was not an Australian resident.

The remaining 1685 participants completed a health questionnaire, and 1463 of these (87%) were also interviewed by research nurses by telephone (median time between histological diagnosis and interview was 3 months). This group formed the sample for our analysis. They were asked what symptoms prompted them to go to a doctor or, if they did not have symptoms, the reason for the consultation that led to their cancer diagnosis. Women were asked about each doctor consulted, dates of visits, tests done and treatment or advice given. The reported dates of first presentation and clinical diagnosis (ie, when the woman was first told she had ovarian cancer, not the date of histological diagnosis) were used to estimate the interval between presentation and diagnosis.

The numbers of symptoms reported, doctors seen and total doctor visits were all highly skewed. These variables were therefore summarised using means and medians, and groups were compared using the non-parametric log-rank test. We used $\chi^2$ tests to investigate associations between a variety of factors (age, family history of cancer, area of residence, education level, and types and duration of symptoms) and whether women were sent for investigations (yes/no) or referred to a gynaecologist, gynaecological oncologist or other specialist. Multiple logistic regression analysis was used to investigate factors associated with an interval of > 6 months between first presentation and diagnosis. All statistical tests were two-sided and a $P$ value $< 0.05$ was considered statistically significant. All analyses were conducted using SAS statistical software (version 9.1; SAS Institute Inc, Cary, NC, USA).

**1 Characteristics of study participants ($n = 1463$)**

| | No. (%)* |
|---|---|
| Age in years, mean (SD) | 57.7 (12) |
| Stage of disease at diagnosis | |
| Borderline | 285 (19.5%) |
| Stage I–II | 335 (22.9%) |
| Stage III–IV | 831 (56.8%) |
| Unknown | 12 (0.8%) |
| Education | |
| School only | 793 (54.3%) |
| Technical college/diploma | 461 (31.5%) |
| University | 207 (14.2%) |
| First-degree relative with breast or ovarian cancer | 264 (18.0%) |
| Parity | |
| 0 | 277 (19.0%) |
| 1–2 | 597 (40.9%) |
| ⩾ 3 | 585 (40.1%) |
| Oral contraception use, months | |
| 0 | 465 (32.1%) |
| 1–60 | 394 (27.1%) |
| ⩾ 61 | 591 (40.8%) |
| Body mass index, kg/m$^2$ | |
| < 25 | 574 (42.4%) |
| 25–29.9 | 454 (33.5%) |
| ⩾ 30 | 327 (24.1%) |
| Previous hysterectomy | 346 (23.7%) |

* Figures are number (%) unless otherwise indicated. Numbers may not sum to total because of missing data. ◆

This study was approved by the Human Research Ethics Committees at the Queensland Institute of Medical Research and all participating centres.

## RESULTS

Characteristics of the 1463 women are shown in Box 1. Overall, 145 women (10%) reported that their cancer was diagnosed incidentally, most often at a routine check-up (50%) or when consulting for another condition (41%). These women were excluded from further analyses.

### Initial presentation

The remaining 1318 women presented to a doctor with one or more symptoms (mean, 1.9). The most common symptoms were abdominal fullness (44%) and abdominal or pelvic pain (41%) (Box 2).

Most women (1222/1318, 93%) presented first to their general practitioner; 54 (4%) presented to a hospital or emergency department; and 16 (1.2%) presented to a gynaecologist. Another 16 women (1.2%) reported consulting another specialist, most often one they had seen previously for another medical condition, and 10 (0.8%) saw another health professional (eg, a nurse or physiotherapist).

### Investigations

Two-thirds of the women (904, 69%) reported that the first doctor they saw requested one or more investigations (mean, 1.9; range 1–7), most commonly an ultrasound (562/1318, 43%), blood test (359/1318, 27%) or computed tomography scan (306/1318, 23%). Only 76 women (6%) specifically reported having a cancer antigen (CA)-125 test, although it is likely that some of the unspecified blood tests were CA-125 tests. Around 3% of women (42/1318) were sent for endoscopy or colonoscopy. Women who had short symptom duration (< 1 month) ($P = 0.003$), reported gastrointestinal symptoms ($P = 0.008$) or were aged over 50 years ($P = 0.0002$) were more likely to report that the first doctor they saw requested no tests.

### Outcomes of the initial presentation

As a result of their first consultation, 6% of women (75/1318) were given a diagnosis of cancer; 37% (484/1318) were referred to a gynaecologist, gynaecological oncologist or oncologist; and 13% (170/1318) were referred to other specialists. The 589 women (45%) who were not diagnosed or referred at the first visit mostly returned to the same doctor (412/589, 70%), making an additional two to three visits on average (range, 1–23). After these additional visits, the final outcome of all the consultations with the first doctor was that 9% of women (116/1318) were diagnosed with ovarian cancer; 52% (690/1318) were referred to a gynaecologist, gynaecological oncologist or oncologist; and 18% (240/1318) were referred to another doctor. Of the 272 women who were not diagnosed or referred by the first doctor they saw, most subsequently presented to another GP (177/272, 65%) or emergency department (34/272, 13%), while 61 (22%) reported consulting a specialist (usually a gynaecologist; $n = 29$) they had seen for another condition or to whom they had requested a referral when their symptoms did not resolve.

**2 Symptoms prompting presentation to a doctor ($n = 1318$)**

| Symptom group* | No. (%) |
|---|---|
| Abdominal fullness† | 584 (44.3%) |
| Abdominal or pelvic pain | 541 (41.0%) |
| Distant symptoms‡ | 446 (33.8%) |
| Bowel symptoms | 196 (14.9%) |
| Urinary symptoms | 175 (13.3%) |
| Abnormal vaginal bleeding | 137 (10.4%) |
| Abdominal mass | 133 (10.1%) |
| Upper gastrointestinal symptoms | 80 (6.1%) |
| Fatigue | 73 (5.5%) |
| Back pain | 44 (3.3%) |

* Symptoms reported by the women were grouped into these broad categories. † Includes swelling, bloating, distension. ‡ Includes weight loss or gain, respiratory symptoms and fever. ◆

### Referral patterns

Of the 930 women referred on by the first doctor, just over a third (361, 39%) were referred to a gynaecologist, nearly a third (302, 32%) to a gynaecological oncologist and a small number (27, 3%) to an oncologist. Others were referred to gastroenterologists (53, 6%), other specialist physicians (32, 3%) or other surgeons (88, 9%). Some women (66, 7%) with a specialist referral reported that they went to an emergency department or back to the GP before the specialist appointment, often because there was a long wait to see the specialist. Women younger than 50 years ($P = 0.01$) or those with abnormal vaginal bleeding or discharge ($P < 0.0001$) were somewhat more likely to be referred to a gynaecologist than a gynaecological oncologist. Bowel ($P = 0.001$), gastric ($P = 0.005$) and distant ($P = 0.01$) symptoms were more likely to prompt referral to a non-gynaecological specialist. Referral patterns did not differ significantly according to a woman's education level ($P = 0.2$) or residential area ($P = 0.2$).

### Diagnosis

While some women reported making many visits to multiple doctors before being diagnosed with cancer, this was the exception (Box 3). Of the 1318 women, 116 (9%) were told they (probably) had ovarian cancer by the first doctor they consulted, while most women were given their diagnosis by either the second (578, 44%) or third (430, 33%) doctor they saw. Only 78 women (6%)

**3 Number of different doctors seen and total number of visits for the same symptoms before diagnosis ($n = 1318$)**

| No. of doctors or visits | Doctors seen | | Doctor visits | |
|---|---|---|---|---|
| | No. of women (%) | Cumulative % | No. of women (%) | Cumulative % |
| 1 | 116 (8.8%) | 8.8% | 81 (6.1%) | 6.1% |
| 2 | 578 (43.9%) | 52.7% | 360 (27.3%) | 33.5% |
| 3 | 430 (32.6%) | 85.3% | 376 (28.5%) | 62.0% |
| 4 | 116 (8.8%) | 94.1% | 195 (14.8%) | 76.8% |
| 5 | 58 (4.4%) | 98.5% | 116 (8.8%) | 85.6% |
| 6 | 11 (0.8%) | 99.3% | 84 (6.4%) | 92.0% |
| 7–8 | 8 (0.6%) | 99.9% | 51 (3.9%) | 95.8% |
| 9–12 | 1 (0.1%) | 100.0% | 36 (2.7%) | 98.6% |
| 13–50 | 0 | — | 19 (1.4%) | 100.0% |

reported seeing five or more different doctors before their cancer was diagnosed.

In terms of numbers of consultations, a third of the women received a diagnosis by their second consultation, almost two-thirds were diagnosed within three consultations, and three-quarters by the fourth consultation (Box 3). Only 55 women (4%) reported making more than eight visits to one or more doctors for the same symptoms before being diagnosed.

The mean number of doctors consulted before diagnosis increased slightly with increasing stage of disease at diagnosis (borderline, 2.5; Stage I–II, 2.5; Stage III–IV, 2.7; log-rank $P = 0.004$), and women with Stage III or IV cancer also reported that, on average, they made slightly more visits to a doctor for the same symptoms than women with borderline or Stage I–II disease (borderline, 3.6; Stage I–II, 3.5; Stage III–IV, 3.9; log-rank $P = 0.009$).

Box 4 summarises the diagnostic pathways of the women, and Box 5 shows the proportions who saw various types of doctors at some stage before diagnosis; one in five saw a specialist outside the fields of gynaecology and oncology. Ultimately, most women received their cancer diagnosis from a gynaecological oncologist (60%) or a gynaecologist (18%).

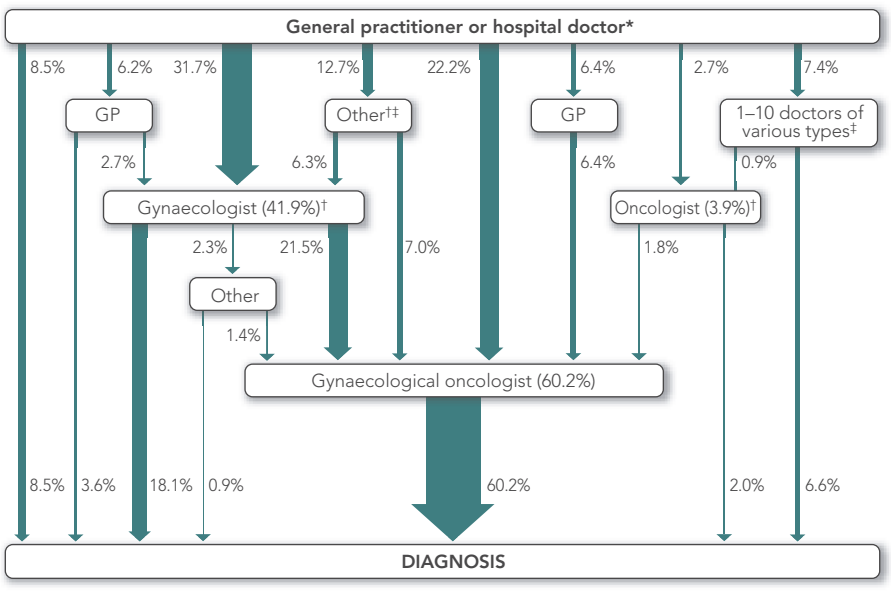
## Time to diagnosis

The interval between first presentation and cancer diagnosis ranged from 0 to 155 months, although 66% of cancers were diagnosed in ⩽ 1 month and 80% within 3 months (Box 6). Only 153 cancers (11.6%) were not diagnosed within 6 months.

Box 7 shows that factors significantly associated with a delay of more than 6 months included living in remote areas of Australia (odds ratio [OR], 4.6; 95% CI, 1.7–12.2 v metropolitan areas); annual household income below $45 000 (OR, 1.6; 95% CI, 1.0–2.6); the number of doctors consulted (OR, 7.0; 95% CI, 3.1–15.7 for five or more v one); and presentation with multiple symptoms (OR, 1.6; 95% CI, 1.0–2.5), abdominal pain (OR, 1.7; 95% CI, 1.1–2.5) or bowel symptoms (OR, 1.8; 95% CI, 1.1–2.9). Longer symptom duration (⩾ 1 month) was associated with more rapid diagnosis after presentation (OR, 0.4; 95% CI, 0.2–0.6 v < 1 month).

Factors not significantly associated with a time to diagnosis of more than 6 months included a family history of breast or ovarian cancer, menopausal status, body mass index, prior hysterectomy, ethnicity, tumour

**4 The referral pathways for 1318 women diagnosed with ovarian cancer in Australia**




* Includes 13 women who reported seeing another clinician ($n = 12$) or other health care professional ($n = 1$) before consulting their GP. † Another 29 women (2.2%) did not present to their GP but to a gynaecologist ($n = 16$), an oncologist ($n = 4$) or another health professional ($n = 9$), and they are included from these points. ‡ Includes all doctors other than a gynaecologist, gynaecological oncologist or oncologist. ◆

**5 Proportions of women who saw various types of doctor at some stage before diagnosis ($n = 1318$)**

| Doctor type | No. (%) |
|---|---|
| General practitioner | 1257 (95.4%) |
| Hospital or emergency doctor | 154 (11.7%) |
| Gynaecologist | 552 (41.9%) |
| Gynaecological oncologist | 793 (60.2%) |
| Oncologist | 69 (5.2%) |
| Any other specialist | 278* (21.1%) |
| Gastroenterologist | 87 (6.6%) |
| General surgeon | 20 (1.5%) |
| Urologist | 15 (1.1%) |
| Cardiologist | 8 (0.6%) |
| Respiratory physician | 11 (0.8%) |
| Other surgeon | 116 (8.8%) |
| Other specialist | 45 (3.4%) |
| Other health professional | 14 (1.1%) |

* Numbers for other specialists sum to more than 278 because some women saw more than one type of other specialist. ◆

**6 Months between reported initial presentation and clinical diagnosis ($n = 1313$)***

| Months | No. of women (%) | Cumulative % |
|---|---|---|
| < 1 | 508 (38.7%) | 38.7% |
| 1 | 352 (26.8%) | 65.5% |
| 2–3 | 186 (14.2%) | 79.7% |
| 4–6 | 114 (8.7%) | 88.3% |
| 7–12 | 88 (6.7%) | 95.0% |
| 13–24 | 39 (3.0%) | 98.0% |
| 25–36 | 14 (1.1%) | 99.1% |
| 37–155 | 12 (0.9%) | 100.0% |

* Data missing for five women. ◆

**7 Adjusted odds ratios (ORs) and 95% confidence intervals for the associations between patient characteristics and time from presentation to diagnosis of more than 6 months compared with ⩽ 6 months**

| Characteristic | > 6 months ($n = 153$) No. (%)* | ⩽ 6 months ($n = 1160$) No. (%)* | OR† (95% CI) |
|---|---|---|---|
| Level of education | | | |
| School only | 81 (53%) | 634 (55%) | 1.00 |
| Technical college | 55 (36%) | 356 (31%) | 1.33 (0.88–2.00) |
| University | 16 (10%) | 169 (15%) | 0.77 (0.40–1.47) |
| Area of residence | | | |
| Major cities | 101 (66%) | 753 (65%) | 1.00 |
| Inner regional | 28 (18%) | 267 (23%) | 0.90 (0.56–1.46) |
| Outer regional | 16 (10%) | 124 (11%) | 0.69 (0.37–1.28) |
| Remote area | 8 (5%) | 15 (1%) | 4.57 (1.71–12.20) |
| Annual household income | | | |
| ⩾ $45 000 | 34 (22%) | 348 (30%) | 1.00 |
| < $45 000 | 92 (60%) | 583 (50%) | 1.62 (1.01–2.62) |
| Number of different doctors seen | | | |
| 1 | 11 (7%) | 103 (9%) | 1.00 |
| 2 | 35 (23%) | 541 (47%) | 0.63 (0.30–1.32) |
| 3 | 43 (28%) | 386 (33%) | 1.10 (0.53–2.28) |
| 4 | 30 (20%) | 86 (7%) | 2.99 (1.36–6.57) |
| ⩾ 5 | 34 (22%) | 44 (4%) | 6.99 (3.10–15.73) |
| Number of symptoms reported | | | |
| 1 | 47 (31%) | 522 (45%) | 1.00 |
| ⩾ 2 | 106 (69%) | 638 (55%) | 1.59 (1.01–2.51) |
| Duration of symptoms before diagnosis | | | |
| < 1 month | 113 (74%) | 603 (52%) | 1.00 |
| ⩾ 1 month | 39 (25%) | 537 (46%) | 0.37 (0.24–0.56) |
| Abdominal pain | | | |
| No | 73 (48%) | 701 (60%) | 1.00 |
| Yes | 80 (52%) | 459 (40%) | 1.67 (1.10–2.51) |
| Abnormal vaginal bleeding | | | |
| No | 132 (86%) | 1046 (90%) | 1.00 |
| Yes | 21 (14%) | 114 (10%) | 1.79 (0.99–3.26) |
| Bowel symptoms | | | |
| No | 117 (76%) | 1000 (86%) | 1.00 |
| Yes | 36 (24%) | 160 (14%) | 1.77 (1.09–2.86) |

* Data missing for some women for some items. Percentages may not sum to 100% because of rounding.
† Each factor adjusted for age at diagnosis and for all other factors listed in the table. ◆

type (invasive v borderline) or disease stage, the investigations ordered, or whether a pelvic examination was performed (data not shown).

These results did not change substantially when women reporting intervals from presentation to diagnosis of 3 or more years were excluded from the analysis.

## DISCUSSION

Our analyses suggest that the majority of symptomatic women with ovarian cancer presenting to a medical practitioner in Australia are investigated and diagnosed promptly. About 42% of women in our study were either given a diagnosis or referred to a gynaecologist, gynaecological oncologist or oncologist as a result of their first medical consultation, and this figure increased to 61% when repeat visits to the same doctor were included. Overall, 66% of women were diagnosed in a month or less and 80% within 3 months of their initial presentation. However, women reported seeing a wide variety of doctors, and just over 10% reported that the diagnostic process took more than 6 months. This delay was more common for women with lower incomes, those who lived in remote areas of Australia and those with abdominal or bowel symptoms. It is likely that some of the women reporting delays of several years had attributed unrelated symptoms to their ovarian cancer.

To our knowledge, this is the first study to describe in detail the diagnostic pathways experienced by women with ovarian cancer in Australia. Our results with respect to time to diagnosis are in close accord with another Australian study that found that 70% of women with ovarian cancer were diagnosed within 3 months of first experiencing symptoms.[11]

We found a strong association between residing in a remote area of Australia and being diagnosed more than 6 months after presentation, although the number of women involved was small. Women from remote areas may have poorer access to primary care services[12] and make fewer visits to GPs and specialists than women living in urban areas.[13] Access inequalities may also explain why women with lower incomes were more likely to have longer diagnostic delays than women with higher incomes, as evidence suggests that, in Australia, all else being equal, those with higher incomes are more likely to consult a

specialist than those with a lower income.[14]

We also found that the number, type and duration of symptoms a woman presented with were associated with whether she was diagnosed more than 6 months after presentation. These findings largely concur with other studies that have investigated determinants of diagnostic delay in patients with ovarian cancer.[5,7,15] Clinicians faced with a woman presenting with several non-gynaecological symptoms probably consider more common diagnoses associated with those symptoms in the first instance, thus potentially delaying diagnosis. However, we did not have information directly from medical practitioners and thus cannot provide insights into how doctors make clinical judgements when faced with the complex symptoms and signs associated with ovarian cancer.

Our study was large and included women from rural and metropolitan areas in every Australian state and territory. However, one limitation is that 14% of women ascertained as having suspected ovarian cancer were unable to participate due to illness or death, and a greater proportion of such women were identified through cancer registries rather than gynaecological oncology clinics. It is likely that a greater proportion of the women we were able to interview were ultimately treated by a gynaecological oncologist than is usual in the broader Australian population, and it is therefore possible that their diagnostic experiences differed from the women who did not participate. As our results suggested that women with higher-stage disease saw more doctors and had more doctor visits before diagnosis, it is possible that women who had died or were too sick to participate also had a more circuitous path to diagnosis. A further limitation is that our study was based on self-report, so women may have inaccurately recalled details of their diagnostic experience. However, it is unlikely that such inaccuracies would have systematically affected our findings. Finally, clinical practices may have changed since these data were collected between 2002 and 2005, although it seems unlikely that any such changes would result in greater diagnostic delays.

In conclusion, our study provides reassurance that, despite anecdotal evidence to the contrary, most women with ovarian cancer in Australia are diagnosed promptly once they present to a medical practitioner. For a small group of women (about 10%), diagnosis can take more than 6 months, and we have identified several factors associated with a longer delay. Further studies addressing these factors, especially lack of access to care, are warranted.

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## COMPETING INTERESTS

None identified.

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