Diagnostic imaging among ovarian cancer patients

Anna Fry\textsuperscript{1,2}, Abigail Bentley\textsuperscript{2}, Isabella Carneiro\textsuperscript{1,2}, David Kennedy\textsuperscript{2}, Gemma Luck\textsuperscript{1,2}, Erika Denton\textsuperscript{3}, Ella Ohuma\textsuperscript{2}, Nick Ormiston-Smith\textsuperscript{2}

National Cancer Registration and Analysis Service (PHE)\textsuperscript{1}, Cancer Research UK\textsuperscript{2}, Norfolk and Norwich University Hospital\textsuperscript{2}

Introduction
What is the DID?

Cancer survival in the UK lags behind comparable countries\textsuperscript{1}. The latest cancer strategy recognises the need for earlier diagnosis and the role of diagnostics in achieving this\textsuperscript{2}. Non-obstetric ultrasound scans, imaging tests used in the diagnosis of ovarian cancer, are among the scans recorded in the Diagnostic Imaging Dataset (DID). Our aim is to investigate the imaging in ovarian cancer (ICD-10 C56) patients, by linking the DID to cancer registry data from England, and describe the use of ultrasounds prior to an ovarian cancer diagnosis.

GP direct access imaging tests are ordered by GPs to allow patients to have an ultrasound prior to seeing a consultant, potentially shortening the pathway to diagnosis. This route to imaging is different from the route to diagnosis, which characterises the sequence of events in the pathway that lead to a cancer diagnosis.

Methods
How was the DID used?

We identified patients diagnosed with ovarian cancer in 2013 from cancer registration records. Patients were excluded if they were outside the age range 15-99, had only a provisional record or had a second primary ovarian cancer diagnosed in 2013.

The DID data were linked to this dataset using NHS number as the linking key. To establish which imaging records were relevant to the ovarian tumour in the registration dataset, ultrasounds in the six months prior to diagnosis were regarded as relevant to the diagnosis of the ovarian cancer.

Routes to diagnosis data, as well as whether the patient had a major resection (surgery with curative intent) was merged into the dataset. Routes to diagnosis are here grouped as emergency, non-emergency or unknown. An emergency route includes presentation via A&E, emergency GP referral, emergency transfer, emergency consultant outpatient referral or emergency admission or attendance.

Results
What did we find?

5,821 patients with an ovarian cancer diagnosis in 2013 were identified (Figure 1). The breakdown of these patients by stage, route to diagnosis and major resection proportion is shown in Figure 2. 49\% of these patients had at least one ultrasound in the 6 months prior to diagnosis (Figure 1).

Of the 2,837 individuals that had an ultrasound within the six months prior to their cancer diagnosis: 41\% were diagnosed at earlier stages (1 and 2) compared to 44\% at late stages (3 and 4) and 15\% at unknown stage (Figure 3). Regarding route to diagnosis, 20\% of patients that had an ultrasound in the six months prior to diagnosis were diagnosed via an emergency route, 29\% via GP referral and 38\% via the two week wait route. 72\% of the patients had a major resection with curative intent.

In comparison to the individuals who did have at least one ultrasound in the 6 months before diagnosis, the patients who did not have an ultrasound in the 6 months before diagnosis had more emergency presentations (32\% vs 20\%), fewer two week wait presentations (25\% vs 38\%), fewer major resections (53\% vs 72\%) and higher proportions of stage 4 (19\% vs 14\%) and unknown stage (23\% vs 15\%) cancers.

Conclusion
What is the impact?

This is the first time that the DID has been linked to ovarian cancer registration data. The linkage has highlighted potential issues with missing ultrasound data. It is expected that more than 49\% of ovarian cancer patients should have had a non-obstetric ultrasound in the six months prior to diagnosis. This is being explored.

Our results indicate a potential association between whether a patient has had an ultrasound in the six months prior to diagnosis and their outcomes. Patients with an ultrasound in the six months before diagnosis had more two week wait presentations, more surgery with curative intent and less unknown stage cancer – a profile associated with improved survival. These cases are likely to better reflect best practice pathways leading to detection of cancer versus incidental cancer finding through late and emergency presentations.

The availability of the DID linked with cancer registry data provides researchers with opportunities to explore whether outcomes are associated with diagnostic imaging practices. Variation in usage of diagnostic tests may lead to problems in diagnosing cancer earlier. Hence, understanding the pathways from imaging to diagnosis could help improve diagnostic and ultimately cancer outcomes.
