



INTERNATIONAL MEETING OF  
THE EUROPEAN SOCIETY OF  
GYNAEOLOGICAL ONCOLOGY (ESGO)  
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# New Treatment Options in Ovarian Cancer

Mansoor Raza Mirza

NSGO: Nordic Society of Gynaecological Oncology

&

Rigshospitalet: Copenhagen University Hospital, Denmark



# Mansoor Raza Mirza

## Disclosures (*last 24 months*)

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Tesaro  
2X Oncology

### Study Grants:

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Clovis Oncology  
Pfizer  
Roche  
Tesaro



**ENGOT**  
**European Network of**  
**Gynaecological Oncology**  
**Trials groups**



**GCIG**  
**Gynecologic Cancer**  
**InterGroup**

# Need for Level 1 Evidence

## Phase II Trial in Ovarian Cancer with Gemcitabine

Results: 100% response rate

Ovarian Cancer

R  
A  
N  
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E

Carboplatin + Paclitaxel

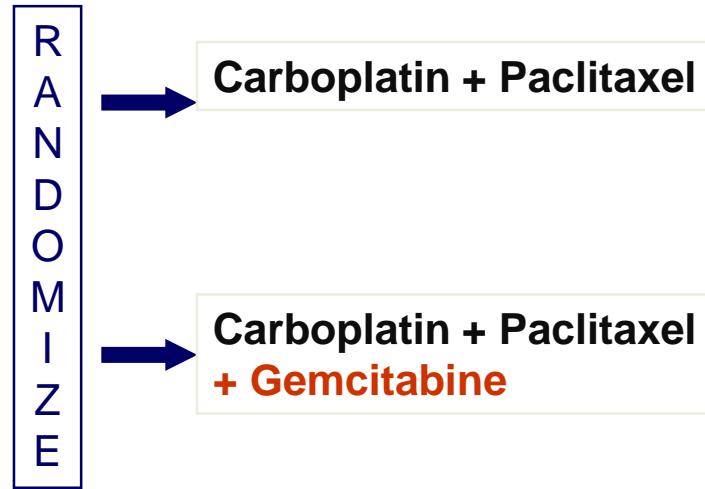
Carboplatin + Paclitaxel  
+ Gemcitabine



Hansen et al. Ann Oncol 1999

# Three Phase III Trials in Ovarian Cancer with Gemcitabine

Ovarian Cancer



*Bookman et al. J Clin Oncol 2006*  
*DuBois et al. J Clin Oncol 2009*

# Three Phase III Trials in Ovarian Cancer with Gemcitabine

Ovarian Cancer

# NEGATIVE

E

axel

axel

*Bookman et al. J Clin Oncol 2006*  
*DuBois et al. J Clin Oncol 2009*

# Clinical Progress in Novel Therapies

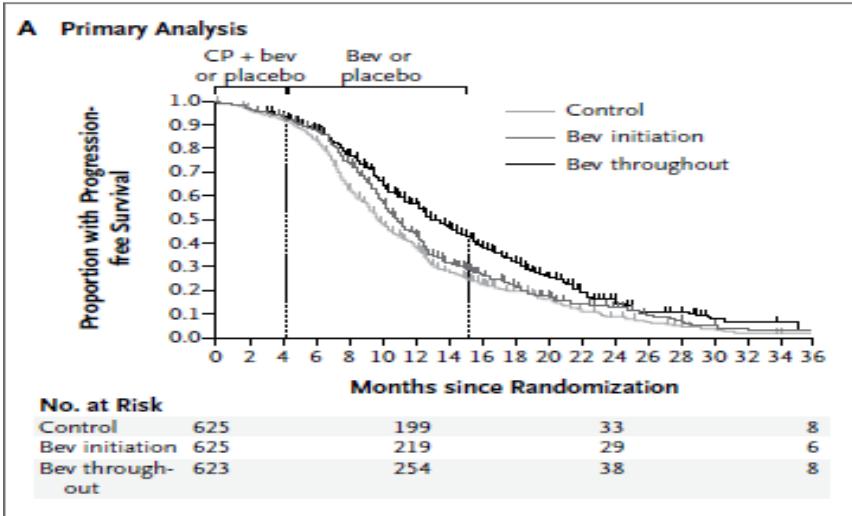
- Anti-angiogenic therapy
- PARP inhibition
- Immunotherapy

# Antiangiogenic therapy

## Bevacizumab in primary Ovarian Cancer

*2 positive trials*

*Improved PFS by adding bevacizumab to carboplatin/paclitaxel and subsequent maintenance therapy*



**GOG 218:** Bev throughout vs placebo  
 HR 0.717; 95% CI 0.625-0.824, p<0.001

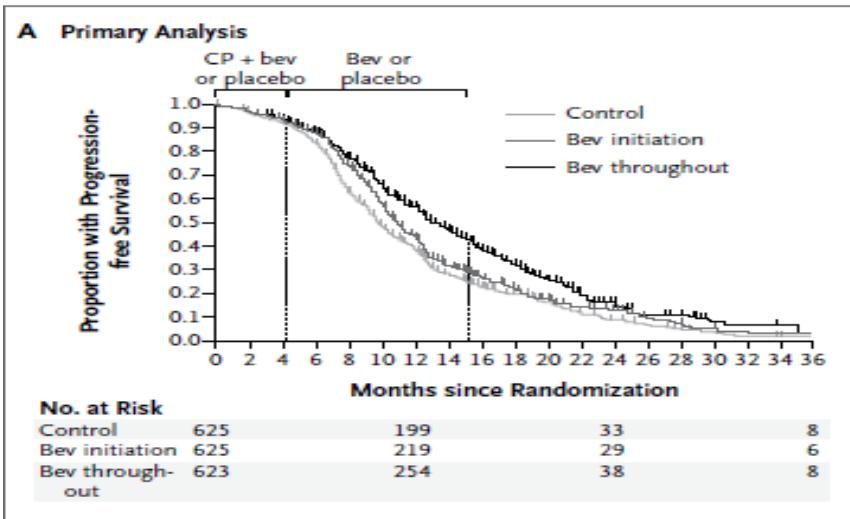
Burger RA et al. New Eng J Med 2011

# Antiangiogenic therapy

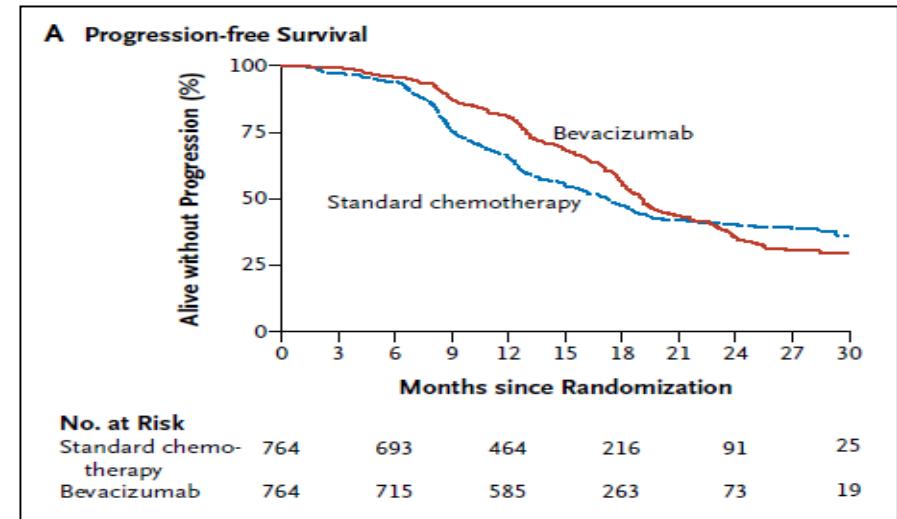
## Bevacizumab in primary Ovarian Cancer

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**GOG 218:** Bev throughout vs placebo  
HR 0.717; 95% CI 0.625-0.824, p<0.001



**ICON 7:** Bev vs control  
HR 0.77; 95% CI 0.77-0.99; p=0.04

Burger RA et al. New Eng J Med 2011

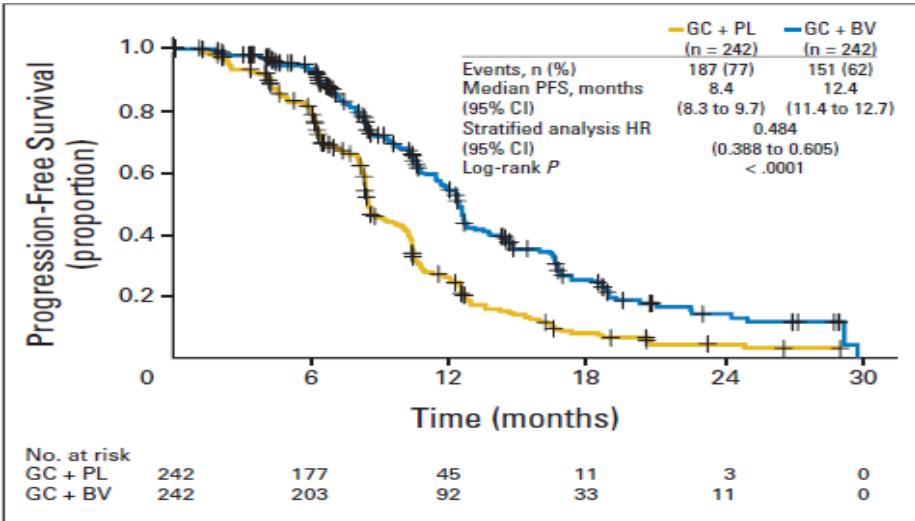
Perren TJ.... Mirza MR et al. New Eng J Med 2011

# Antiangiogenic therapy

## Bevacizumab in Recurrent Ovarian Cancer: Platinum-Sensitive Relapse

*2 positive trials*

*Improved PFS by adding bevacizumab to platinum based chemo and subsequent maintenance therapy*



OCEANS: PFS CG+/-Bev

HR 0.484; 95% CI 0.388-0.605, p<0.001

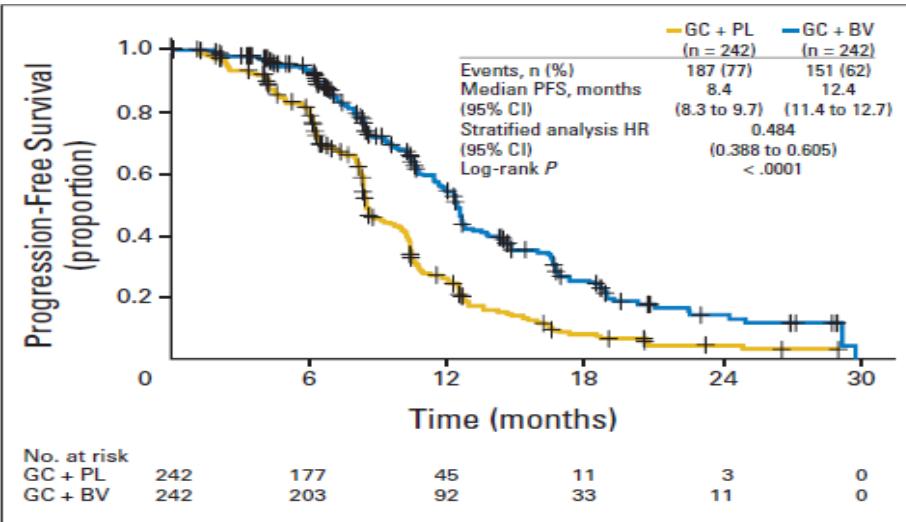
Aghajanian C et al. J Clin Oncol 2012

# Antiangiogenic therapy

## Bevacizumab in Recurrent Ovarian Cancer: *Platinum-Sensitive Relapse*

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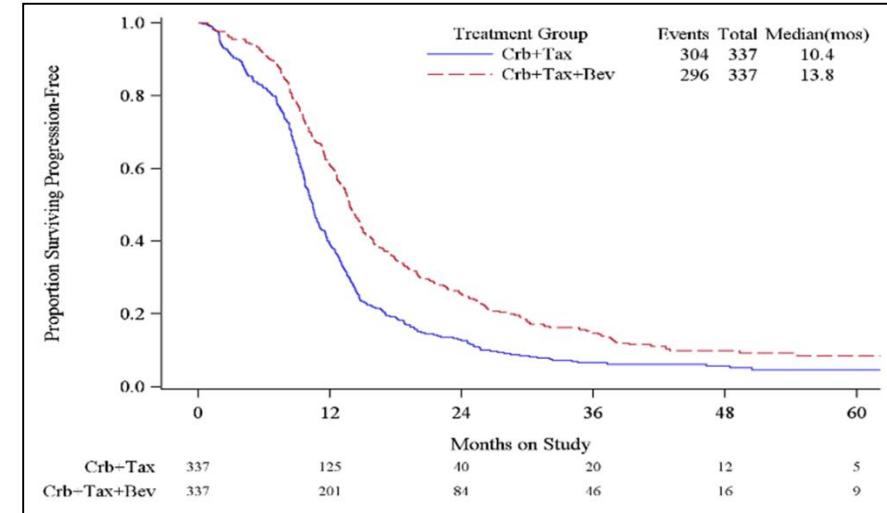
*Improved PFS by adding bevacizumab to platinum based chemo and subsequent maintenance therapy*



OCEANS: PFS CG+/-Bev

HR 0.484; 95% CI 0.388-0.605, p<0.001

Aghajanian C et al. J Clin Oncol 2012



GOG 213: TC +/- Bev

HR 0.61; 95%CI 0.52-0.72, p<0.0001

Coleman RA et al. SGO 2015

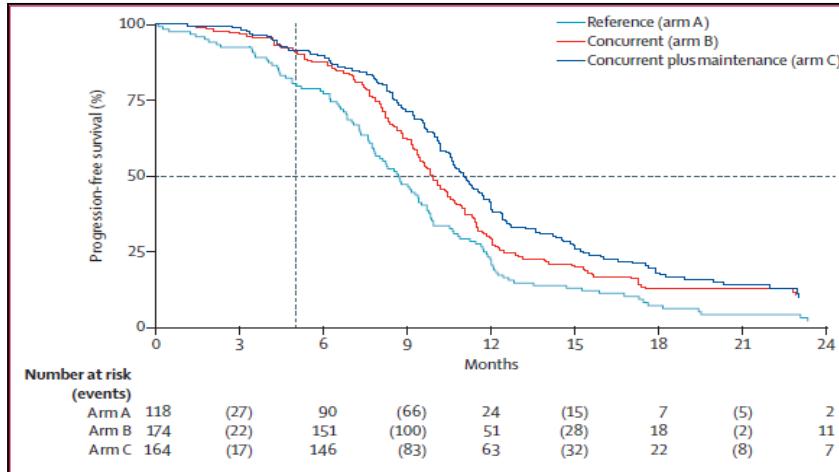
# Antiangiogenic therapy

## Tyrosine Kinase Inhibitors in Recurrent Ovarian Cancer

1 positive trial

*Improved PFS or PFS & OS by adding a TKI standard chemotherapy*

### Cediranib



**ICON 6: Platinum +/- Cediranib**  
 HR 0.56; 95%CI 0.44-0.72, p<0.001

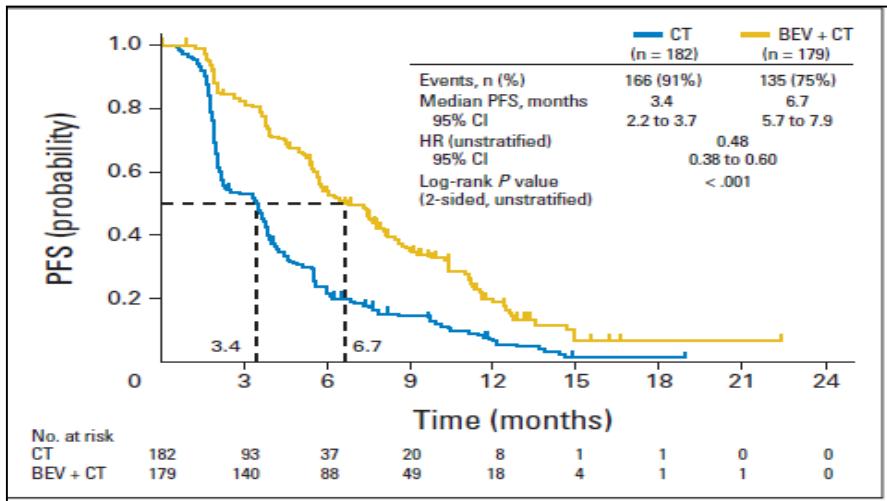
Ledermann J et al. Lancet 2016

# Antiangiogenic therapy

## Bevacizumab in Recurrent Ovarian Cancer: *Platinum-Resistant Relapse*

**1 positive trial**

**Improved PFS by adding bevacizumab to non-platinum based chemo + QoL benefit in symptomatic pts.**



**AURELIA: PFS NonPlat +/- Bev**

HR 0.48; 95% CI 0.38-0.60, p< 0.001

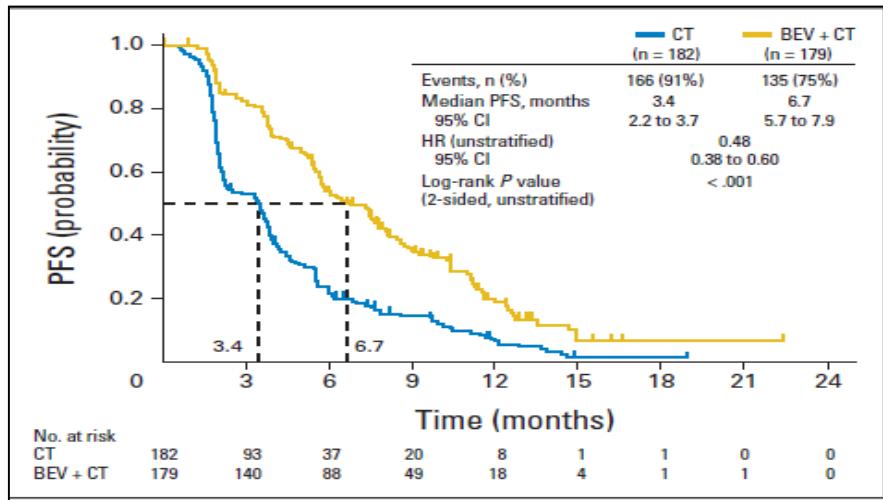
Pujade-Lauraine E.... Mirza MR et al. J Clin Oncol 2014

# Antiangiogenic therapy

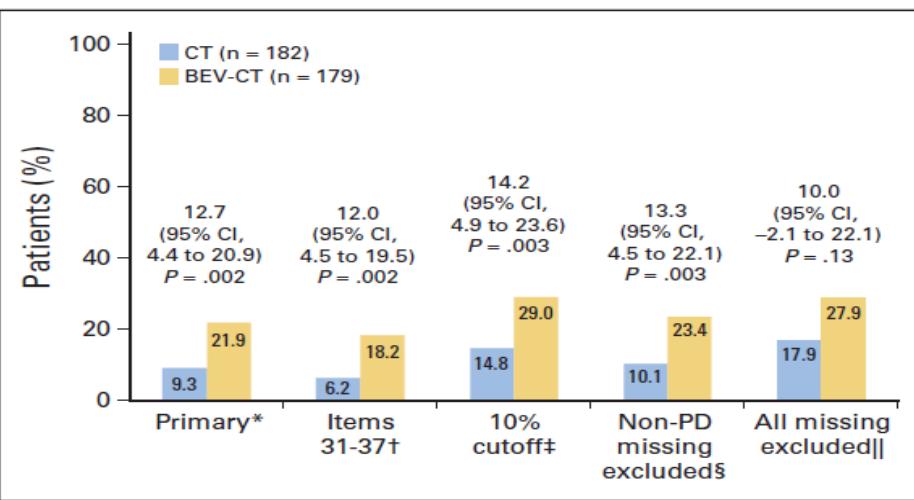
## Bevacizumab in Recurrent Ovarian Cancer: *Platinum-Resistant Relapse*

1 positive trial

Improved PFS by adding bevacizumab to non-platinum based chemo + QoL benefit in symptomatic pts.



AURELIA: PFS NonPlat +/- Bev  
 HR 0.48; 95% CI 0.38-0.60, p< 0.001



AURELIA: Primary and sensitivity analysis of the primary hypothesis ( $\geq 15\%$  improvement in symptomatic pts)

Pujade-Lauraine E.... Mirza MR et al. J Clin Oncol 2014

Stockler MR.... Mirza MR et al. J Clin Oncol 2014

# Antiangiogenic therapy

## Facts & Clinical Considerations

But do we have any biomarkers to select the right population?

# Antiangiogenic therapy

## Facts & Clinical Considerations

**But do we have any biomarkers to select the right population?**

**If not: what are the selection criteria?**

So far, only Bevacizumab is approved in ovarian cancer

Bevacizumab is only allowed once in the course of disease

The benefit of adding bevacizumab is given in primary, early and late relapse

**What are the risks of bevacizumab**

Pulmonary embolism

Hypertension

Bowel perforation and fistula

# Antiangiogenic therapy

## Facts & Clinical Considerations

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**What are the risks of bevacizumab**

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Hypertension

Bowel perforation and fistula

**Every ovarian cancer patient should receive bevacizumab during the course of disease**

# PARP Inhibitors

- Inhibiting base excision repair
- Trapping PARP on damaged DNA, thus interfering with the catalytic cycle of PARP, hindering DNA repair & promoting double-strand breaks
- Disrupting BRCA1 recruitment to damaged DNA
- Activating non-homologous end-joining, which is more prone to errors.

Audeh MW et al. Lancet 2010; 376:245-51

Murai J et al. Cancer Res 2012;72:5588-5599

Konecny et al. 2016

# Status of phase III PARP inhibitors trials

	Reported	Awaited
<b>Niraparib</b>	<b>ENGOT-OV16 / NOVA</b>	<b>PRIMA</b>
<b>Olaparib</b>	<b>ENGOT-OV30 / SOLO2</b>	<b>SOLO1</b> <b>PAOLA1</b>
<b>Rucaparib</b>	<b>ARIEL3</b>	
<b>Veliparib</b>	-	<b>GOG3005</b>
<b>Talazoparib</b>	-	<i>Ovarian Cancer Strategy Unclear</i>

# Status of FDA & EMA approvals

## Maintenance Therapy

	FDA	EMA
Niraparib	All patients <i>regardless of histology, BRCA &amp; HRD status</i>	All patients <i>regardless of BRCA &amp; HRD status</i> Positive CHMP opinion
Olaparib	All patients <i>regardless of BRCA status</i>	BRCAmut only
Rucaparib	Awaited	Awaited

## Post Multiple-Lines of Therapy

	FDA	EMA
Rucaparib	BRCAmut only	-
Olaparib	BRCAmut only	-

# Results from Randomized Trials in Ovarian Cancer

**Niraparib:** ENGOT-OV16 / NOVA phase 3 randomized

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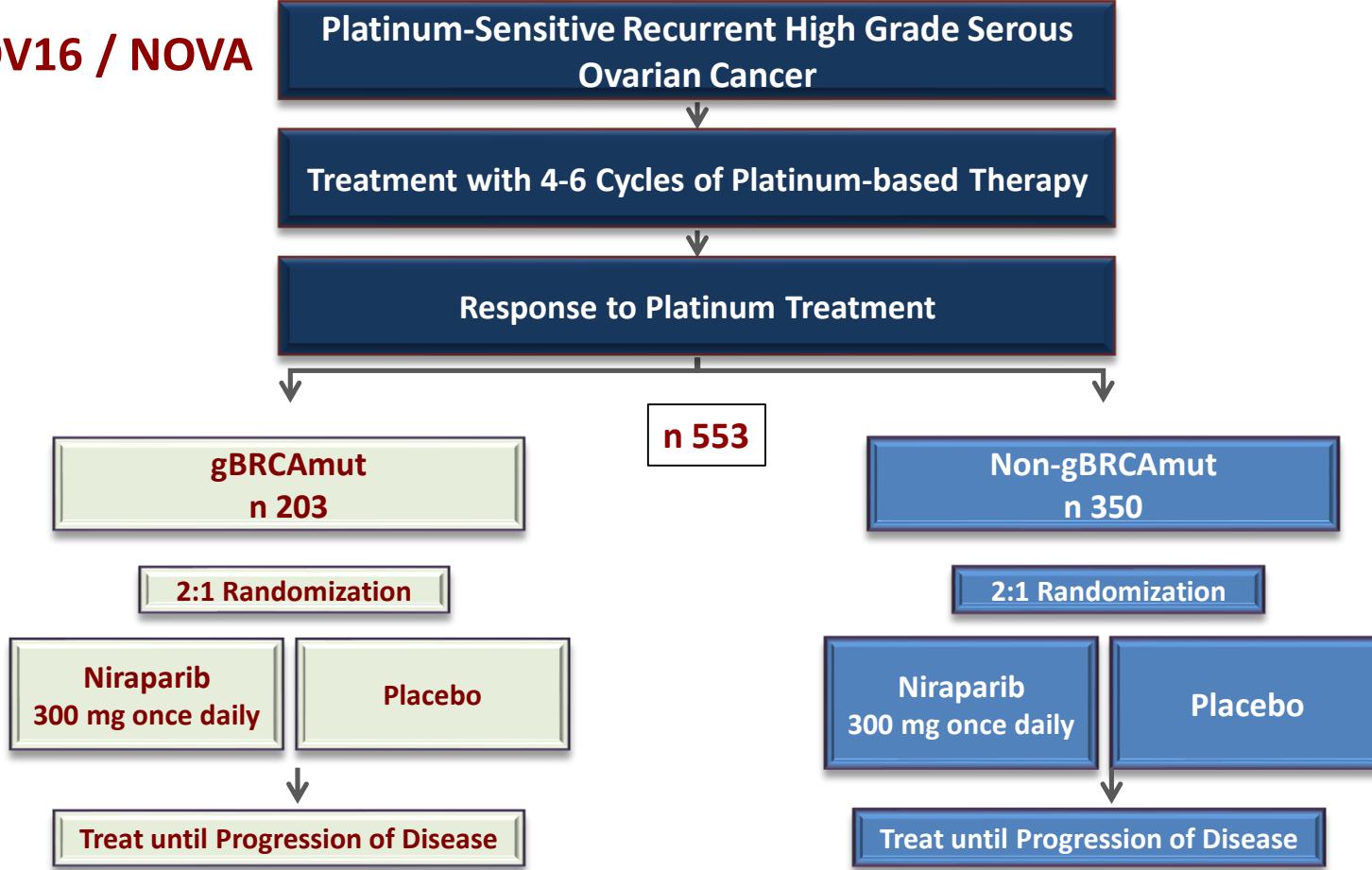
**Olaparib:** Study 19 phase 2 randomized

ENGOT-OV21 / SOLO2 phase 3 randomized

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**Rucaparib:** ARIEL3 phase 3 randomized

**Niraparib, as a selective PARP1/2 inhibitor, will provide a clinical benefit to all patients who have platinum-sensitive recurrent ovarian cancer who are in response to platinum, regardless of *gBRCA* mutation status**

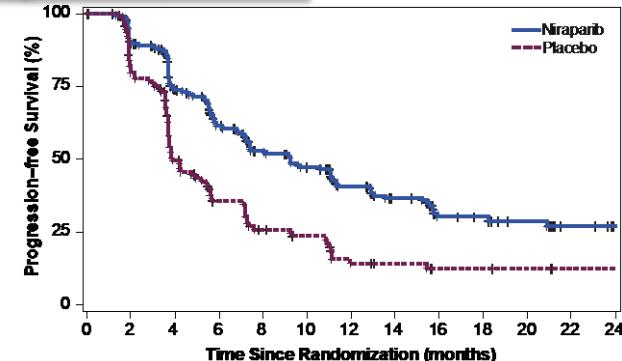
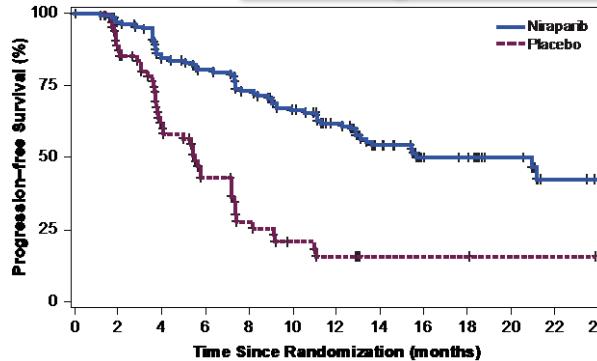


Recurrent ovarian cancer following a complete or partial response to platinum-based therapy<sup>€</sup>

Evaluate gBRCA mutation status\*

gBRCAmut

non-gBRCAmut<sup>†</sup>



Treatment	PFS Median (95% CI) (Months)	Hazard Ratio (95% CI) p-value	% of Patients without Progression or Death	
			12 mo	18 mo
Niraparib (N=138)	<b>21.0</b> (12.9, NR)	<b>0.27</b> (0.173, 0.410)	62%	<b>50%</b>
Placebo (N=65)	<b>5.5</b> (3.8, 7.2)	p<0.0001	16%	16%

Treatment	PFS Median (95% CI) (Months)	Hazard Ratio (95% CI) p-value	% of Patients without Progression or Death	
			12 mo	18 mo
Niraparib (N=234)	<b>9.3</b> (7.2, 11.2)	<b>0.45</b> (0.338, 0.607)	41%	<b>30%</b>
Placebo (N=116)	<b>3.9</b> (3.7, 5.5)	p<0.0001	14%	12%

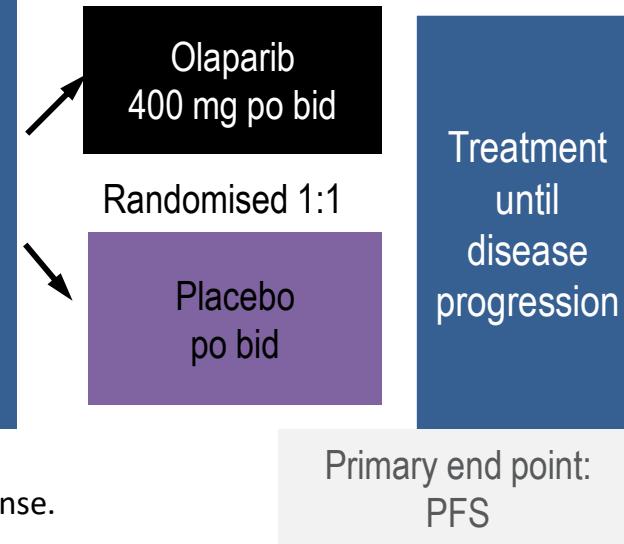
# The Study 19

## Phase 2 randomised trial of maintenance olaparib in platinum-sensitive high-grade serous relapse OC

randomized, double-blind, placebo-controlled phase II maintenance study  
*n 265 patients*

### Patients:

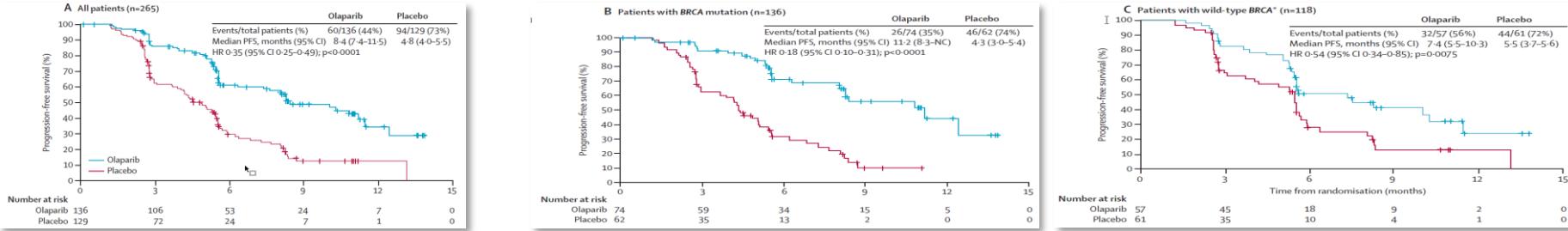
- Platinum-sensitive high-grade serous ovarian cancer
- ≥2 previous platinum regimens
- Last chemotherapy was platinum-based, to which they had a maintained PR or CR prior to enrolment
- Stable CA-125



bid, twice daily; CA-125, Cancer Antigen 125;  
CR, complete response; po, orally; PR, partial response.

# The Study 19

## Phase 2 randomised trial of maintenance olaparib in platinum-sensitive high-grade serous relapse OC



Whole population with HGSOC

BRCA<sup>mut</sup>

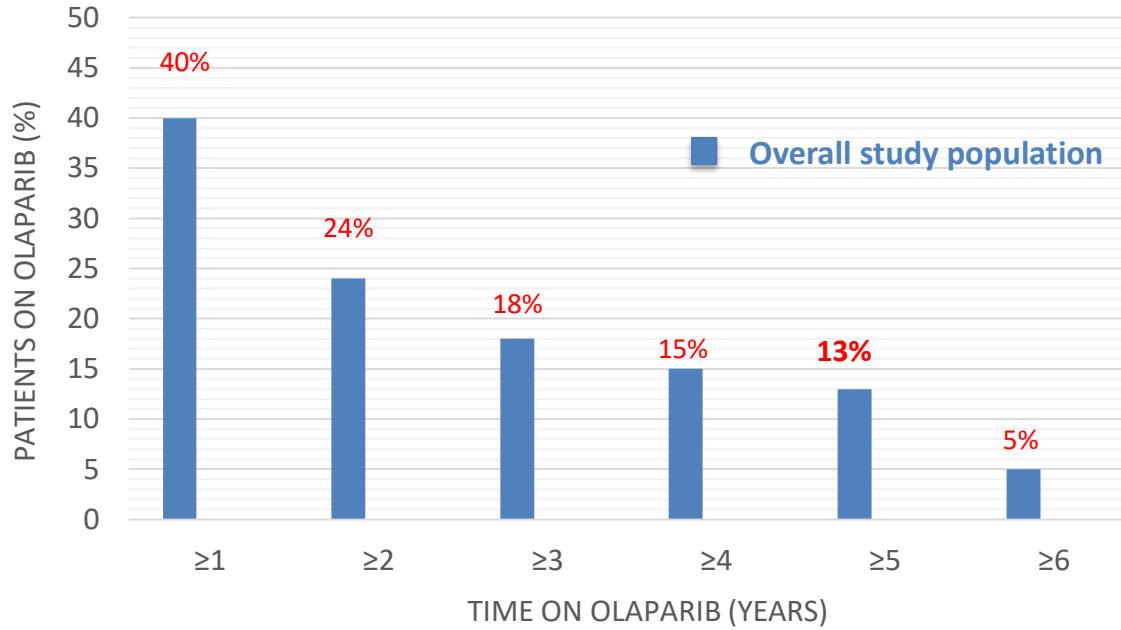
BRCA<sup>wt</sup>

Ledermann J et al. N Engl J Med 2012

Ledermann J et al. Lancet Oncol 2014

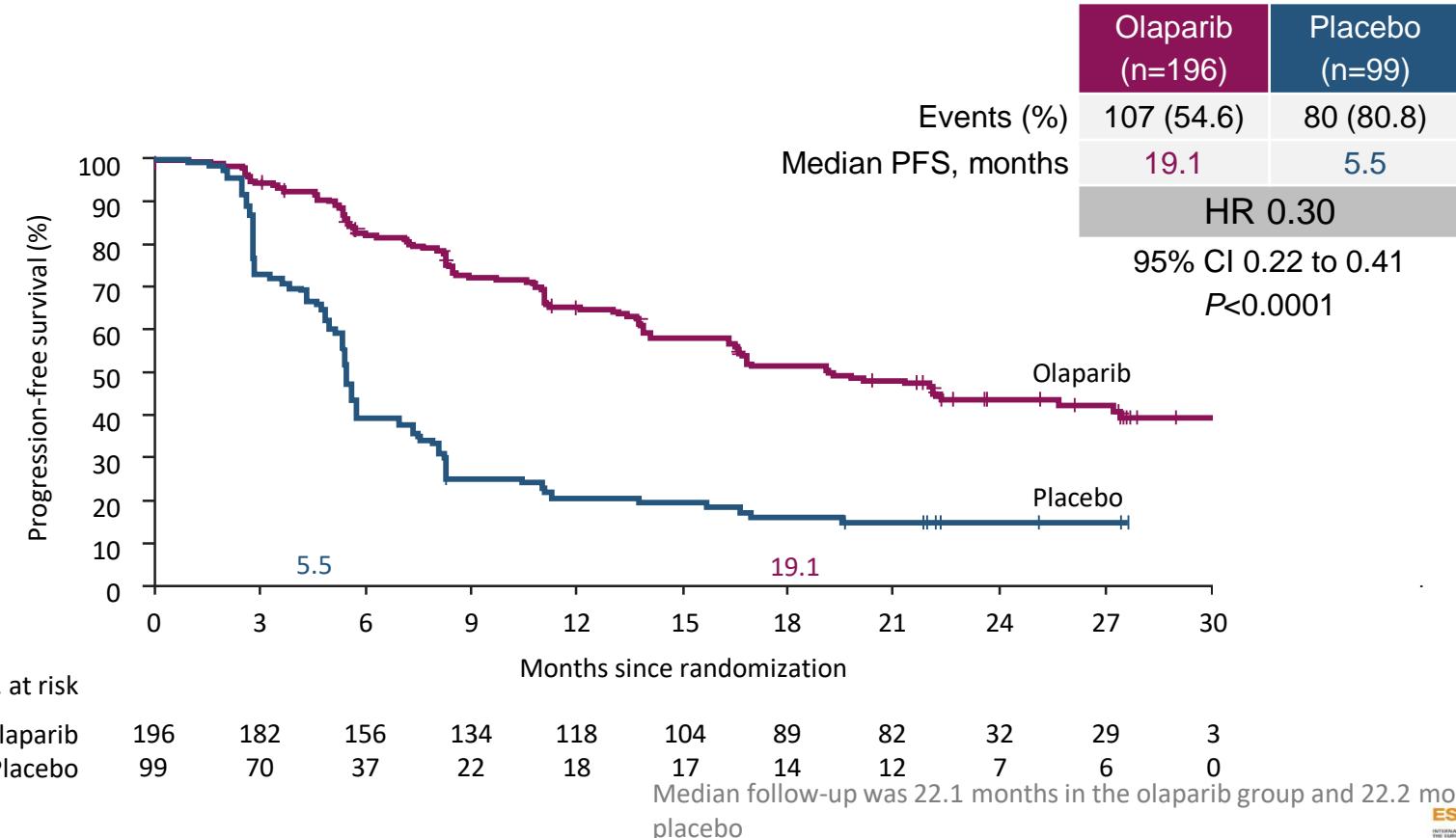
# Long-term exposure to olaparib in 'study 19' in BRCAm and BRCA<sup>wt</sup>

Median follow-up of 5.9 years: **15 patients (11%)** still receiving olaparib



# ENGOT-OV21 / SOLO2

## Progression-Free Survival



Pujade-Lauraine E et al. Lancet Oncol 2017

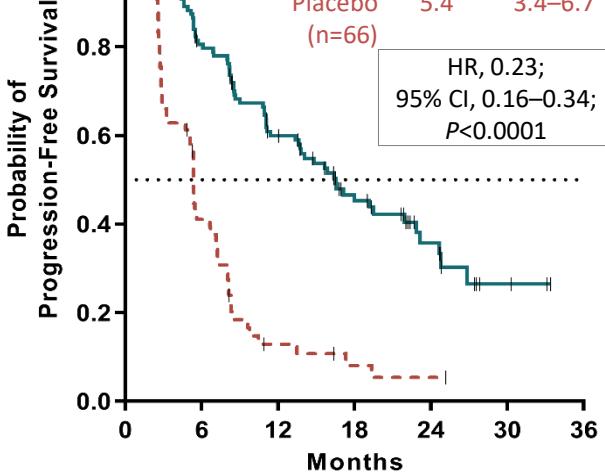
# ARIEL3: Progression-Free Survival

## BRCA mutant

Median (months) 16.6 13.4–22.9

Rucaparib (n=130)  
Placebo (n=66)

HR, 0.23;  
95% CI, 0.16–0.34;  
 $P < 0.0001$

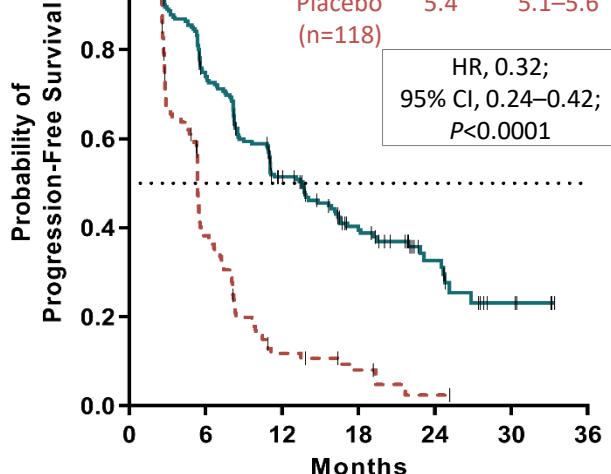


## HRD

Median (months) 13.6 10.9–16.2

Rucaparib (n=236)  
Placebo (n=118)

HR, 0.32;  
95% CI, 0.24–0.42;  
 $P < 0.0001$

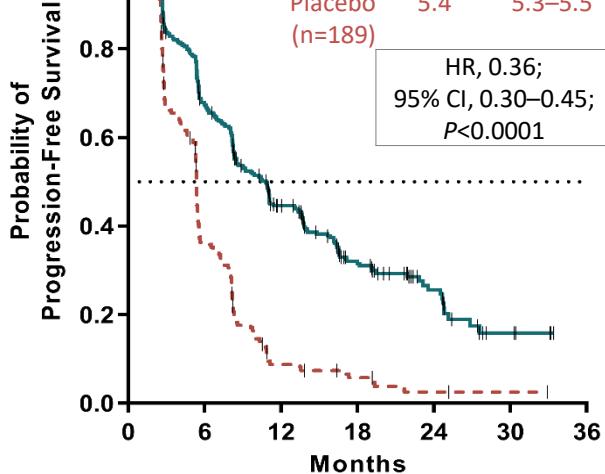


## ITT

Median (months) 10.8 8.3–11.4

Rucaparib (n=375)  
Placebo (n=189)

HR, 0.36;  
95% CI, 0.30–0.45;  
 $P < 0.0001$



At risk (events)							
Rucaparib	130 (0)	93 (23)	63 (46)	35 (58)	15 (64)	3 (67)	0 (67)
Placebo	66 (0)	24 (37)	6 (53)	3 (55)	1 (56)	0 (56)	
Rucaparib, % censored	48%						

At risk (events)							
Rucaparib	236 (0)	161 (55)	96 (104)	54 (122)	21 (129)	5 (134)	0 (134)
Placebo	118 (0)	40 (68)	11 (95)	6 (98)	1 (101)	0 (101)	
Rucaparib, % censored	43%						
Placebo, % censored	14%						

At risk (events)							
Rucaparib	375 (0)	228 (111)	128 (186)	65 (217)	26 (226)	5 (234)	0 (234)
Placebo	189 (0)	63 (114)	13 (160)	7 (164)	2 (167)	1 (167)	0 (167)
Rucaparib, % censored	38%						
Placebo, % censored	12%						

Coleman RL et al. Lancet 2017

# Adverse Events (any grade; PARP / placebo)

	Rucaparib	Olaparib	Niraparib
Fatigue	69 / 44	66 / 39	59 / 41
Nausea	75 / 37	76 / 33	74 / 45
Vomiting	37 / 15	37 / 19	34 / 16
Constipation	37 / 24	20 / 23	40 / 20
Diarrhea	<b>32 / 22</b>	<b>33 / 20</b>	19 / 21
Dysgeusia	<b>39 / 7</b>	<b>27 / 7</b>	10 / 4
Decreased appetite	23 / 14	22 / 11	25 / 14
Anemia	37 / 6	44 / 8	50 / 7
Thrombocytopenia	28 / 3	8 / 3	<b>61 / 6</b>
Hypertension	-	-	<b>19 / 4</b>
Photosensitivity reaction	<b>17 / 1</b>	-	-
Increased Creatinine	<b>15 / 2</b>	-	-
Increased ALT/AST	<b>34 / 4</b>	-	-

*Rucaparib:*

*Coleman RL et al.*

*Lancet 2017*

*Olaparib:*

*Pujade-Lauraine E et al.*

*Lancet Oncol. 2017*

*Niraparib:*

*Mirza MR et al.*

*N Engl J Med 2016*

# Adverse Events

## Treatment Related Dose Discontinuations

Rucaparib	Olaparib	Niraparib
13.4%	11%	14.7%

*Rucaparib:*

*Coleman RL et al.*

*Lancet 2017*

*Olaparib:*

*Pujade-Lauraine E et al.*

*Lancet Oncol. 2017*

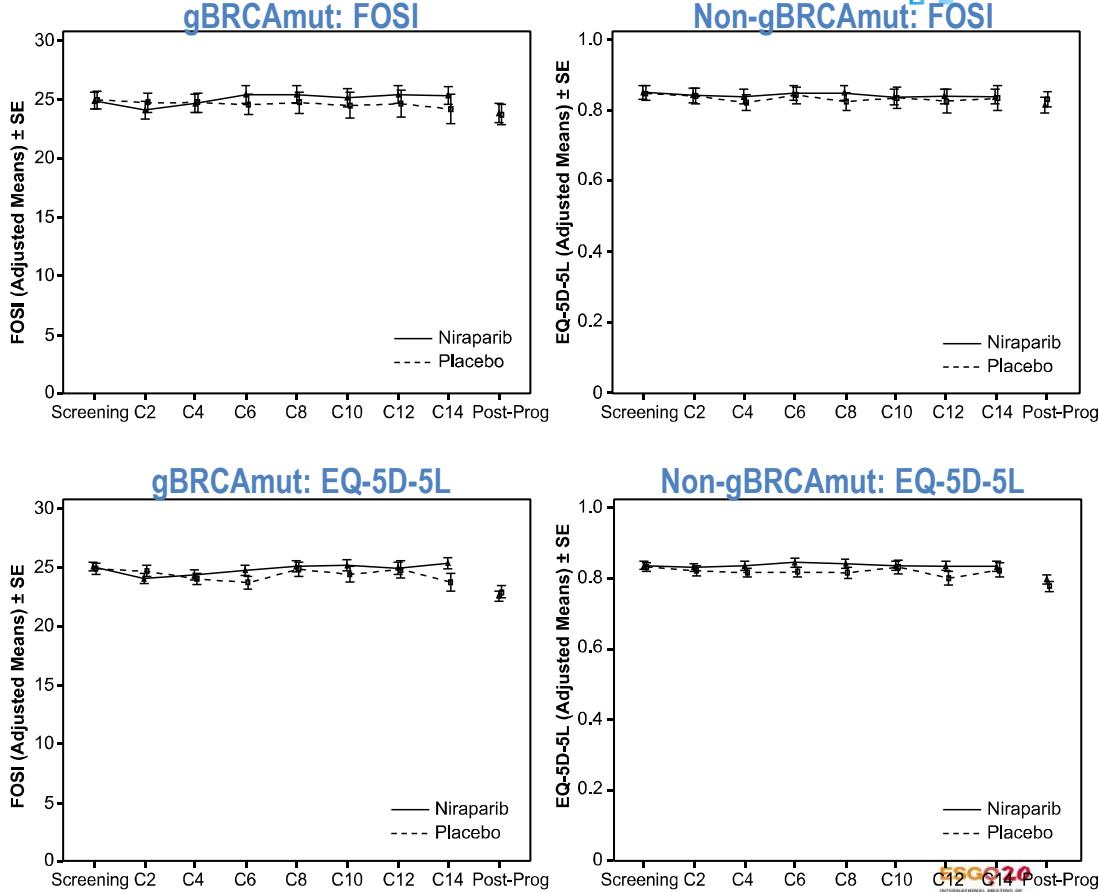
*Niraparib:*

*Mirza MR et al.*

*N Engl J Med 2016*

# NOVA: Patient-Reported Outcomes

- Measured using the Functional Assessment of Cancer Therapy – Ovarian Symptom Index (FOSI) and the EQ-5D-5L
- PRO surveys were collected at:
  - Screening visit
  - Every other cycle through cycle 14
  - Post progression
- Compliance rates were high, and similar between the two treatment arms
  - Niraparib: FOSI completion rate ranged from 75.0% to 97.1%
  - Placebo: FOSI completion rate ranged from 77.6% to 97.4%
- PROs were similar for niraparib compared with placebo



# Conclusions: PARPi

- PARP significantly improved PFS in patients with platinum-sensitive recurrent ovarian cancer.
- Efficacy is highest in BRCAmut population
- Beyond BRCA, platinum-sensitivity remains the best “biomarker” for response to PARP inhibitors

# PARPi Combination Therapies

**Increased DNA damage:**

DNA repair inhibitors:

Radiation: complex DNA damage

DNA damage primes the immune system:

Immunotherapies: harnessing the genomic instability/genomic load

Stromal Inhibition: switch to C1 phenotype / block immune response

Create / re-create HRD:

Induce hypoxia: Anti-angiogenics

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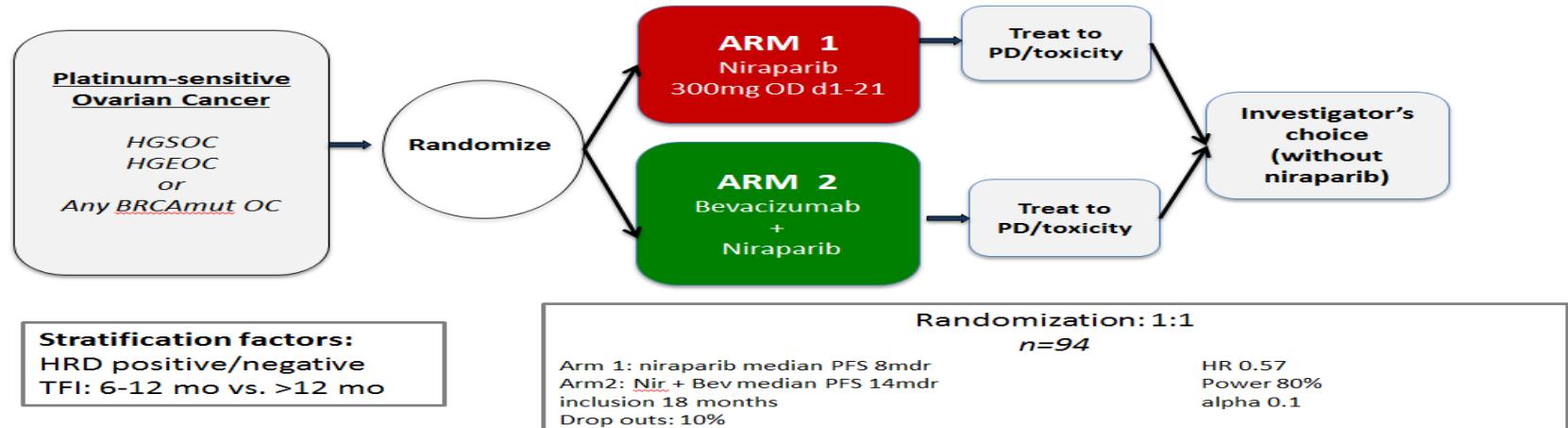
Stromal Inhibition: switch to C1 phenotype / block immune response

**Create / re-create HRD:**

Induce hypoxia: Anti-angiogenics

## OV24/AVANOVA

A two-arm, open-label, phase II randomized study to evaluate the efficacy of niraparib versus niraparib-bevacizumab combination in Women with platinum-sensitive epithelial ovarian, fallopian tube, or peritoneal cancer.



No. of already recruited patients: 73 (part 2)

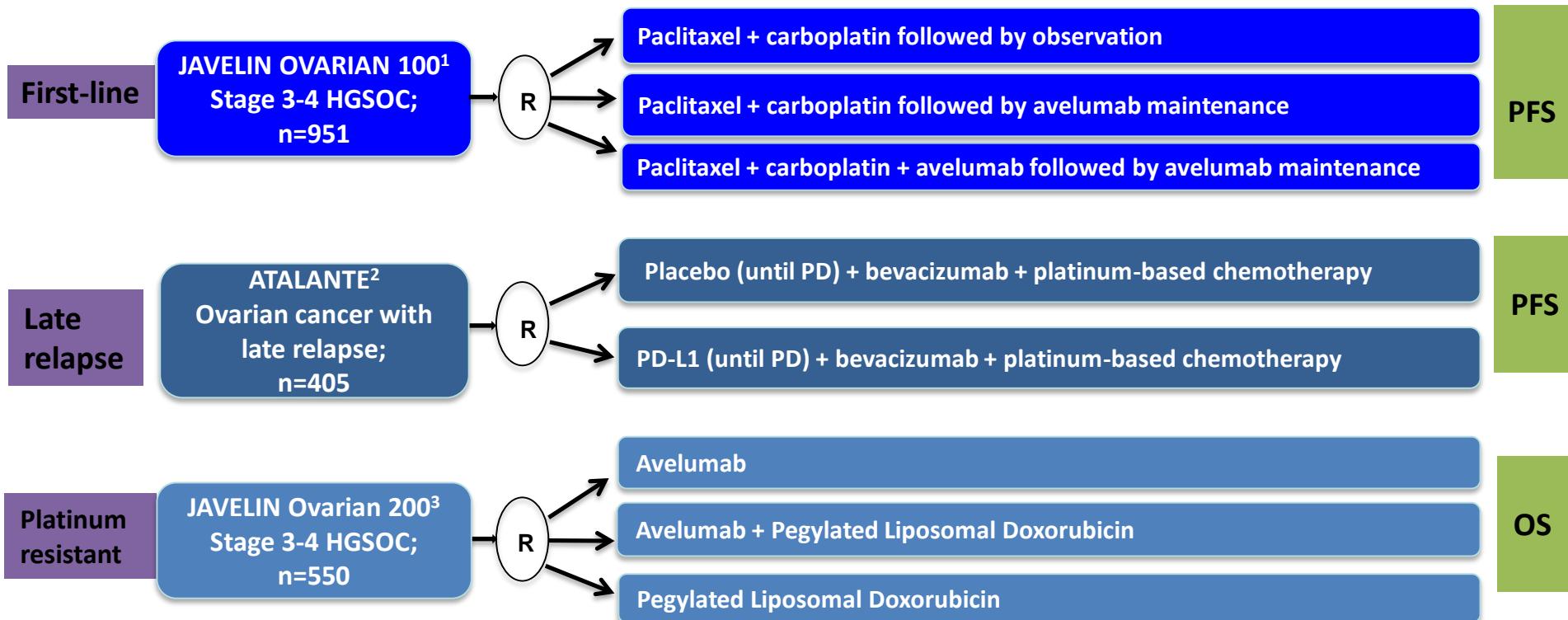
Planned No. of patients: 94 (part 2)

Status: recruiting

Sponsor: NSGO  
PI: Mansoor Raza Mirza  
Project Manager: Louisa Boufercha  
Statistics: René DePont Christensen

# CAN IMMUNO-ONCOLOGY BECOME A NEW TREATMENT OPTION IN OVARIAN CANCER?

# Ongoing Phase III Immuno-Oncology Studies in ovarian cancer

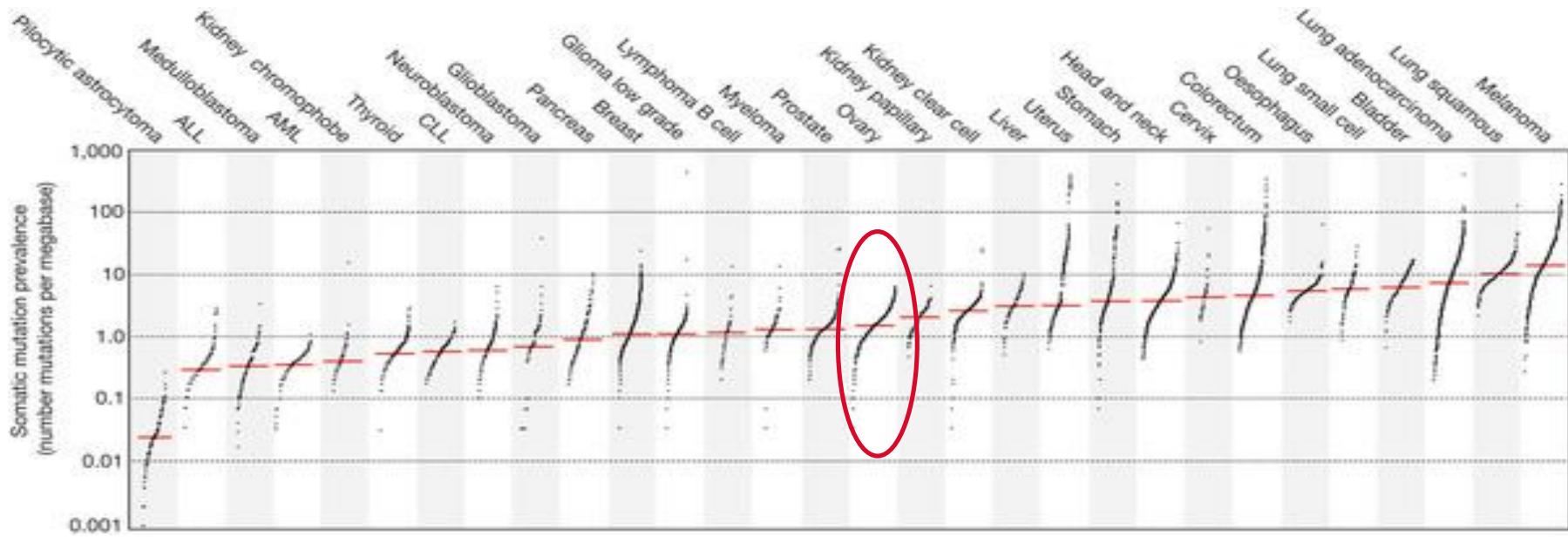


1. NCT02718417 (Sponsor: Pfizer; PI: Monk & Ledermann). Available at: <https://clinicaltrials.gov/ct2/show/NCT02718417?term=NCT02718417&rank=1>;

2. NCT02891824 (Sponsor: GINECO; PI: Kurtz). Available at: <https://clinicaltrials.gov/ct2/show/NCT02891824?term=NCT02891824&rank=1>;

3. NCT02580058 (Sponsor: Pfizer; PI: Monk & Pujade-Lauraine). Available at: <https://clinicaltrials.gov/ct2/show/NCT02580058?term=NCT02580058&rank=1>

# PD-1/PD-L1 monotherapy in ovarian cancer



Alexandrov et al., Nature 2013

# Immune Checkpoint Inhibitors in OC: Overview

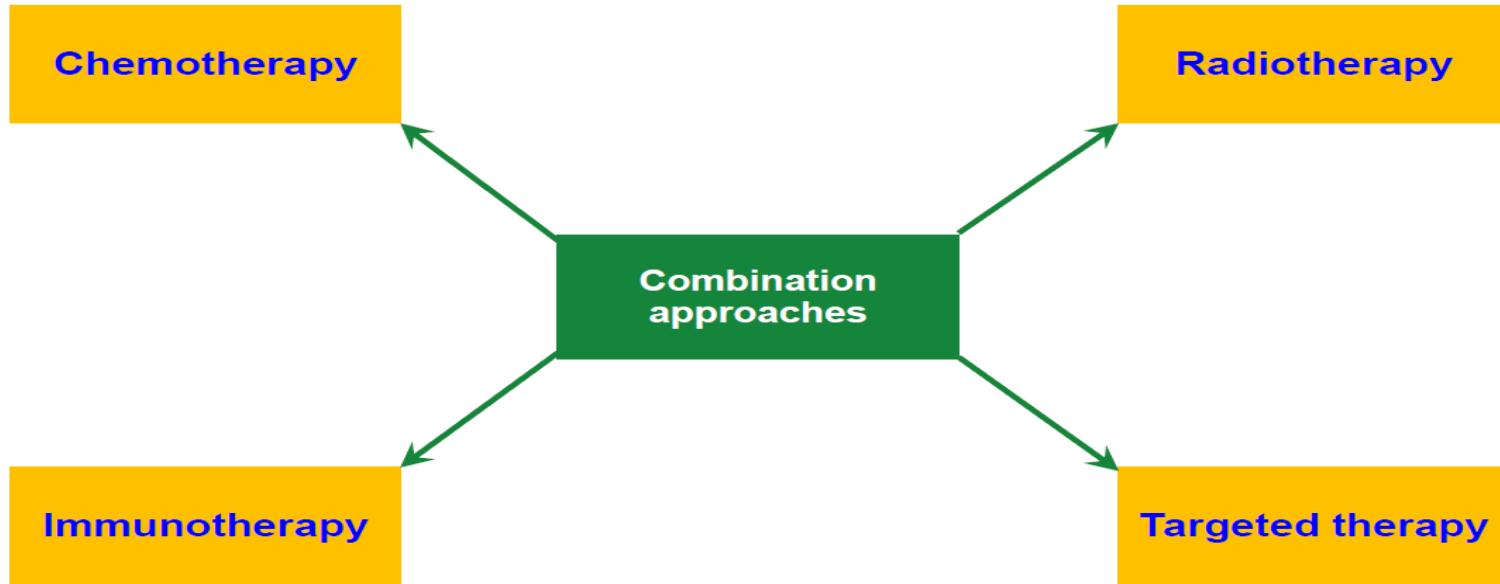
	Ipilimumab <sup>1</sup>	Nivolumab <sup>2</sup>	Pembrolizumab <sup>3</sup>	Avelumab <sup>4</sup>	PD-L1 <sup>5</sup>	Durvalumab <sup>6</sup>
<b>N</b>	9	20	26	124	12	20*
<b>Prior therapies</b>	<b>Not reported</b>	<b>≥4: 55%</b>	<b>≥5: 38.5%</b>	<b>≥3: 65.3%</b>	<b>≥6: 58%</b>	<b>Median: 4*</b>
<b>PD-L1+ prevalence</b>	Not reported	80% (IC 2/3)	100% ( $\geq 1\%$ TC)	77% ( $\geq 1\%$ TC)	83% (IC 2/3)	>5% TC: 73% (11/15)*
<b>ORR</b>	<b>Not reported</b>	<b>15%</b>	<b>11.5%</b>	<b>9.7%</b>	<b>25%</b>	<b>Not reported</b>

\* Includes ovarian cancer (n=15), triple-negative breast cancer (n=2), cervical cancer (n=2), and uterine leiomyosarcoma patients (n=1).

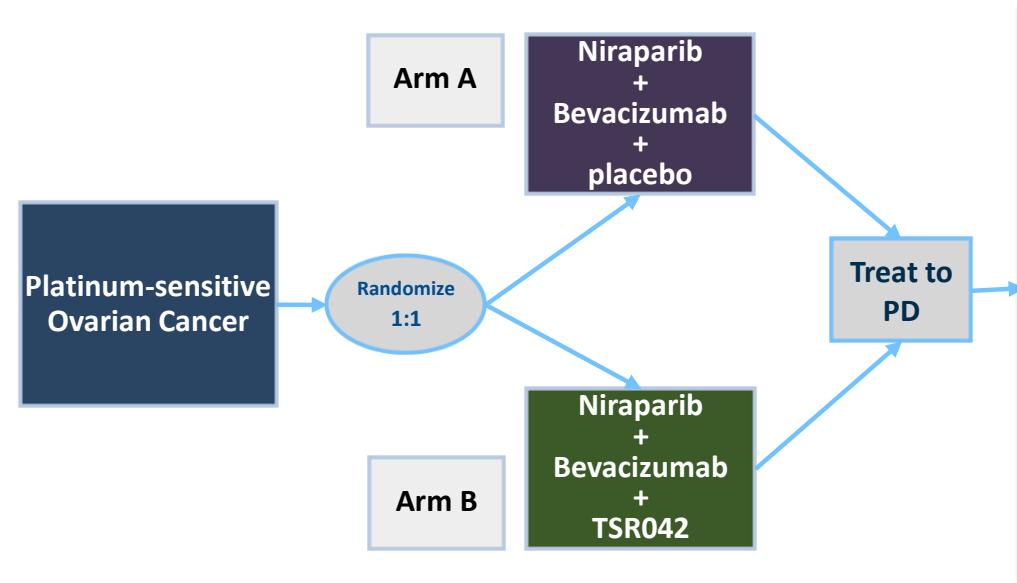
CI, confidence interval'; DCR, disease control rate; IC, immune cell; ORR, overall response rate; OS, overall survival; PFS, progression-free survival; TC, tumor cell; TRAE, treatment-related adverse event, Tx, treatment.

1. Hodi FS et al. *Proc Natl Acad Sci U S A*. 2008;105:3005-3010. 2. Hamanishi J et al. *J Clin Oncol*. 2015;33:4015-4022. Abstract 5510. 3. Varga A et al. Presented at ASCO 2015. 4. Disis ML et al. Presented at ASCO 2016. Abstract 5533. 5. Infante JR et al. Presented at ESMO 2016. Abstract 871. 6. Lee JM et al. Presented at ESGO 2016. Abstract 7001. 7. Lohr H et al. Presented at ESGO 2017. Abstract 7001.

# Raising the bar with combinations



**ENGOT-OV42-NSGO / AVANOVA-Imune1**  
**Multicenter, Double-blind, Phase 2 Randomized Trial**  
**n=338**

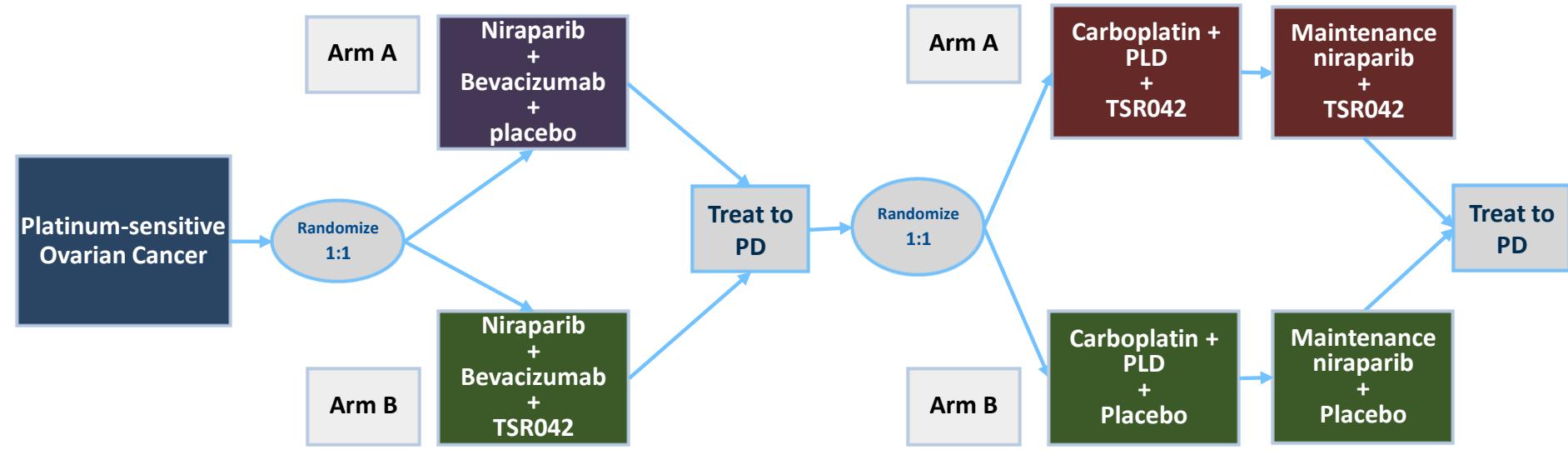


**Stratification factors Part 1**

- BRCAmut vs BRCAwt
- Chemotherapy-Free Interval: 6-12mo vs >12 mo

# Multicenter, Double-blind, Phase 2 Randomized Trial

n=223



## Stratification factors Part 2

- BRCA status
- Duration of treatment in part 1: 6-12mo vs >12 mo

# A phase II umbrella trial in patients with relapsed ovarian cancer

## NSGO-OV-UMB1 ENGOT-OV30 / NSGO

EudraCT number: 2017-002805-36

**Sponsor: NSGO**

Study Chair: Mansoor Raza Mirza

### Participating groups & Lead PIs:

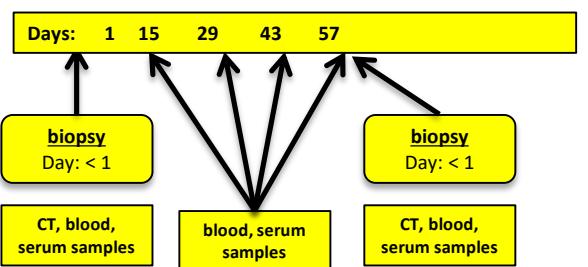
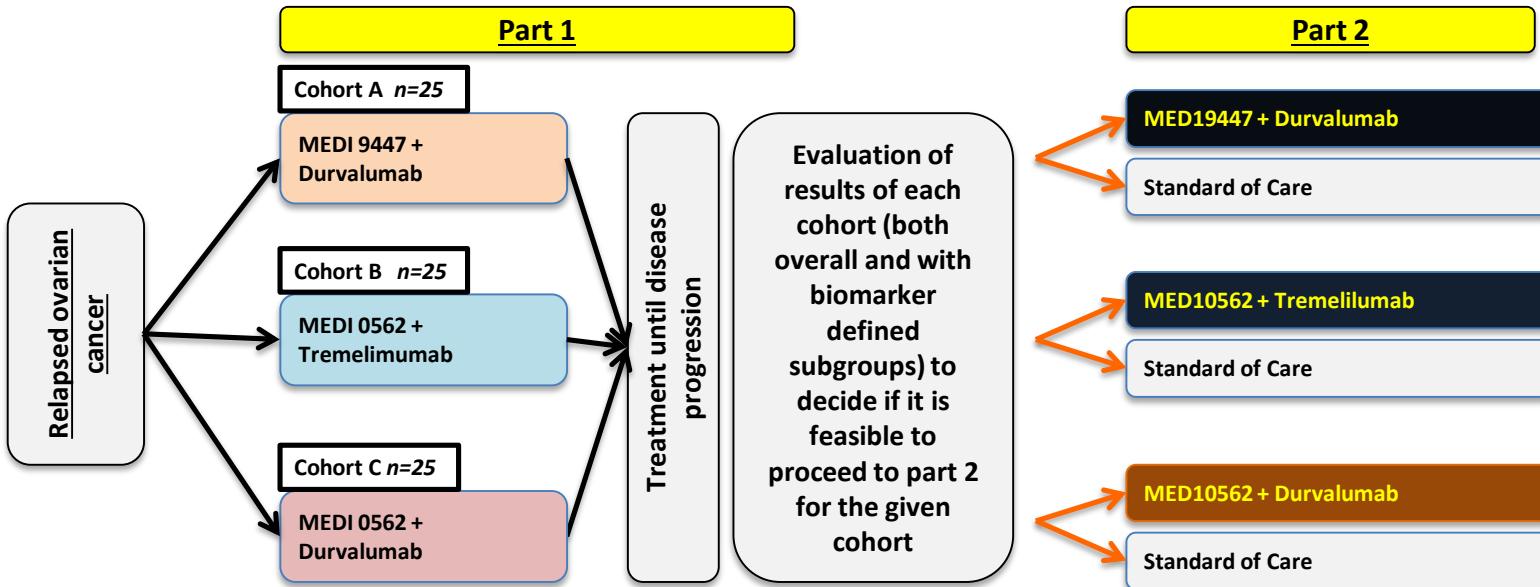
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<input type="checkbox"/> SGCTG UK:	C Gourley
<input type="checkbox"/> PMHC Canada:	A Oza
<input type="checkbox"/> BGOG Belgium:	I Vergote
<input type="checkbox"/> ANZGOG Australia:	M Friedlander
<input type="checkbox"/> COGI US:	J Barek
<input type="checkbox"/> GOTIC Japan:	K Fujiwara
<input type="checkbox"/> KGOG S Korea	SY Ryu
<input type="checkbox"/> NOGGO Germany:	Jalid Sehouli

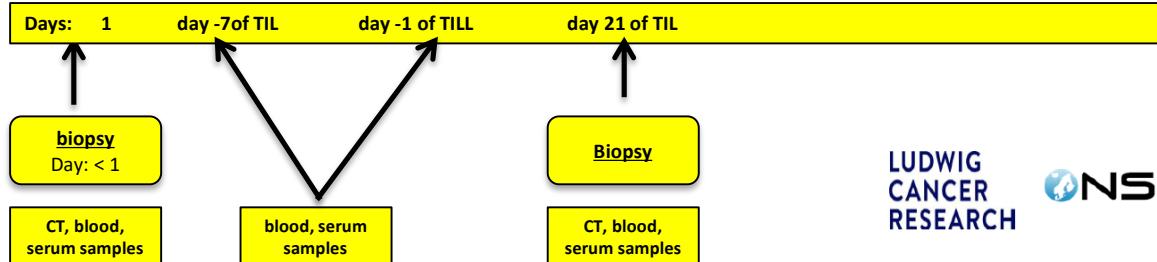
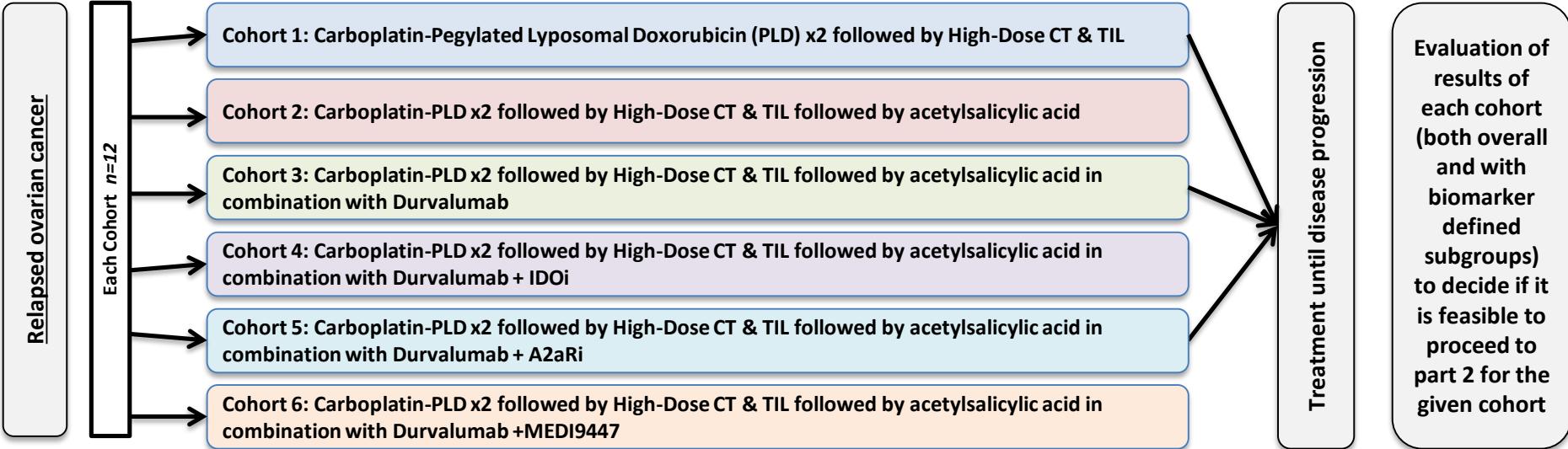
### Study Status

- Cohort A accepted (DHMA, EC) in DK
- Submission in NOR, FIN, SWE in Q4 17
- Expected FPI: Jan 18
- Cohort B (SGCTG UK), submission end Q1 18
- Cohort C (PMHC Canada), submission Q3 18

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**NSGO-OV-UMB1  
ENGOT-OV30**





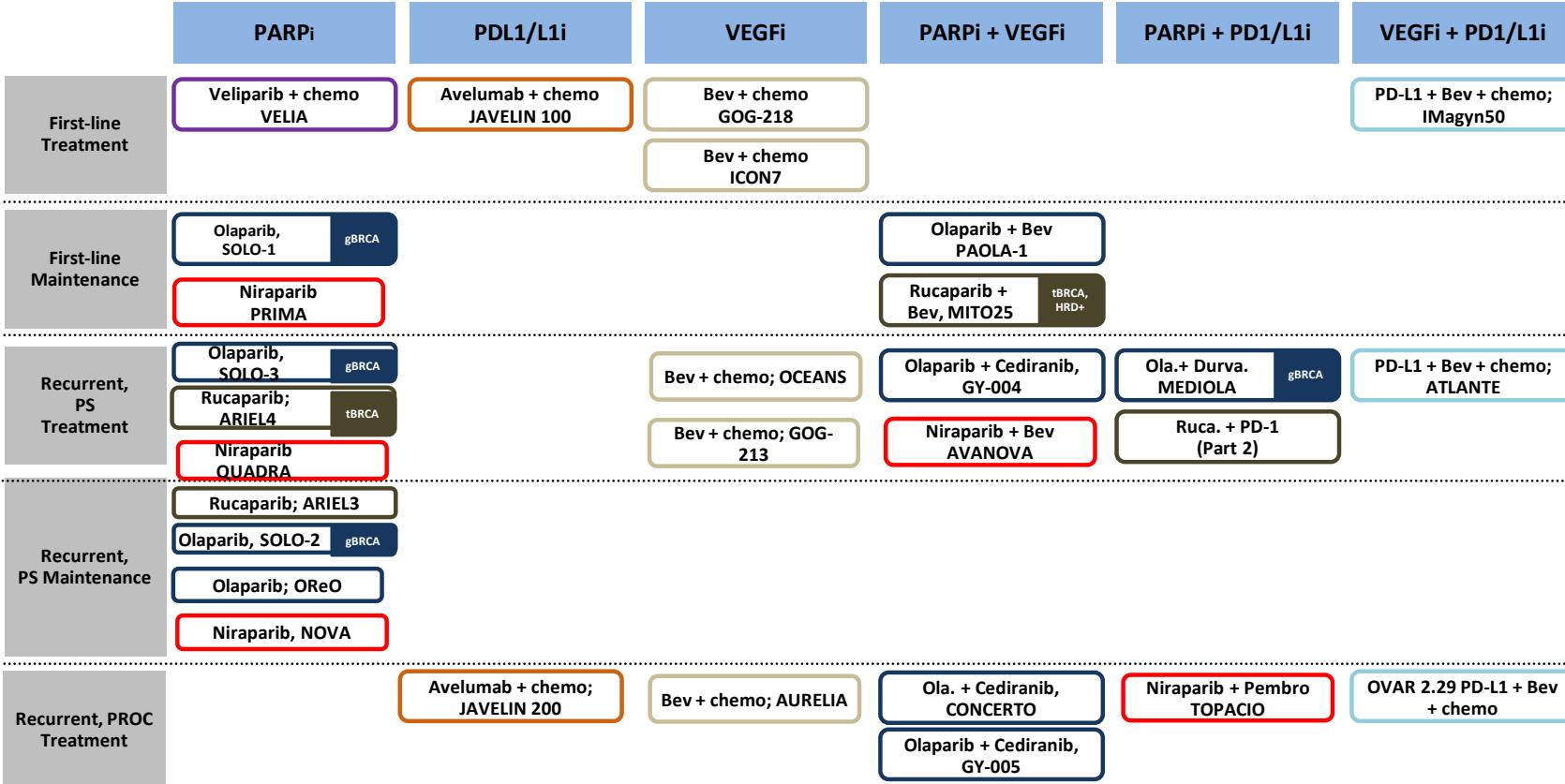
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 VIENNA, AUSTRIA 2017

# Ovarian Cancer Targeted Therapy Landscape Overview



\*Includes PARPs (niraparib, olaparib, rucaparib, veliparib) and PD1/L1s (PD-L1, avelumab).

