

## 1. NAME OF THE MEDICINAL PRODUCT

OPDIVO 10 mg/mL concentrate for solution for infusion.

## 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each mL of concentrate for solution for infusion contains 10 mg of nivolumab.

One vial of 4 mL contains 40 mg of nivolumab.

One vial of 10 mL contains 100 mg of nivolumab.

One vial of 12 mL contains 120 mg of nivolumab.

One vial of 24 mL contains 240 mg of nivolumab.

Nivolumab is produced in Chinese hamster ovary cells by recombinant DNA technology.

### Excipient with known effect

Each mL of concentrate contains 0.1 mmol (or 2.5 mg) sodium.

For the full list of excipients, see section 6.1.

## 3. PHARMACEUTICAL FORM

Concentrate for solution for infusion (sterile concentrate).

Clear to opalescent, colourless to pale yellow liquid that may contain few light particles. The solution has a pH of approximately 6.0 and an osmolality of approximately 340 mOsm/kg.

## 4. CLINICAL PARTICULARS

### 4.1 Therapeutic indications

#### Melanoma

OPDIVO as monotherapy or in combination with ipilimumab is indicated for the treatment of advanced (unresectable or metastatic) melanoma in adults.

Relative to nivolumab monotherapy, an increase in progression-free survival (PFS) and overall survival (OS) for the combination of nivolumab with ipilimumab is established only in patients with low tumour PD-L1 expression (see sections 4.4 and 5.1).

#### Adjuvant treatment of melanoma

OPDIVO as monotherapy is indicated for the adjuvant treatment of adults with melanoma with involvement of lymph nodes or metastatic disease who have undergone complete resection (see section 5.1).

#### Non-small cell lung cancer (NSCLC)

OPDIVO in combination with ipilimumab and 2 cycles of platinum-based chemotherapy is indicated for the first-line treatment of metastatic non-small cell lung cancer in adults whose tumours have no sensitising EGFR mutation or ALK translocation.

OPDIVO as monotherapy is indicated for the treatment of locally advanced or metastatic non-small cell lung cancer after prior chemotherapy in adults.

### Malignant pleural mesothelioma (MPM)

OPDIVO in combination with ipilimumab is indicated for the first-line treatment of adult patients with unresectable malignant pleural mesothelioma.

### Renal cell carcinoma (RCC)

OPDIVO as monotherapy is indicated for the treatment of advanced renal cell carcinoma after prior therapy in adults.

OPDIVO in combination with ipilimumab is indicated for the first-line treatment of adult patients with intermediate/poor-risk advanced renal cell carcinoma (see section 5.1).

OPDIVO in combination with cabozantinib is indicated for the first-line treatment of adult patients with advanced renal cell carcinoma (see section 5.1).

### Classical Hodgkin lymphoma (cHL)

OPDIVO as monotherapy is indicated for the treatment of adult patients with relapsed or refractory classical Hodgkin lymphoma after autologous stem cell transplant (ASCT) and treatment with brentuximab vedotin.

### Squamous cell cancer of the head and neck (SCCHN)

OPDIVO as monotherapy is indicated for the treatment of recurrent or metastatic squamous cell cancer of the head and neck in adults progressing on or after platinum-based therapy (see section 5.1).

### Urothelial carcinoma

OPDIVO as monotherapy is indicated for the treatment of locally advanced unresectable or metastatic urothelial carcinoma in adults after failure of prior platinum-containing therapy.

### Adjuvant treatment of urothelial carcinoma

OPDIVO as monotherapy is indicated for the adjuvant treatment of adults with muscle invasive urothelial carcinoma (MIUC) with tumour cell PD-L1 expression  $\geq 1\%$ , who are at high risk of recurrence after undergoing radical resection of MIUC (see section 5.1).

### Mismatch repair deficient (dMMR) or microsatellite instability-high (MSI-H) colorectal cancer (CRC)

OPDIVO in combination with ipilimumab is indicated for the treatment of adult patients with mismatch repair deficient or microsatellite instability-high metastatic colorectal cancer after prior fluoropyrimidine-based combination chemotherapy (see section 5.1).

### Oesophageal squamous cell carcinoma (OSCC)

OPDIVO in combination with ipilimumab is indicated for the first-line treatment of adult patients with unresectable advanced, recurrent or metastatic oesophageal squamous cell carcinoma with tumour cell PD-L1 expression  $\geq 1\%$ .

OPDIVO in combination with fluoropyrimidine- and platinum-based combination chemotherapy is indicated for the first-line treatment of adult patients with unresectable advanced, recurrent or metastatic oesophageal squamous cell carcinoma with tumour cell PD-L1 expression  $\geq 1\%$ .

OPDIVO as monotherapy is indicated for the treatment of adult patients with unresectable advanced, recurrent or metastatic oesophageal squamous cell carcinoma after prior fluoropyrimidine- and platinum-based combination chemotherapy.

## Adjuvant treatment of oesophageal or gastro-oesophageal junction cancer (OC or GEJC)

OPDIVO as monotherapy is indicated for the adjuvant treatment of adult patients with oesophageal or gastro-oesophageal junction cancer who have residual pathologic disease following prior neoadjuvant chemoradiotherapy (see section 5.1).

## Gastric, gastro-oesophageal junction (GEJ) or oesophageal adenocarcinoma

OPDIVO in combination with fluoropyrimidine- and platinum-based combination chemotherapy is indicated for the first-line treatment of adult patients with HER2-negative advanced or metastatic gastric, gastro-oesophageal junction or oesophageal adenocarcinoma whose tumours express PD-L1 with a combined positive score (CPS)  $\geq 5$ .

## 4.2 Posology and method of administration

Treatment must be initiated and supervised by physicians experienced in the treatment of cancer.

### PD-L1 testing

If specified in the indication, patient selection for treatment with OPDIVO based on the tumour expression of PD-L1 should be confirmed by a validated test (see sections 4.1, 4.4, and 5.1).

### Posology

#### OPDIVO as monotherapy

The recommended dose of OPDIVO is either nivolumab 240 mg every 2 weeks **or** 480 mg every 4 weeks (see section 5.1) depending on the indication, as presented in Table 1.

**Table 1: Recommended dose and infusion time for intravenous administration of nivolumab monotherapy**

Indication*	Recommended dose and infusion time
Melanoma (advanced or adjuvant treatment) Renal cell carcinoma Muscle invasive urothelial carcinoma (MIUC) (adjuvant treatment)	240 mg every 2 weeks over 30 minutes or 480 mg every 4 weeks over 60 minutes
Oesophageal or gastro-oesophageal junction cancer (adjuvant treatment)	240 mg every 2 weeks over 30 minutes or 480 mg every 4 weeks over 30 minutes for the first 16 weeks, followed by 480 mg every 4 weeks over 30 minutes
Non-small cell lung cancer Classical Hodgkin lymphoma Squamous cell cancer of the head and neck Urothelial carcinoma Oesophageal squamous cell carcinoma	240 mg every 2 weeks over 30 minutes

\*As per monotherapy indication in section 4.1.

If melanoma, RCC, OC, GEJC or MIUC (adjuvant treatment) patients need to be switched from the 240 mg every 2 weeks schedule to the 480 mg every 4 weeks schedule, the first 480 mg dose should be administered two weeks after the last 240 mg dose. Conversely, if patients need to be switched from the 480 mg every 4 weeks schedule to the 240 mg every 2 weeks schedule, the first 240 mg dose should be administered four weeks after the last 480 mg dose.

### OPDIVO in combination with ipilimumab

#### Melanoma

The recommended dose is 1 mg/kg nivolumab in combination with 3 mg/kg ipilimumab administered intravenously every 3 weeks for the first 4 doses. This is then followed by a second phase in which nivolumab monotherapy is administered intravenously at either 240 mg every 2 weeks **or** at 480 mg every 4 weeks, as presented in Table 2. For the monotherapy phase, the first dose of nivolumab should be administered;

- 3 weeks after the last dose of the combination of nivolumab and ipilimumab if using 240 mg every 2 weeks; or
- 6 weeks after the last dose of the combination of nivolumab and ipilimumab if using 480 mg every 4 weeks.

**Table 2: Recommended doses and infusion times for intravenous administration of nivolumab in combination with ipilimumab for melanoma**

	Combination phase, every 3 weeks for 4 dosing cycles	Monotherapy phase
Nivolumab	1 mg/kg over 30 minutes	240 mg every 2 weeks over 30 minutes or 480 mg every 4 weeks over 60 minutes
Ipilimumab	3 mg/kg over 30 minutes	

#### Malignant pleural mesothelioma

The recommended dose is 360 mg nivolumab administered intravenously over 30 minutes every 3 weeks in combination with 1 mg/kg ipilimumab administered intravenously over 30 minutes every 6 weeks. Treatment is continued for up to 24 months in patients without disease progression.

#### Renal cell carcinoma and dMMR or MSI-H colorectal cancer

The recommended dose is 3 mg/kg nivolumab in combination with 1 mg/kg ipilimumab administered intravenously every 3 weeks for the first 4 doses. This is then followed by a second phase in which nivolumab monotherapy is administered intravenously at either 240 mg every 2 weeks **or** at 480 mg every 4 weeks (RCC only), as presented in Table 3. For the monotherapy phase, the first dose of nivolumab should be administered;

- 3 weeks after the last dose of the combination of nivolumab and ipilimumab if using 240 mg every 2 weeks; or
- 6 weeks after the last dose of the combination of nivolumab and ipilimumab if using 480 mg every 4 weeks (RCC only).

**Table 3: Recommended doses and infusion times for intravenous administration of nivolumab in combination with ipilimumab for RCC and dMMR or MSI-H CRC**

	Combination phase, every 3 weeks for 4 dosing cycles	Monotherapy phase
Nivolumab	3 mg/kg over 30 minutes	240 mg every 2 weeks over 30 minutes or 480 mg every 4 weeks over 60 minutes (RCC only)
Ipilimumab	1 mg/kg over 30 minutes	

#### Oesophageal squamous cell carcinoma

The recommended dose is either 3 mg/kg nivolumab every 2 weeks or 360 mg nivolumab every 3 weeks administered intravenously over 30 minutes in combination with 1 mg/kg ipilimumab administered intravenously over 30 minutes every 6 weeks. Treatment is recommended until disease progression, unacceptable toxicity, or up to 24 months in patients without disease progression.

### OPDIVO in combination with cabozantinib

#### Renal cell carcinoma

The recommended dose is nivolumab administered intravenously at either 240 mg every 2 weeks **or** 480 mg every 4 weeks in combination with 40 mg cabozantinib administered orally every day.

**Table 4: Recommended doses and infusion times for intravenous administration of nivolumab in combination with oral administration of cabozantinib for RCC**

	Combination phase
<b>Nivolumab</b>	240 mg every 2 weeks over 30 minutes or 480 mg every 4 weeks over 60 minutes
<b>Cabozantinib</b>	40 mg once daily

*OPDIVO in combination with ipilimumab and chemotherapy*

Non-small cell lung cancer

The recommended dose is 360 mg nivolumab administered intravenously over 30 minutes every 3 weeks in combination with 1 mg/kg ipilimumab administered intravenously over 30 minutes every 6 weeks, and platinum-based chemotherapy administered every 3 weeks. After completion of 2 cycles of chemotherapy, treatment is continued with 360 mg nivolumab administered intravenously every 3 weeks in combination with 1 mg/kg ipilimumab every 6 weeks. Treatment is recommended until disease progression, unacceptable toxicity, or up to 24 months in patients without disease progression.

*OPDIVO in combination with chemotherapy*

Oesophageal squamous cell carcinoma

The recommended dose of nivolumab is 240 mg every 2 weeks or 480 mg every 4 weeks administered intravenously over 30 minutes in combination with fluoropyrimidine- and platinum-based chemotherapy (see section 5.1). Treatment with nivolumab is recommended until disease progression, unacceptable toxicity, or up to 24 months in patients without disease progression.

Gastric, gastro-oesophageal junction or oesophageal adenocarcinoma

The recommended dose is 360 mg nivolumab administered intravenously over 30 minutes in combination with fluoropyrimidine- and platinum-based chemotherapy administered every 3 weeks or 240 mg nivolumab administered intravenously over 30 minutes in combination with fluoropyrimidine- and platinum-based chemotherapy administered every 2 weeks (see section 5.1). Treatment with nivolumab is recommended until disease progression, unacceptable toxicity, or up to 24 months in patients without disease progression.

Duration of treatment

Treatment with OPDIVO, either as a monotherapy or in combination with ipilimumab or other therapeutic agents, should be continued as long as clinical benefit is observed or until treatment is no longer tolerated by the patient (and up to maximum duration of therapy if specified for an indication).

For adjuvant therapy, the maximum treatment duration with OPDIVO is 12 months.

For OPDIVO in combination with cabozantinib, OPDIVO should be continued until disease progression, unacceptable toxicity, or up to 24 months in patients without disease progression. Cabozantinib should be continued until disease progression or unacceptable toxicity. Refer to the Summary of Product Characteristics (SmPC) for cabozantinib.

Atypical responses (i.e., an initial transient increase in tumour size or small new lesions within the first few months followed by tumour shrinkage) have been observed. It is recommended to continue treatment with nivolumab or nivolumab in combination with ipilimumab for clinically stable patients with initial evidence of disease progression until disease progression is confirmed.

Dose escalation or reduction is not recommended for OPDIVO as monotherapy or in combination with other therapeutic agents. Dosing delay or discontinuation may be required based on individual safety and tolerability. Guidelines for permanent discontinuation or withholding of doses are described in Table 5. Detailed guidelines for the management of immune-related adverse reactions are described in section 4.4. When nivolumab is administered in combination with other therapeutic agents, refer to the SmPC of these other combination therapeutic agents regarding dosing.

**Table 5: Recommended treatment modifications for OPDIVO or OPDIVO in combination**

Immune-related adverse reaction	Severity	Treatment modification
Immune-related pneumonitis	Grade 2 pneumonitis	Withhold dose(s) until symptoms resolve, radiographic abnormalities improve, and management with corticosteroids is complete
	Grade 3 or 4 pneumonitis	Permanently discontinue treatment
Immune-related colitis	Grade 2 diarrhoea or colitis	Withhold dose(s) until symptoms resolve and management with corticosteroids, if needed, is complete
	Grade 3 diarrhoea or colitis OPDIVO monotherapy	Withhold dose(s) until symptoms resolve and management with corticosteroids is complete
	Grade 3 diarrhoea or colitis OPDIVO+ipilimumab <sup>a</sup>	Permanently discontinue treatment
Immune-related hepatitis	Grade 2 elevation in aspartate aminotransferase (AST), alanine aminotransferase (ALT), or total bilirubin	Withhold dose(s) until laboratory values return to baseline and management with corticosteroids, if needed, is complete
	Grade 3 or 4 elevation in AST, ALT, or total bilirubin	Permanently discontinue treatment
<b>NOTE:</b> for RCC patients treated with <b>OPDIVO in combination with cabozantinib</b> with liver enzyme elevations, see dosing guidelines following this table.	Grade 2 or 3 creatinine elevation	Withhold dose(s) until creatinine returns to baseline and management with corticosteroids is complete
	Grade 4 creatinine elevation	Permanently discontinue treatment
Immune-related nephritis and renal dysfunction	Symptomatic Grade 2 or 3 hypothyroidism, hyperthyroidism, hypophysitis, Grade 2 adrenal insufficiency Grade 3 diabetes	Withhold dose(s) until symptoms resolve and management with corticosteroids (if needed for symptoms of acute inflammation) is complete. Treatment should be continued in the presence of hormone replacement therapy <sup>b</sup> as long as no symptoms are present
	Grade 4 hypothyroidism Grade 4 hyperthyroidism Grade 4 hypophysitis Grade 3 or 4 adrenal insufficiency Grade 4 diabetes	Permanently discontinue treatment
Immune-related skin adverse reactions	Grade 3 rash	Withhold dose(s) until symptoms resolve and management with corticosteroids is complete
	Grade 4 rash	Permanently discontinue treatment
	Stevens-Johnson syndrome (SJS) or toxic epidermal necrolysis (TEN)	Permanently discontinue treatment (see section 4.4)

Immune-related adverse reaction	Severity	Treatment modification
Immune-related myocarditis	Grade 2 myocarditis	Withhold dose(s) until symptoms resolve and management with corticosteroids is complete <sup>c</sup>
	Grade 3 or 4 myocarditis	Permanently discontinue treatment
Other immune-related adverse reactions	Grade 3 (first occurrence)	Withhold dose(s)
	Grade 4 or recurrent Grade 3 ; persistent Grade 2 or 3 despite treatment modification; inability to reduce corticosteroid dose to 10 mg prednisone or equivalent per day	Permanently discontinue treatment

Note: Toxicity grades are in accordance with National Cancer Institute Common Terminology Criteria for Adverse Events Version 4.0 (NCI-CTCAE v4).

<sup>a</sup> During administration of the second phase of treatment (nivolumab monotherapy) following combination treatment, permanently discontinue treatment if Grade 3 diarrhoea or colitis occurs.

<sup>b</sup> Recommendation for the use of hormone replacement therapy is provided in section 4.4.

<sup>c</sup> The safety of re-initiating nivolumab or nivolumab in combination with ipilimumab therapy in patients previously experiencing immune-related myocarditis is not known.

OPDIVO as monotherapy or in combination with other therapeutic agents should be permanently discontinued for:

- Grade 4 or recurrent Grade 3 adverse reactions;
- Persistent Grade 2 or 3 adverse reactions despite management.

Patients treated with OPDIVO must be given the patient alert card and be informed about the risks of OPDIVO (see also package leaflet).

When OPDIVO is administered in combination with ipilimumab, if either agent is withheld, the other agent should also be withheld. If dosing is resumed after a delay, either the combination treatment or OPDIVO monotherapy could be resumed based on the evaluation of the individual patient.

When OPDIVO is administered in combination with chemotherapy, refer to the SmPC of the other combination therapy agents regarding dosing. If any agents are withheld, the other agents may be continued. If dosing is resumed after a delay, either the combination treatment, OPDIVO monotherapy or chemotherapy alone could be resumed based on the evaluation of the individual patient.

#### *OPDIVO in combination with cabozantinib in RCC*

When OPDIVO is used in combination with cabozantinib, the above treatment modifications in Table 5 also apply to the OPDIVO component. In addition, for liver enzyme elevations, in patients with RCC being treated with OPDIVO in combination with cabozantinib:

- If ALT or AST > 3 times ULN but ≤ 10 times ULN without concurrent total bilirubin ≥ 2 times ULN, both OPDIVO and cabozantinib should be withheld until these adverse reactions recover to Grades 0-1. Corticosteroid therapy may be considered. Rechallenge with a single medicine or rechallenge with both medicines after recovery may be considered. If rechallenging with cabozantinib, refer to cabozantinib SmPC.
- If ALT or AST > 10 times ULN or > 3 times ULN with concurrent total bilirubin ≥ 2 times ULN, both OPDIVO and cabozantinib should be permanently discontinued and corticosteroid therapy may be considered.

#### *Special populations*

##### *Paediatric population*

The safety and efficacy of OPDIVO in children below 18 years of age have not been established. Currently available data of OPDIVO as monotherapy or in combination with ipilimumab are described in sections 4.8 and 5.1 but no recommendation on a posology can be made.

### Elderly

No dose adjustment is required for elderly patients ( $\geq 65$  years) (see section 5.2).

### Renal impairment

Based on the population pharmacokinetic (PK) results, no dose adjustment is required in patients with mild or moderate renal impairment (see section 5.2). Data from patients with severe renal impairment are too limited to draw conclusions on this population.

### Hepatic impairment

Based on the population PK results, no dose adjustment is required in patients with mild hepatic impairment (see section 5.2). Data from patients with moderate or severe hepatic impairment are too limited to draw conclusions on these populations. OPDIVO must be administered with caution in patients with moderate (total bilirubin  $> 1.5 \times$  to  $3 \times$  the upper limit of normal [ULN] and any AST) or severe (total bilirubin  $> 3 \times$  ULN and any AST) hepatic impairment.

### Method of administration

OPDIVO is for intravenous use only. It is to be administered as an intravenous infusion over a period of 30 or 60 minutes depending on the dose (see Tables 1, 2, 3 and 4). The infusion must be administered through a sterile, non-pyrogenic, low protein binding in-line filter with a pore size of 0.2-1.2  $\mu\text{m}$ .

OPDIVO must not be administered as an intravenous push or bolus injection.

The total dose of OPDIVO required can be infused directly as a 10 mg/mL solution or can be diluted with sodium chloride 9 mg/mL (0.9%) solution for injection or glucose 50 mg/mL (5%) solution for injection (see section 6.6).

When administered in combination with ipilimumab and/or chemotherapy, OPDIVO should be given first followed by ipilimumab (if applicable) and then by chemotherapy on the same day. Use separate infusion bags and filters for each infusion.

For instructions on the preparation and handling of the medicinal product before administration, see section 6.6.

## **4.3 Contraindications**

Hypersensitivity to the active substance or to any of the excipients listed in section 6.1.

## **4.4 Special warnings and precautions for use**

### Traceability

In order to improve the traceability of biological medicinal products, the name and the batch number of the administered product should be clearly recorded.

### Assessment of PD-L1 status

When assessing the PD-L1 status of the tumour, it is important that a well-validated and robust methodology is used.

### Immune-related adverse reactions

When nivolumab is administered in combination, refer to the SmPC of the other combination therapy agents prior to initiation of treatment. Immune-related adverse reactions have occurred at higher frequencies when nivolumab was administered in combination with ipilimumab compared with nivolumab as monotherapy. Immune-related adverse reactions have occurred at similar frequencies when OPDIVO was administered in combination with cabozantinib relative to nivolumab monotherapy. Therefore, the guidance below for immune-related adverse reactions applies to the



OPDIVO component of the combination, except where specifically noted. Most immune-related adverse reactions improved or resolved with appropriate management, including initiation of corticosteroids and treatment modifications (see section 4.2).  
Immune-related adverse reactions affecting more than one body system can occur simultaneously.

Cardiac and pulmonary adverse reactions including pulmonary embolism have also been reported with combination therapy. Patients should be monitored for cardiac and pulmonary adverse reactions continuously, as well as for clinical signs, symptoms, and laboratory abnormalities indicative of electrolyte disturbances and dehydration prior to and periodically during treatment. Nivolumab in combination with ipilimumab should be discontinued for life-threatening or recurrent severe cardiac and pulmonary adverse reactions (see section 4.2).

Patients should be monitored continuously (at least up to 5 months after the last dose) as an adverse reaction with nivolumab or nivolumab in combination with ipilimumab may occur at any time during or after discontinuation of therapy.

For suspected immune-related adverse reactions, adequate evaluation should be performed to confirm aetiology or exclude other causes. Based on the severity of the adverse reaction, nivolumab or nivolumab in combination with ipilimumab should be withheld and corticosteroids administered. If immunosuppression with corticosteroids is used to treat an adverse reaction, a taper of at least 1 month duration should be initiated upon improvement. Rapid tapering may lead to worsening or recurrence of the adverse reaction. Non-corticosteroid immunosuppressive therapy should be added if there is worsening or no improvement despite corticosteroid use.

Nivolumab or nivolumab in combination with ipilimumab should not be resumed while the patient is receiving immunosuppressive doses of corticosteroids or other immunosuppressive therapy. Prophylactic antibiotics should be used to prevent opportunistic infections in patients receiving immunosuppressive therapy.

Nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued for any severe immune-related adverse reaction that recurs and for any life-threatening immune-related adverse reaction.

#### Immune-related pneumonitis

Severe pneumonitis or interstitial lung disease, including fatal cases, has been observed with nivolumab monotherapy or nivolumab in combination with ipilimumab (see section 4.8). Patients should be monitored for signs and symptoms of pneumonitis such as radiographic changes (e.g., focal ground glass opacities, patchy infiltrates), dyspnoea, and hypoxia. Infectious and disease-related aetiologies should be ruled out.

For Grade 3 or 4 pneumonitis, nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued, and corticosteroids should be initiated at a dose of 2 to 4 mg/kg/day methylprednisolone equivalents.

For Grade 2 (symptomatic) pneumonitis, nivolumab or nivolumab in combination with ipilimumab should be withheld and corticosteroids initiated at a dose of 1 mg/kg/day methylprednisolone equivalents. Upon improvement, nivolumab or nivolumab in combination with ipilimumab may be resumed after corticosteroid taper. If worsening or no improvement occurs despite initiation of corticosteroids, corticosteroid dose should be increased to 2 to 4 mg/kg/day methylprednisolone equivalents and nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued.

#### Immune-related colitis

Severe diarrhoea or colitis has been observed with nivolumab monotherapy or nivolumab in combination with ipilimumab (see section 4.8). Patients should be monitored for diarrhoea and additional symptoms of colitis, such as abdominal pain and mucus or blood in stool. Cytomegalovirus (CMV) infection/reactivation has been reported in patients with corticosteroid-refractory

immune-related colitis. Infectious and other aetiologies of diarrhoea should be ruled out, therefore appropriate laboratory tests and additional examinations must be performed. If diagnosis of corticosteroid-refractory immune-related colitis is confirmed addition of an alternative immunosuppressive agent to the corticosteroid therapy, or replacement of the corticosteroid therapy, should be considered.

For Grade 4 diarrhoea or colitis, nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued, and corticosteroids should be initiated at a dose of 1 to 2 mg/kg/day methylprednisolone equivalents.

Nivolumab monotherapy should be withheld for Grade 3 diarrhoea or colitis, and corticosteroids initiated at a dose of 1 to 2 mg/kg/day methylprednisolone equivalents. Upon improvement, nivolumab monotherapy may be resumed after corticosteroid taper. If worsening or no improvement occurs despite initiation of corticosteroids, nivolumab monotherapy must be permanently discontinued. Grade 3 diarrhoea or colitis observed with nivolumab in combination with ipilimumab requires permanent discontinuation of treatment and initiation of corticosteroids at a dose of 1 to 2 mg/kg/day methylprednisolone equivalents.

For Grade 2 diarrhoea or colitis, nivolumab or nivolumab in combination with ipilimumab should be withheld. Persistent diarrhoea or colitis should be managed with corticosteroids at a dose of 0.5 to 1 mg/kg/day methylprednisolone equivalents. Upon improvement, nivolumab or nivolumab in combination with ipilimumab may be resumed after corticosteroid taper, if needed. If worsening or no improvement occurs despite initiation of corticosteroids, corticosteroid dose should be increased to 1 to 2 mg/kg/day methylprednisolone equivalents and nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued.

#### *Immune-related hepatitis*

Severe hepatitis has been observed with nivolumab monotherapy or nivolumab in combination with ipilimumab (see section 4.8). Patients should be monitored for signs and symptoms of hepatitis such as transaminase and total bilirubin elevations. Infectious and disease-related aetiologies should be ruled out.

For Grade 3 or 4 transaminase or total bilirubin elevation, nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued, and corticosteroids should be initiated at a dose of 1 to 2 mg/kg/day methylprednisolone equivalents.

For Grade 2 transaminase or total bilirubin elevation, nivolumab or nivolumab in combination with ipilimumab should be withheld. Persistent elevations in these laboratory values should be managed with corticosteroids at a dose of 0.5 to 1 mg/kg/day methylprednisolone equivalents. Upon improvement, nivolumab or nivolumab in combination with ipilimumab may be resumed after corticosteroid taper, if needed. If worsening or no improvement occurs despite initiation of corticosteroids, corticosteroid dose should be increased to 1 to 2 mg/kg/day methylprednisolone equivalents and nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued.

#### *Immune-related nephritis and renal dysfunction*

Severe nephritis and renal dysfunction have been observed with monotherapy treatment or nivolumab in combination with ipilimumab (see section 4.8). Patients should be monitored for signs and symptoms of nephritis or renal dysfunction. Most patients present with asymptomatic increases in serum creatinine. Disease-related aetiologies should be ruled out.

For Grade 4 serum creatinine elevation, nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued, and corticosteroids should be initiated at a dose of 1 to 2 mg/kg/day methylprednisolone equivalents.

For Grade 2 or 3 serum creatinine elevation, nivolumab or nivolumab in combination with ipilimumab should be withheld, and corticosteroids should be initiated at a dose of 0.5 to 1 mg/kg/day

methylprednisolone equivalents. Upon improvement, nivolumab or nivolumab in combination with ipilimumab may be resumed after corticosteroid taper. If worsening or no improvement occurs despite initiation of corticosteroids, corticosteroid dose should be increased to 1 to 2 mg/kg/day methylprednisolone equivalents, and nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued.

#### *Immune-related endocrinopathies*

Severe endocrinopathies, including hypothyroidism, hyperthyroidism, adrenal insufficiency (including secondary adrenocortical insufficiency), hypophysitis (including hypopituitarism), diabetes mellitus, and diabetic ketoacidosis have been observed with nivolumab monotherapy or nivolumab in combination with ipilimumab (see section 4.8).

Patients should be monitored for clinical signs and symptoms of endocrinopathies and for hyperglycaemia and changes in thyroid function (at the start of treatment, periodically during treatment, and as indicated based on clinical evaluation). Patients may present with fatigue, headache, mental status changes, abdominal pain, unusual bowel habits, and hypotension, or nonspecific symptoms which may resemble other causes such as brain metastasis or underlying disease. Unless an alternate aetiology has been identified, signs or symptoms of endocrinopathies should be considered immune-related.

For symptomatic hypothyroidism, nivolumab or nivolumab in combination with ipilimumab should be withheld, and thyroid hormone replacement should be initiated as needed. For symptomatic hyperthyroidism, nivolumab or nivolumab in combination with ipilimumab should be withheld and antithyroid medication should be initiated as needed. Corticosteroids at a dose of 1 to 2 mg/kg/day methylprednisolone equivalents should also be considered if acute inflammation of the thyroid is suspected. Upon improvement, nivolumab or nivolumab in combination with ipilimumab may be resumed after corticosteroid taper, if needed. Monitoring of thyroid function should continue to ensure appropriate hormone replacement is utilised. Nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued for life-threatening hyperthyroidism or hypothyroidism.

For symptomatic Grade 2 adrenal insufficiency, nivolumab or nivolumab in combination with ipilimumab should be withheld, and physiologic corticosteroid replacement should be initiated as needed. Nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued for severe (Grade 3) or life-threatening (Grade 4) adrenal insufficiency. Monitoring of adrenal function and hormone levels should continue to ensure appropriate corticosteroid replacement is utilised.

For symptomatic Grade 2 or 3 hypophysitis, nivolumab or nivolumab in combination with ipilimumab should be withheld, and hormone replacement should be initiated as needed. Corticosteroids at a dose of 1 to 2 mg/kg/day methylprednisolone equivalents should also be considered if acute inflammation of the pituitary gland is suspected. Upon improvement, nivolumab or nivolumab in combination with ipilimumab may be resumed after corticosteroid taper, if needed. Nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued for life-threatening (Grade 4) hypophysitis. Monitoring of pituitary function and hormone levels should continue to ensure appropriate hormone replacement is utilised.

For symptomatic diabetes, nivolumab or nivolumab in combination with ipilimumab should be withheld, and insulin replacement should be initiated as needed. Monitoring of blood sugar should continue to ensure appropriate insulin replacement is utilised. Nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued for life-threatening diabetes.

#### *Immune-related skin adverse reactions*

Severe rash has been observed with nivolumab in combination with ipilimumab and, less commonly, with nivolumab as monotherapy (see section 4.8). Nivolumab or nivolumab in combination with ipilimumab should be withheld for Grade 3 rash and discontinued for Grade 4 rash. Severe rash should be managed with high-dose corticosteroid at a dose of 1 to 2 mg/kg/day methylprednisolone equivalents.

Rare cases of SJS and TEN some of them with fatal outcome have been observed. If symptoms or signs of SJS or TEN appear, treatment with nivolumab or nivolumab in combination with ipilimumab should be discontinued and the patient referred to a specialised unit for assessment and treatment. If the patient has developed SJS or TEN with the use of nivolumab or nivolumab in combination with ipilimumab, permanent discontinuation of treatment is recommended (see section 4.2).

Caution should be used when considering the use of nivolumab in a patient who has previously experienced a severe or life-threatening skin adverse reaction on prior treatment with other immune-stimulatory anticancer agents.

#### Other immune-related adverse reactions

The following immune-related adverse reactions were reported in less than 1% of patients treated with nivolumab monotherapy or nivolumab in combination with ipilimumab in clinical trials across doses and tumour types: pancreatitis, uveitis, demyelination, autoimmune neuropathy (including facial and abducens nerve paresis), Guillain-Barré syndrome, myasthenia gravis, myasthenic syndrome, aseptic meningitis, encephalitis, gastritis, sarcoidosis, duodenitis, myositis, myocarditis, and rhabdomyolysis. Cases of Vogt-Koyanagi-Harada syndrome, hypoparathyroidism, and cystitis noninfective have been reported post-marketing (see sections 4.2 and 4.8).

For suspected immune-related adverse reactions, adequate evaluation should be performed to confirm aetiology or exclude other causes. Based on the severity of the adverse reaction, nivolumab or nivolumab in combination with ipilimumab should be withheld and corticosteroids administered. Upon improvement, nivolumab or nivolumab in combination with ipilimumab may be resumed after corticosteroid taper. Nivolumab or nivolumab in combination with ipilimumab must be permanently discontinued for any severe immune-related adverse reaction that recurs and for any life-threatening immune-related adverse reaction.

Cases of myotoxicity (myositis, myocarditis, and rhabdomyolysis), some with fatal outcome, have been reported with nivolumab or nivolumab in combination with ipilimumab. If a patient develops signs and symptoms of myotoxicity, close monitoring should be implemented, and the patient referred to a specialist for assessment and treatment without delay. Based on the severity of myotoxicity, nivolumab or nivolumab in combination with ipilimumab should be withheld or discontinued (see section 4.2), and appropriate treatment instituted.

The diagnosis of myocarditis requires a high index of suspicion. Patients with cardiac or cardio-pulmonary symptoms should be assessed for potential myocarditis. If myocarditis is suspected, prompt initiation of a high dose of steroids (prednisone 1 to 2 mg/kg/day or methylprednisolone 1 to 2 mg/kg/day) and prompt cardiology consultation with diagnostic workup according to current clinical guidelines should be initiated. Once a diagnosis of myocarditis is established, nivolumab or nivolumab in combination with ipilimumab should be withheld or permanently discontinued (see section 4.2).

Solid organ transplant rejection has been reported in the post-marketing setting in patients treated with PD-1 inhibitors. Treatment with nivolumab may increase the risk of rejection in solid organ transplant recipients. The benefit of treatment with nivolumab versus the risk of possible organ rejection should be considered in these patients.

Haemophagocytic lymphohistiocytosis (HLH) has been observed with nivolumab as monotherapy and nivolumab in combination with ipilimumab. Caution should be taken when nivolumab is administered as monotherapy or in combination with ipilimumab. If HLH is confirmed, administration of nivolumab or nivolumab in combination with ipilimumab should be discontinued and treatment for HLH initiated.

#### Infusion reactions

Severe infusion reactions have been reported in clinical trials of nivolumab or nivolumab in combination with ipilimumab (see section 4.8). In case of a severe or life-threatening infusion reaction, the nivolumab or nivolumab in combination with ipilimumab infusion must be discontinued

and appropriate medical therapy administered. Patients with mild or moderate infusion reaction may receive nivolumab or nivolumab in combination with ipilimumab with close monitoring and use of premedication according to local treatment guidelines for prophylaxis of infusion reactions.

### Disease-specific precautions

#### Advanced melanoma

Patients with a baseline performance score  $\geq 2$ , active brain metastases or leptomeningeal metastases, autoimmune disease, and patients who had been receiving systemic immunosuppressants prior to study entry were excluded from the pivotal clinical trials of nivolumab or nivolumab in combination with ipilimumab (see sections 4.5 and 5.1). Patients with ocular/uveal melanoma were excluded from pivotal clinical trials of melanoma. In addition, CA209037 excluded patients who have had a Grade 4 adverse reaction that was related to anti-CTLA-4 therapy (see section 5.1). Patients with baseline performance score of 2, treated leptomeningeal metastases, ocular/uveal melanoma, autoimmune disease and patients who have had a Grade 3-4 adverse reaction that was related to prior anti-CTLA-4 therapy were included in study CA209172 (see section 5.1). In the absence of data for patients who had been receiving systemic immunosuppressants prior to study entry, and for patients with active brain or leptomeningeal metastases, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

Relative to nivolumab monotherapy, an increase in PFS for the combination of nivolumab with ipilimumab is established only in patients with low tumour PD-L1 expression. The improvement in OS was similar between nivolumab in combination with ipilimumab and nivolumab monotherapy in patients with high tumour PD-L1 expression (PD-L1  $\geq 1\%$ ). Before initiating treatment with the combination, physicians are advised to carefully evaluate the individual patient and tumour characteristics, taking into consideration the observed benefits and the toxicity of the combination relative to nivolumab monotherapy (see sections 4.8 and 5.1).

#### Use of nivolumab in melanoma patients with rapidly progressing disease

Physicians should consider the delayed onset of nivolumab effect before initiating treatment in patients with rapidly progressing disease (see section 5.1).

#### Adjuvant treatment of melanoma

There are no data on adjuvant treatment in patients with melanoma with the following risk factors (see sections 4.5 and 5.1):

- patients with prior autoimmune disease, and any condition requiring systemic treatment with either corticosteroids ( $\geq 10$  mg daily prednisone or equivalent) or other immunosuppressive medications,
- patients with prior therapy for melanoma (except patients with surgery, adjuvant radiotherapy after neurosurgical resection for lesions of the central nervous system, and prior adjuvant interferon completed  $\geq 6$  months prior to randomisation),
- patients treated with prior therapy with anti-PD-1, anti-PD-L1, anti-PD-L2, anti-CD137, or anti-CTLA-4 antibody (including ipilimumab or any other antibody or drug specifically targeting T cell co-stimulation or checkpoint pathways),
- subjects under the age of 18 years.

In the absence of data, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

#### Non-small cell lung cancer

##### First-line treatment of NSCLC

Patients with active autoimmune disease, symptomatic interstitial lung disease, medical conditions requiring systemic immunosuppression, active (untreated) brain metastasis, who received prior systemic treatment for advanced disease, or who had sensitising EGFR mutations or ALK translocations were excluded from the pivotal trial in first-line treatment of NSCLC (see sections 4.5 and 5.1). Limited data are available in elderly patients ( $\geq 75$  years) (see section 5.1). In these patients, nivolumab in combination with ipilimumab and chemotherapy should be used with caution after careful consideration of the potential benefit/risk on an individual basis.

#### Treatment of NSCLC after prior chemotherapy

Patients with a baseline performance score  $\geq 2$ , active brain metastases or autoimmune disease, symptomatic interstitial lung disease, and patients who had been receiving systemic immunosuppressants prior to study entry were excluded from the pivotal clinical trials of NSCLC (see sections 4.5 and 5.1). Patients with baseline performance score of 2 were included in study CA209171 (see section 5.1). In the absence of data for patients with autoimmune disease, symptomatic interstitial lung disease, active brain metastases and patients who had been receiving systemic immunosuppressants prior to study entry, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

Physicians should consider the delayed onset of nivolumab effect before initiating treatment in patients with poorer prognostic features and/or aggressive disease. In non-squamous NSCLC, a higher number of deaths within 3 months was observed in nivolumab compared to docetaxel. Factors associated with early deaths were poorer prognostic factors and/or more aggressive disease combined with low or no tumour PD-L1 expression (see section 5.1).

#### Malignant pleural mesothelioma

Patients with primitive peritoneal, pericardial, testis, or tunica vaginalis mesothelioma, interstitial lung disease, active autoimmune disease, medical conditions requiring systemic immunosuppression, and brain metastasis (unless surgically resected or treated with stereotaxic radiotherapy and no evolution within 3 months prior to inclusion in the study) were excluded from the pivotal trial in first-line treatment of MPM (see sections 4.5 and 5.1). In the absence of data, nivolumab in combination with ipilimumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

#### Renal cell carcinoma

##### Nivolumab or nivolumab in combination with ipilimumab

Patients with any history of concurrent brain metastases, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the clinical trials of nivolumab or nivolumab in combination with ipilimumab (see sections 4.5 and 5.1). In the absence of data, nivolumab or nivolumab in combination with ipilimumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

##### Nivolumab in combination with cabozantinib

Patients with any active brain metastases, autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the clinical trials of nivolumab in combination with cabozantinib (see sections 4.5 and 5.1). In the absence of data, nivolumab in combination with cabozantinib should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

When nivolumab is given with cabozantinib, higher frequencies of Grades 3 and 4 ALT and AST elevations have been reported relative to nivolumab monotherapy in patients with advanced RCC (see section 4.8). Liver enzymes should be monitored before initiation of and periodically throughout treatment. Medical management guidelines for both medicines should be followed (see section 4.2 and refer to the SmPC for cabozantinib).

#### Classical Hodgkin lymphoma

Patients with active autoimmune disease and symptomatic interstitial lung disease were excluded from clinical trials of cHL (see section 5.1). In the absence of data, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

#### Complications of allogeneic haematopoietic stem cell transplant (HSCT) in classical Hodgkin lymphoma

Cases of acute graft-versus-host disease (GVHD) and transplant related mortality (TRM) have been observed from the follow-up of patients with cHL undergoing allogeneic HSCT after previous exposure to nivolumab. Careful consideration to the potential benefits of HSCT and the possible increased risk of transplant related complications should be made case-by-case (see section 4.8).

In patients treated with nivolumab after allogeneic HSCT, rapid-onset and severe GVHD, some with fatal outcome, have been reported in the post-marketing setting. Treatment with nivolumab may increase the risk of severe GVHD and death in patients who have had prior allogeneic HSCT, mainly in those with prior history of GVHD. The benefit of treatment with nivolumab versus the possible risk should be considered in these patients (see section 4.8).

#### Head and neck cancer

Patients with a baseline performance score  $\geq 2$ , active brain or leptomeningeal metastases, active autoimmune disease, medical conditions requiring systemic immunosuppression, or carcinoma of the nasopharynx or salivary gland as the primary tumour sites were excluded from the SCCHN clinical trial (see sections 4.5 and 5.1). In the absence of data, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

Physicians should consider the delayed onset of nivolumab effect before initiating treatment in patients with poorer prognostic features and/or aggressive disease. In head and neck cancer, a higher number of deaths within 3 months was observed in nivolumab compared to docetaxel. Factors associated with early deaths were ECOG performance status, fast progressive disease on prior platinum therapy and high tumour burden.

#### Urothelial carcinoma

##### Treatment of advanced urothelial carcinoma

Patients with a baseline performance score  $\geq 2$ , active brain metastases or leptomeningeal metastases, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the clinical trials of urothelial carcinoma (see sections 4.5 and 5.1). In the absence of data, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

##### Adjuvant treatment of urothelial carcinoma

Patients with a baseline performance score of  $\geq 2$  (except patients with a baseline performance score of 2 who have not received cisplatin based neoadjuvant chemotherapy and are considered ineligible for cisplatin adjuvant chemotherapy), evidence of disease after surgery, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the clinical trial of adjuvant treatment of urothelial carcinoma (see sections 4.5 and 5.1). In the absence of data, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

#### dMMR or MSI-H colorectal cancer

Patients with a baseline performance score  $\geq 2$ , active brain metastases or leptomeningeal metastases, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the clinical trial in dMMR or MSI-H metastatic CRC (see sections 4.5 and 5.1). In the absence of data, nivolumab in combination with ipilimumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

#### Oesophageal squamous cell carcinoma

##### First-line treatment of OSCC

Patients with a baseline performance score  $\geq 2$ , any history of concurrent brain metastases, active autoimmune disease, medical conditions requiring systemic immunosuppression, or at high risk of bleeding or fistula due to apparent invasion of tumour to organs adjacent to the oesophageal tumour were excluded from the clinical trial in OSCC (see sections 4.5 and 5.1). In the absence of data, nivolumab in combination with ipilimumab or chemotherapy should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

In the first-line OSCC trial, a higher number of deaths within 4 months was observed with nivolumab in combination with ipilimumab compared to chemotherapy. Physicians should consider the delayed onset of effect of nivolumab in combination with ipilimumab before initiating treatment in patients with poorer prognostic features and/or aggressive disease (see section 5.1).

#### Treatment of OSCC after prior first-line chemotherapy

The majority of clinical data available in oesophageal squamous cell carcinoma are in patients of Asian origin (see section 5.1).

Patients with a baseline performance score  $\geq 2$ , brain metastases that were symptomatic or required treatment, apparent tumour invasion in organs located adjacent to the oesophagus (e.g. the aorta or respiratory tract), active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the clinical study in OSCC (see sections 4.5 and 5.1). In the absence of data, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

Physicians should consider the delayed onset of nivolumab effect before initiating treatment in patients with OSCC. A higher number of deaths within 2.5 months after randomisation was observed with nivolumab compared to chemotherapy. No specific factor(s) associated with early deaths could be identified (see section 5.1).

#### Adjuvant treatment of oesophageal or gastro-oesophageal junction cancer

Patients with a baseline performance score  $\geq 2$ , who did not receive concurrent chemoradiotherapy (CRT) prior to surgery, with stage IV resectable disease, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the clinical study in oesophageal and gastro-oesophageal junction cancer (see sections 4.5 and 5.1). In the absence of data, nivolumab should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

#### Gastric, gastro-oesophageal junction or oesophageal adenocarcinoma

Patients who had baseline ECOG performance score  $\geq 2$ , untreated central nervous system metastases, active, known, or suspected autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the clinical study in gastric, GEJ or oesophageal adenocarcinoma (see sections 4.5 and 5.1). In the absence of data, nivolumab in combination with chemotherapy should be used with caution in these populations after careful consideration of the potential benefit/risk on an individual basis.

Study CA209649 excluded patients with known HER2-positive status. Patients with undetermined status were allowed in the study and represented 40.3% of patients (see section 5.1).

#### Patients on controlled sodium diet

Each mL of this medicinal product contains 0.1 mmol (or 2.5 mg) sodium. This medicinal product contains 10 mg sodium per 4 ml vial, 25 mg sodium per 10 ml vial, 30 mg sodium per 12 ml vial or 60 mg sodium per 24 ml vial, which is equivalent to 0.5%, 1.25%, 1.5% or 3% respectively, of the WHO recommended maximum daily intake of 2 g sodium for an adult.

#### Patient alert card

All prescribers of OPDIVO must be familiar with the physician information and management guidelines. The prescriber must discuss the risks of OPDIVO therapy with the patient. The patient will be provided with the patient alert card with each prescription.

### **4.5 Interaction with other medicinal products and other forms of interaction**

Nivolumab is a human monoclonal antibody, as such pharmacokinetic interaction studies have not been conducted. As monoclonal antibodies are not metabolised by cytochrome P450 (CYP) enzymes or other drug metabolising enzymes, inhibition or induction of these enzymes by co-administered medicinal products is not anticipated to affect the pharmacokinetics of nivolumab.



## Other forms of interaction

### *Systemic immunosuppression*

The use of systemic corticosteroids and other immunosuppressants at baseline, before starting nivolumab, should be avoided because of their potential interference with the pharmacodynamic activity. However, systemic corticosteroids and other immunosuppressants can be used after starting nivolumab to treat immune-related adverse reactions. The preliminary results show that systemic immunosuppression after starting nivolumab treatment does not appear to preclude the response on nivolumab.

## 4.6 Fertility, pregnancy and lactation

### Pregnancy

There are no data from the use of nivolumab in pregnant women. Studies in animals have shown embryofoetal toxicity (see section 5.3). Human IgG4 is known to cross the placental barrier and nivolumab is an IgG4; therefore, nivolumab has the potential to be transmitted from the mother to the developing foetus. Nivolumab is not recommended during pregnancy and in women of childbearing potential not using effective contraception unless the clinical benefit outweighs the potential risk. Effective contraception should be used for at least 5 months following the last dose of nivolumab.

### Breast-feeding

It is unknown whether nivolumab is secreted in human milk. Because many medicinal products, including antibodies, can be secreted in human milk, a risk to the newborns/infants cannot be excluded. A decision must be made whether to discontinue breast-feeding or to discontinue from nivolumab therapy taking into account the benefit of breast-feeding for the child and the benefit of therapy for the woman.

### Fertility

Studies to evaluate the effect of nivolumab on fertility have not been performed. Thus, the effect of nivolumab on male and female fertility is unknown.

## 4.7 Effects on ability to drive and use machines

Nivolumab or nivolumab in combination with ipilimumab may have a minor influence on the ability to drive and use machines. Because of potential adverse reactions such as fatigue (see section 4.8), patients should be advised to use caution when driving or operating machinery until they are certain that nivolumab does not adversely affect them.

## 4.8 Undesirable effects

### Nivolumab as monotherapy (see section 4.2)

#### *Summary of the safety profile*

In the pooled dataset of nivolumab as monotherapy across tumour types (n = 4122) with minimum follow-up ranging from 2.3 to 28 months, the most frequent adverse reactions ( $\geq 10\%$ ) were fatigue (45%), musculoskeletal pain (31%), diarrhoea (26%), cough (24%), rash (24%), nausea (23%), pruritus (19%), decreased appetite (18%), constipation (17%), dyspnoea (17%), abdominal pain (16%), upper respiratory tract infection (16%), arthralgia (14%), pyrexia (14%), vomiting (14%), headache (13%) and oedema (10%). The majority of adverse reactions were mild to moderate (Grade 1 or 2). The incidence of Grade 3-5 adverse reactions was 44%, with 0.3% fatal adverse reactions attributed to study drug. With a minimum of 63 months follow-up in NSCLC, no new safety signals were identified.

#### *Tabulated summary of adverse reactions*

Adverse reactions reported in the pooled dataset for patients treated with nivolumab monotherapy (n = 4122) are presented in Table 6. These reactions are presented by system organ class and by frequency. Frequencies are defined as: very common ( $\geq 1/10$ ); common ( $\geq 1/100$  to  $< 1/10$ );

uncommon ( $\geq 1/1,000$  to  $< 1/100$ ); rare ( $\geq 1/10,000$  to  $< 1/1,000$ ); very rare ( $< 1/10,000$ ); not known (cannot be estimated from available post-marketing data). Within each frequency grouping, adverse reactions are presented in the order of decreasing seriousness.

<b>Table 6:</b>	<b>Adverse reactions with nivolumab monotherapy</b>
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	<b>Nivolumab monotherapy</b>
<b>Infections and infestations</b>	
Very common	upper respiratory tract infection
Common	pneumonia <sup>a</sup> , bronchitis
Rare	aseptic meningitis
<b>Neoplasms benign, malignant and unspecified (including cysts and polyps)</b>	
Rare	histiocytic necrotising lymphadenitis (Kikuchi lymphadenitis)
<b>Blood and lymphatic system disorders</b>	
Very common	lymphopaenia <sup>b</sup> , anaemia <sup>b,i</sup> , leucopenia <sup>b</sup> , neutropaenia <sup>a,b</sup> , thrombocytopaenia <sup>b</sup>
Uncommon	eosinophilia
Not known	haemophagocytic lymphohistiocytosis
<b>Immune system disorders</b>	
Common	infusion related reaction, hypersensitivity (including anaphylactic reaction)
Uncommon	sarcoidosis
Not known	solid organ transplant rejection <sup>f</sup>
<b>Endocrine disorders</b>	
Common	hypothyroidism, hyperthyroidism, thyroiditis
Uncommon	adrenal insufficiency <sup>j</sup> , hypopituitarism, hypophysitis, diabetes mellitus
Rare	diabetic ketoacidosis, hypoparathyroidism
<b>Metabolism and nutrition disorders</b>	
Very common	decreased appetite, hyperglycaemia <sup>b</sup> , hypoglycaemia <sup>b</sup>
Common	dehydration, weight decreased
Uncommon	metabolic acidosis
Not known	tumour lysis syndrome <sup>g</sup>
<b>Nervous system disorders</b>	
Very common	headache
Common	peripheral neuropathy, dizziness
Uncommon	polyneuropathy, autoimmune neuropathy (including facial and abducens nerve paresis)
Rare	Guillain-Barré syndrome, demyelination, myasthenic syndrome, encephalitis <sup>a,k</sup>
<b>Eye disorders</b>	
Common	blurred vision, dry eye
Uncommon	uveitis
Not known	Vogt-Koyanagi-Harada syndrome <sup>f</sup>
<b>Cardiac disorders</b>	
Common	tachycardia, atrial fibrillation
Uncommon	myocarditis <sup>a</sup> , pericardial disorders <sup>h</sup> , arrhythmia (including ventricular arrhythmia)
<b>Vascular disorders</b>	
Common	hypertension
Rare	vasculitis
<b>Respiratory, thoracic and mediastinal disorders</b>	
Very common	dyspnoea <sup>a</sup> , cough
Common	pneumonitis <sup>a</sup> , pleural effusion
Uncommon	lung infiltration
<b>Gastrointestinal disorders</b>	
Very common	diarrhoea, vomiting, nausea, abdominal pain, constipation
Common	colitis <sup>a</sup> , stomatitis, dry mouth
Uncommon	pancreatitis, gastritis
Rare	duodenal ulcer

<b>Hepatobiliary disorders</b>	
Uncommon	hepatitis, cholestasis
<b>Skin and subcutaneous tissue disorders</b>	
Very common	rash <sup>c</sup> , pruritus
Common	vitiligo, dry skin, erythema, alopecia, urticaria
Uncommon	psoriasis, rosacea, erythema multiforme
Rare	toxic epidermal necrolysis <sup>a, d</sup> , Stevens-Johnson syndrome <sup>a</sup>
Not known	lichen sclerosus <sup>g</sup> , other lichen disorders
<b>Musculoskeletal and connective tissue disorders</b>	
Very common	musculoskeletal pain <sup>c</sup> , arthralgia
Common	arthritis
Uncommon	polymyalgia rheumatica
Rare	Sjogren's syndrome, myopathy, myositis (including polymyositis) <sup>a</sup> , rhabdomyolysis <sup>a, d</sup>
<b>Renal and urinary disorders</b>	
Common	renal failure (including acute kidney injury) <sup>a</sup>
Rare	tubulointerstitial nephritis, cystitis noninfective
<b>General disorders and administration site conditions</b>	
Very common	fatigue, pyrexia, oedema <sup>l</sup>
Common	pain, chest pain
<b>Investigations<sup>b</sup></b>	
Very common	increased AST, hyponatraemia, hypoalbuminaemia, increased alkaline phosphatase, increased creatinine, increased ALT, increased lipase, hyperkalaemia, increased amylase, hypocalcaemia, hypomagnesaemia, hypokalaemia, hypercalcaemia
Common	increased total bilirubin, hypernatraemia, hypermagnesaemia

Adverse reaction frequencies presented in Table 6 may not be fully attributable to nivolumab alone but may contain contributions from the underlying disease.

<sup>a</sup> Fatal cases have been reported in completed or ongoing clinical studies.

<sup>b</sup> Frequencies of laboratory terms reflect the proportion of patients who experienced a worsening from baseline in laboratory measurements. See "Description of selected adverse reactions; laboratory abnormalities" below.

<sup>c</sup> Rash is a composite term which includes rash maculopapular, rash erythematous, rash pruritic, rash follicular, rash macular, rash morbilliform, rash papular, rash pustular, rash vesicular, exfoliative rash, dermatitis, dermatitis acneiform, dermatitis allergic, dermatitis atopic, dermatitis bullous, dermatitis exfoliative, dermatitis psoriasiform, drug eruption and pemphigoid.

<sup>d</sup> Reported also in studies outside the pooled dataset. The frequency is based on the program-wide exposure.

<sup>e</sup> Musculoskeletal pain is a composite term which includes back pain, bone pain, musculoskeletal chest pain, musculoskeletal discomfort, myalgia, myalgia intercostal, neck pain, pain in extremity, and spinal pain.

<sup>f</sup> Post-marketing event (also see section 4.4).

<sup>g</sup> Reported in clinical studies and in the post-marketing setting.

<sup>h</sup> Pericardial disorders is a composite term which includes pericarditis, pericardial effusion, cardiac tamponade, and Dressler's syndrome.

<sup>i</sup> Anaemia is a composite term which includes, among other causes, haemolytic anaemia and autoimmune anaemia, haemoglobin decreased, iron deficiency anaemia and red blood cell count decreased.

<sup>j</sup> Includes adrenal insufficiency, adrenocortical insufficiency acute, and secondary adrenocortical insufficiency.

<sup>k</sup> Includes encephalitis and limbic encephalitis.

<sup>l</sup> Oedema is a composite term which includes generalised oedema, oedema peripheral, peripheral swelling and swelling.

## Nivolumab in combination with other therapeutic agents (see section 4.2)

### Summary of the safety profile

When nivolumab is administered in combination, refer to the SmPC for the other therapeutic agents for additional information on the safety profile, prior to initiation of treatment.

### Nivolumab in combination with ipilimumab (with or without chemotherapy)

In the pooled dataset of nivolumab administered in combination with ipilimumab (with or without chemotherapy) across tumour types (n = 2094) with minimum follow-up ranging from 6 to 47 months,

the most frequent adverse reactions ( $\geq 10\%$ ) were fatigue (50%), rash (38%), diarrhoea (37%), nausea (31%), pruritus (29%), musculoskeletal pain (28%), pyrexia (25%), cough (24%), decreased appetite (23%), vomiting (20%), dyspnoea (19%), constipation (19%), arthralgia (19%), abdominal pain (18%), hypothyroidism (16%), headache (16%), upper respiratory tract infection (15%), oedema (13%), and dizziness (11%). The incidence of Grade 3-5 adverse reactions was 67% for nivolumab in combination with ipilimumab (with or without chemotherapy), with 0.7% fatal adverse reactions attributed to study drug. Among patients treated with nivolumab 1 mg/kg in combination with ipilimumab 3 mg/kg, fatigue (62%), rash (57%), diarrhoea (52%), nausea (42%), pruritus (40%), pyrexia (36%), and headache (26%) were reported at an incidence rate  $\geq 10\%$  higher than the rates reported in the pooled dataset of nivolumab in combination with ipilimumab (with or without chemotherapy) incidence rate. Among patients treated with nivolumab 360 mg in combination with ipilimumab 1 mg/kg and chemotherapy, anaemia (32%) and neutropaenia (15%) were reported at an incidence rate  $\geq 10\%$  higher than the rates reported in the pooled dataset of nivolumab in combination with ipilimumab (with or without chemotherapy) incidence rate.

#### *Nivolumab in combination with chemotherapy*

In the pooled dataset of nivolumab 240 mg every 2 weeks or 360 mg every 3 weeks in combination with chemotherapy across tumour types (n = 1092), with a minimum follow-up ranging from 12.1 to 20 months for gastric, GEJ or oesophageal adenocarcinoma, or OSCC, the most frequent adverse reactions ( $\geq 10\%$ ) were nausea (53%), peripheral neuropathy (43%), fatigue (41%), diarrhoea (37%), decreased appetite (35%), constipation (30%), vomiting (29%), stomatitis (25%), abdominal pain (23%), pyrexia (19%), rash (17%), musculoskeletal pain (17%), cough (14%), oedema (including peripheral oedema) (14%), hypoalbuminaemia (13%), headache (10%). Incidences of Grade 3-5 adverse reactions were 76% for nivolumab in combination with chemotherapy and 62% for chemotherapy alone, with 1.4% fatal adverse reactions attributed to nivolumab in combination with chemotherapy. Median duration of therapy was 6.44 months (95% CI: 5.95, 6.80) for nivolumab in combination with chemotherapy and 4.34 months (95% CI: 4.04, 4.70) for chemotherapy for gastric, GEJ or oesophageal adenocarcinoma, or OSCC.

#### *Nivolumab in combination with cabozantinib*

In the dataset of nivolumab 240 mg every 2 weeks in combination with cabozantinib 40 mg once daily in RCC (n = 320), with a minimum follow-up of 16.0 months, the most frequent adverse reactions ( $\geq 10\%$ ) were diarrhoea (64.7%), fatigue (51.3%), palmar-plantar erythrodysesthesia syndrome (40.0%), stomatitis (38.8%), musculoskeletal pain (37.5%), hypertension (37.2%), rash (36.3%), hypothyroidism (35.6%), decreased appetite (30.3%), nausea (28.8%), abdominal pain (25.0%), dysgeusia (23.8%), upper respiratory tract infection (20.6%), cough (20.6%), pruritus (20.6%), arthralgia (19.4%), vomiting (18.4%), dysphonia (17.8%), headache (16.3%), dyspepsia (15.9%), dizziness (14.1%), constipation (14.1%), pyrexia (14.1%), oedema (13.4%), muscle spasm (12.2%), dyspnoea (11.6%), proteinuria (10.9%) and hyperthyroidism (10.0%). The incidence of Grade 3-5 adverse reactions was 78%, with 0.3% fatal adverse reactions attributed to study drug.

#### *Tabulated summary of adverse reactions*

Adverse reactions reported in the pooled dataset for patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy) (n = 2094), nivolumab in combination with chemotherapy (n = 1092), and nivolumab in combination with cabozantinib (n = 320) are presented in Table 7. These reactions are presented by system organ class and by frequency. Frequencies are defined as: very common ( $\geq 1/10$ ); common ( $\geq 1/100$  to  $< 1/10$ ); uncommon ( $\geq 1/1,000$  to  $< 1/100$ ); rare ( $\geq 1/10,000$  to  $< 1/1,000$ ), not known (cannot be estimated from available post-marketing data). Within each frequency grouping, adverse reactions are presented in the order of decreasing seriousness.

**Table 7: Adverse reactions with nivolumab in combination with other therapeutic agents**

	Combination with ipilimumab (with or without chemotherapy)	Combination with chemotherapy	Combination with cabozantinib
<b>Infections and infestations</b>			
Very common	upper respiratory tract infection		upper respiratory tract infection
Common	pneumonia, bronchitis, conjunctivitis	upper respiratory tract infection, pneumonia <sup>a</sup>	pneumonia
Rare	aseptic meningitis		
<b>Blood and lymphatic system disorders</b>			
Very common	anaemia <sup>b,i</sup> , thrombocytopaenia <sup>b</sup> , leucopenia <sup>b</sup> , lymphopaenia <sup>b</sup> , neutropaenia <sup>b</sup>	neutropaenia <sup>b</sup> , anaemia <sup>b,i</sup> , leucopenia <sup>b</sup> , lymphopaenia <sup>b</sup> , thrombocytopaenia <sup>b</sup>	anaemia <sup>b</sup> , thrombocytopaenia <sup>b</sup> , leucopenia <sup>b</sup> , lymphopaenia <sup>b</sup> , neutropaenia <sup>b</sup>
Common	eosinophilia	febrile neutropaenia <sup>a</sup>	eosinophilia
Uncommon	febrile neutropaenia	eosinophilia	
Not known	haemophagocytic lymphohistiocytosis		
<b>Immune system disorders</b>			
Common	infusion related reaction, hypersensitivity	hypersensitivity, infusion related reaction	hypersensitivity (including anaphylactic reaction)
Uncommon			infusion related hypersensitivity reaction
Rare	sarcoidosis		
Not known	solid organ transplant rejection <sup>f</sup>		
<b>Endocrine disorders</b>			
Very common	hypothyroidism		hypothyroidism, hyperthyroidism
Common	hyperthyroidism, thyroiditis, adrenal insufficiency, hypophysitis, hypopituitarism, diabetes mellitus	hypothyroidism, hyperthyroidism, adrenal insufficiency	adrenal insufficiency
Uncommon	diabetic ketoacidosis	hypopituitarism, diabetes mellitus	hypophysitis, thyroiditis
Rare	hypoparathyroidism	hypophysitis	
<b>Metabolism and nutrition disorders</b>			
Very common	decreased appetite, hyperglycaemia <sup>b</sup> , hypoglycaemia <sup>b</sup>	decreased appetite, hypoalbuminaemia, hyperglycaemia <sup>b</sup> , hypoglycaemia <sup>b</sup>	decreased appetite, hypoglycaemia <sup>b</sup> , hyperglycaemia <sup>b</sup> , weight decreased
Common	dehydration, hypoalbuminaemia, hypophosphataemia, weight decreased	hypophosphataemia	dehydration
Uncommon	metabolic acidosis		
Rare		tumour lysis syndrome	
Not known	tumour lysis syndrome <sup>g</sup>		
<b>Nervous system disorders</b>			
Very common	headache, dizziness	peripheral neuropathy, headache	dysgeusia, dizziness, headache
Common	peripheral neuropathy	paraesthesia, dizziness	peripheral neuropathy

Uncommon	polyneuropathy, peroneal nerve palsy, autoimmune neuropathy (including facial and abducens nerve paresis), encephalitis, myasthenia gravis		encephalitis autoimmune, Guillain-Barré syndrome, myasthenic syndrome
Rare	Guillain-Barré syndrome, neuritis	Guillain-Barré syndrome, encephalitis	
<b>Ear and labyrinth disorders</b>			
Common			tinnitus
<b>Eye disorders</b>			
Common	blurred vision, dry eye	dry eye, blurred vision	dry eye, blurred vision
Uncommon	uveitis, episcleritis	uveitis	uveitis
Rare	Vogt-Koyanagi-Harada syndrome		
<b>Cardiac disorders</b>			
Common	tachycardia, atrial fibrillation	tachycardia	atrial fibrillation, tachycardia
Uncommon	myocarditis <sup>a</sup> , arrhythmia (including ventricular arrhythmia) <sup>a</sup> , bradycardia	myocarditis	myocarditis
Not known	pericardial disorders <sup>h</sup>		
<b>Vascular disorders</b>			
Very common			hypertension
Common	hypertension	thrombosis <sup>a,j</sup> , hypertension	thrombosis <sup>j</sup>
<b>Respiratory, thoracic and mediastinal disorders</b>			
Very common	cough, dyspnoea	cough	dysphonia, dyspnoea, cough
Common	pneumonitis <sup>a</sup> , pulmonary embolism <sup>a</sup> , pleural effusion	pneumonitis <sup>a</sup> , dyspnoea	pneumonitis, pulmonary embolism, pleural effusion, epistaxis
<b>Gastrointestinal disorders</b>			
Very common	diarrhoea, vomiting, nausea, abdominal pain, constipation	diarrhoea <sup>a</sup> , stomatitis, vomiting, nausea, abdominal pain, constipation	diarrhoea, vomiting, nausea, constipation, stomatitis, abdominal pain, dyspepsia
Common	colitis <sup>a</sup> , pancreatitis, stomatitis, gastritis, dry mouth	colitis, dry mouth	colitis, gastritis, oral pain, dry mouth, haemorrhoids
Uncommon	duodenitis	pancreatitis	pancreatitis, small intestine perforation <sup>a</sup> , glossodynia
Rare	intestinal perforation <sup>a</sup>		
<b>Hepatobiliary disorders</b>			
Common	hepatitis		hepatitis
Uncommon		hepatitis	
<b>Skin and subcutaneous tissue disorders</b>			
Very common	rash <sup>c</sup> , pruritus	rash <sup>c</sup>	palmar-plantar erythrodysesthesia syndrome, rash <sup>c</sup> , pruritus



Common	alopecia, vitiligo, urticaria, dry skin, erythema,	palmar-plantar erythrodysesthesia syndrome, pruritus, skin hyperpigmentation, alopecia, dry skin, erythema	alopecia, dry skin, erythema, hair colour change
Uncommon	Stevens-Johnson syndrome, erythema multiforme, psoriasis		psoriasis, urticaria
Rare	toxic epidermal necrolysis <sup>a,d</sup> , lichen sclerosus, other lichen disorders		
Not known			lichen sclerosus, other lichen disorders
<b>Musculoskeletal and connective tissue disorders</b>			
Very common	musculoskeletal pain <sup>e</sup> , arthralgia	musculoskeletal pain <sup>e</sup>	musculoskeletal pain <sup>e</sup> , arthralgia, muscle spasm
Common	muscle spasms, muscular weakness, arthritis	arthralgia, muscular weakness	arthritis
Uncommon	polymyalgia rheumatica, myopathy, myositis (including polymyositis) <sup>a</sup>		myopathy, osteonecrosis of the jaw, fistula
Rare	spondyloarthritis, Sjogren's syndrome, rhabdomyolysis <sup>a</sup>		
<b>Renal and urinary disorders</b>			
Very common			proteinuria
Common	renal failure (including acute kidney injury) <sup>a</sup>	renal failure <sup>a</sup>	renal failure, acute kidney injury
Uncommon	tubulointerstitial nephritis, nephritis	cystitis noninfective	nephritis
Rare	cystitis noninfective	nephritis	cystitis noninfective <sup>g</sup>
<b>General disorders and administration site conditions</b>			
Very common	fatigue, pyrexia, oedema (including peripheral oedema)	fatigue, pyrexia, oedema (including peripheral oedema)	fatigue, pyrexia, oedema
Common	chest pain, pain, chills		pain, chest pain
<b>Investigations</b>			
Very common	increased alkaline phosphatase <sup>b</sup> , increased AST <sup>b</sup> , increased ALT <sup>b</sup> , increased total bilirubin <sup>b</sup> , increased creatinine <sup>b</sup> , increased amylase <sup>b</sup> , increased lipase <sup>b</sup> , hyponatraemia <sup>b</sup> , hyperkalaemia <sup>b</sup> , hypokalaemia <sup>b</sup> , hypercalcaemia <sup>b</sup> , hypocalcaemia <sup>b</sup>	hypocalcaemia <sup>b</sup> , increased transaminases <sup>b</sup> , hyponatraemia <sup>b</sup> , increased amylase, hypomagnesaemia <sup>b</sup> , increased alkaline phosphatase <sup>b</sup> , hypokalaemia <sup>b</sup> , increased creatinine <sup>b</sup> , increased lipase, hyperkalaemia <sup>b</sup> , increased total bilirubin <sup>b</sup> , hypernatraemia <sup>b</sup>	increased alkaline phosphatase <sup>b</sup> , increased ALT <sup>b</sup> , increased AST <sup>b</sup> , increased total bilirubin <sup>b</sup> , increased creatinine <sup>b</sup> , increased amylase <sup>b</sup> , increased lipase <sup>b</sup> , hypokalaemia <sup>b</sup> , hypomagnesaemia <sup>b</sup> , hyponatraemia <sup>b</sup> , hypocalcaemia <sup>b</sup> , hypercalcaemia <sup>b</sup> , hypophosphataemia <sup>b</sup> , hyperkalaemia <sup>b</sup> , hypermagnesaemia <sup>b</sup> , hypernatraemia <sup>b</sup>

Common	hypernatraemia <sup>b</sup> , hypermagnesaemia <sup>b</sup> , increased thyroid stimulating hormone, increased gamma- glutamyltransferase	hypercalcaemia <sup>b</sup> , hypermagnesaemia <sup>b</sup>	blood cholesterol increased, hypertriglyceridaemia
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Adverse reaction frequencies presented in Table 7 may not be fully attributable to nivolumab alone or in combination with other therapeutic agents, but may contain contributions from the underlying disease or from medicinal product used in combination.

<sup>a</sup> Fatal cases have been reported in completed or ongoing clinical studies.

<sup>b</sup> Frequencies of laboratory terms reflect the proportion of patients who experienced a worsening from baseline in laboratory measurements. See “Description of selected adverse reactions; laboratory abnormalities” below.

<sup>c</sup> Rash is a composite term which includes maculopapular rash, rash erythematous, rash pruritic, rash follicular, rash macular, rash morbilliform, rash papular, rash pustular, rash papulosquamous, rash vesicular, rash generalised, exfoliative rash, dermatitis, dermatitis acneiform, dermatitis allergic, dermatitis atopic, dermatitis bullous, dermatitis exfoliative, dermatitis psoriasiform, drug eruption, nodular rash, and pemphigoid.

<sup>d</sup> Reported also in studies outside the pooled dataset. The frequency is based on the program-wide exposure.

<sup>e</sup> Musculoskeletal pain is a composite term which includes back pain, bone pain, musculoskeletal chest pain, musculoskeletal discomfort, myalgia, myalgia intercostal, neck pain, pain in extremity, and spinal pain.

<sup>f</sup> Post-marketing event (also see section 4.4).

<sup>g</sup> Reported in clinical studies and in the post-marketing setting.

<sup>h</sup> Pericardial disorders is a composite term which includes pericarditis, pericardial effusion, cardiac tamponade, and Dressler’s syndrome.

<sup>i</sup> Anaemia is a composite term which includes, among other causes, haemolytic anaemia and autoimmune anaemia, haemoglobin decreased, iron deficiency anaemia and red blood cell count decreased.

<sup>j</sup> Thrombosis is a composite term which includes portal vein thrombosis, pulmonary vein thrombosis, pulmonary thrombosis, aortic thrombosis, arterial thrombosis, deep vein thrombosis, pelvic vein thrombosis, vena cava thrombosis, venous thrombosis, limb venous thrombosis.

#### Description of selected adverse reactions

Nivolumab or nivolumab in combination with other therapeutic agents is associated with immune-related adverse reactions. With appropriate medical therapy, immune-related adverse reactions resolved in most cases. Permanent discontinuation of treatment generally was required in a greater proportion of patients receiving nivolumab in combination with other agents than in those receiving nivolumab monotherapy. Table 8 presents the percentage of patients with immune-related adverse reactions who were permanently discontinued from treatment by dosing regimen. Additionally, for patients who experienced an event, Table 8 presents the percentage of patients who required high-dose corticosteroids (at least 40 mg daily prednisone equivalents) by dosing regimen. The management guidelines for these adverse reactions are described in section 4.4.

**Table 8: Immune-related adverse reactions leading to permanent discontinuation or requiring high-dose corticosteroids by dosing regimen (nivolumab monotherapy, nivolumab in combination with ipilimumab (with or without chemotherapy), nivolumab in combination with chemotherapy, or nivolumab in combination with cabozantinib)**

	Nivolumab monotherapy %	Nivolumab in combination with ipilimumab (with or without chemotherapy) %	Nivolumab in combination with chemotherapy %	Nivolumab in combination with cabozantinib %
<b>Immune-related adverse reaction leading to permanent discontinuation</b>				
Pneumonitis	1.5	2.5	2.4	2.5
Colitis	1.0	6	2.5	2.5
Hepatitis	0.9	5	1.1	4.1
Nephritis and renal dysfunction	0.3	1.2	3.3	0.6
Endocrinopathies	0.3	2.0	0.5	1.3
Skin	0.6	1.0	1.0	2.2
Hypersensitivity/Infusion reaction	0.1	0.3	2.5	0
<b>Immune-related adverse reaction requiring high-dose corticosteroids<sup>a,b</sup></b>				
Pneumonitis	65	59	59	56
Colitis	14	32	8	8
Hepatitis	20	37	8	23
Nephritis and renal dysfunction	22	27	10	9
Endocrinopathies	6	20	6	4.2
Skin	4	8	6	8
Hypersensitivity/Infusion reaction	18	16	24	0

<sup>a</sup> at least 40 mg daily prednisone equivalents

<sup>b</sup> frequency is based on the number of patients who experienced the immune-related adverse reaction

#### *Immune-related pneumonitis*

In patients treated with nivolumab monotherapy, the incidence of pneumonitis, including interstitial lung disease and lung infiltration, was 3.6% (147/4122). The majority of cases were Grade 1 or 2 in severity reported in 0.9% (38/4122) and 1.8% (74/4122) of patients respectively. Grade 3 and 4 cases were reported in 0.8% (32/4122) and <0.1% (1/4122) of patients respectively. Six patients (0.1%) had a fatal outcome. Median time to onset was 14.4 weeks (range: 0.7-85.1). Resolution occurred in 100 patients (68.0%) with a median time to resolution of 6.6 weeks (range: 0.1<sup>+</sup>-109.1<sup>+</sup>); <sup>+</sup> denotes a censored observation.

In patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy), the incidence of pneumonitis including interstitial lung disease, was 6.9% (145/2094). Grade 2, Grade 3, and Grade 4 cases were reported in 3.5% (73/2094), 1.1% (24/2094), and 0.4% (8/2094) of patients, respectively. Four patients (0.2%) had a fatal outcome. Median time to onset was 2.7 months (range: 0.1-56.8). Resolution occurred in 119 patients (82.1%) with a median time to resolution of 6.1 weeks (range: 0.3-149.3<sup>+</sup>).

In patients treated with nivolumab in combination with chemotherapy, the incidence of pneumonitis including interstitial lung disease was 5.4% (59/1092). Grade 2, Grade 3, and Grade 4 cases were reported in 2.7% (29/1092), 1.2% (13/1092), and 0.3% (3/1092), of patients, respectively. Two

patients (0.2%) had a fatal outcome. Median time to onset was 24.1 weeks (range: 1.6-96.9). Resolution occurred in 40 patients (67.8%) with a median time to resolution of 10.4 weeks (range: 0.3<sup>+</sup>-121.3<sup>+</sup>).

In patients treated with nivolumab in combination with cabozantinib, the incidence of pneumonitis including interstitial lung disease was 5.6% (18/320). Grade 2 and Grade 3 cases were reported in 1.9% (6/320) and 1.6% (5/320) of patients, respectively. Median time to onset was 26.9 weeks (range: 12.3-74.3 weeks). Resolution occurred in 14 patients (77.8%) with a median time to resolution of 7.5 weeks (range: 2.1-60.7<sup>+</sup> weeks).

#### Immune-related colitis

In patients treated with nivolumab monotherapy, the incidence of diarrhoea, colitis, or frequent bowel movements was 15.3% (631/4122). The majority of cases were Grade 1 or 2 in severity reported in 9.9% (409/4122) and 3.9% (160/4122) of patients respectively. Grade 3 and 4 cases were reported in 1.5% (61/4122) and <0.1% (1/4122) of patients respectively. Median time to onset was 7.9 weeks (range: 0.1-115.6). Resolution occurred in 565 patients (90.5%) with a median time to resolution of 2.4 weeks (range: 0.1-124.4<sup>+</sup>).

In patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy), the incidence of diarrhoea or colitis was 27.7% (580/2094). Grade 2, Grade 3, and Grade 4 cases were reported in 8.8% (184/2094), 6.8% (142/2094), and 0.1% (3/2094), of patients, respectively. One patient (<0.1%) had a fatal outcome. Median time to onset was 1.4 months (range: 0.0-48.9). Resolution occurred in 577 patients (90.8%) with a median time to resolution of 2.7 weeks (range: 0.1-159.4<sup>+</sup>). Among patients treated with nivolumab 1 mg/kg in combination with ipilimumab 3 mg/kg, the incidence of diarrhoea or colitis was 46.7%, including Grade 2 (13.6%), Grade 3 (15.8%), and Grade 4 (0.4%).

In patients treated with nivolumab in combination with chemotherapy, the incidence of diarrhoea or colitis was 29.8% (325/1092). Grade 2, Grade 3, and Grade 4 cases were reported in 9.4% (103/1092), 4.0% (44/1092), and 0.5% (6/1092) of patients, respectively. One patient (<0.1%) had a fatal outcome. Median time to onset was 4.4 weeks (range: 0.1-93.6). Resolution occurred in 284 patients (87.7%) with a median time to resolution of 1.6 weeks (range: 0.1-117.6<sup>+</sup>).

In patients treated with nivolumab in combination with cabozantinib, the incidence of diarrhoea, colitis, frequent bowel movements or enteritis was 59.1% (189/320). Grade 2 and Grade 3 cases were reported in 25.6% (82/320) and 6.3% (20/320) of patients, respectively. Grade 4 were reported in 0.6% (2/320). Median time to onset was 12.9 weeks (range: 0.3-110.9 weeks). Resolution occurred in 143 patients (76.1%) with a median time to resolution of 12.9 weeks (range: 0.1-139.7<sup>+</sup> weeks).

#### Immune-related hepatitis

In patients treated with nivolumab monotherapy, the incidence of liver function test abnormalities was 7.4% (306/4122). The majority of cases were Grade 1 or 2 in severity reported in 4.0% (165/4122) and 1.7% (70/4122) of patients respectively. Grade 3 and 4 cases were reported in 1.4% (59/4122) and 0.3% (12/4122) of patients, respectively. Median time to onset was 10.0 weeks (range: 0.1-120.0). Resolution occurred in 240 patients (79.5%) with a median time to resolution of 6.1 weeks (range: 0.1-126.4<sup>+</sup>).

In patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy), the incidence of liver function test abnormalities was 19.2% (402/2094). Grade 2, Grade 3, and Grade 4 cases were reported in 4.2% (88/2094), 7.8% (163/2094), and 1.2% (25/2094) of patients,

respectively. Median time to onset was 1.9 months (range: 0.0-36.6). Resolution occurred in 351 patients (87.8%) with a median time to resolution of 5.3 weeks (range: 0.1-175.9<sup>+</sup>). Among patients treated with nivolumab 1 mg/kg in combination with ipilimumab 3 mg/kg, the incidence of liver function test abnormalities was 30.1% including Grade 2 (6.9%), Grade 3 (15.8%), and Grade 4 (1.8%).

In patients treated with nivolumab in combination with chemotherapy, the incidence of liver function test abnormalities was 21.6% (236/1092). Grade 2, Grade 3 and Grade 4 cases were reported in 7.1% (77/1092), 3.2% (35/1092) and < 0.1% (1/1092) of patients, respectively. Median time to onset was 7.9 weeks (range: 0.1-84.1). Resolution occurred in 185 patients (79.7%) with a median time to resolution of 9.1 weeks (range: 0.4-150.6<sup>+</sup>).

In patients treated with nivolumab in combination with cabozantinib, the incidence of liver function test abnormalities was 41.6% (133/320). Grade 2, Grade 3, and Grade 4 cases were reported in 14.7% (47/320), 10.3% (33/320), and 0.6% (2/320) of patients, respectively. Median time to onset was 8.3 weeks (range: 0.1-107.9 weeks). Resolution occurred in 101 patients (75.9%) with a median time to resolution of 9.6 weeks (range: 0.1-89.3<sup>+</sup> weeks).

#### Immune-related nephritis and renal dysfunction

In patients treated with nivolumab monotherapy, the incidence of nephritis or renal dysfunction was 2.7% (112/4122). The majority of cases were Grade 1 or 2 in severity reported in 1.6% (66/4122) and 0.7% (28/4122) of patients respectively. Grade 3 and 4 cases were reported in 0.4% (17/4122) and <0.1% (1/4122) of patients, respectively. Median time to onset was 11.3 weeks (range: 0.1-79.1). Resolution occurred in 74 patients (69.2%) with a median time to resolution of 8.0 weeks (range: 0.3-79.1<sup>+</sup>).

In patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy), the incidence of nephritis or renal dysfunction was 6.1% (128/2094). Grade 2, Grade 3, and Grade 4 cases were reported in 2.3% (49/2094), 1.0% (20/2094), and 0.5% (10/2094) of patients, respectively. Two patients (<0.1%) had a fatal outcome. Median time to onset was 2.5 months (range: 0.0-34.8). Resolution occurred in 97 patients (75.8%) with a median time to resolution of 6.3 weeks (range: 0.1-172.1<sup>+</sup>).

In patients treated with nivolumab in combination with chemotherapy, the incidence of nephritis or renal dysfunction was 9.1% (99/1092). Grade 2, Grade 3, and Grade 4 cases were reported in 3.7% (40/1092), 1.1% (12/1092), and 0.2% (2/1092) of patients, respectively. One patient (<0.1%) had a fatal outcome. Median time to onset was 11.3 weeks (range: 0.7-60.7). Resolution occurred in 62 patients (62.6%) with a median time to resolution of 11.7 weeks (range: 0.1-135.1<sup>+</sup>).

In patients treated with nivolumab in combination with cabozantinib, the incidence of nephritis, immune mediated nephritis, renal failure, acute kidney injury, blood creatinine increased or blood urea increased was 10.0% (32/320). Grade 2 and Grade 3 cases were reported in 3.4% (11/320), and 1.3% (4/320) of patients, respectively. Median time to onset was 14.2 weeks (range: 2.1-87.1 weeks). Resolution occurred in 18 patients (58.1%) with a median time to resolution of 10.1 weeks (range: 0.6-90.9<sup>+</sup> weeks).

#### Immune-related endocrinopathies

In patients treated with nivolumab monotherapy, the incidence of thyroid disorders, including hypothyroidism or hyperthyroidism, was 12.5% (516/4122). The majority of cases were Grade 1 or 2 in severity reported in 6.1% (253/4122) and 6.2% (256/4122) of patients, respectively. Grade 3 thyroid disorders were reported in 0.2% (7/4122) of patients. Hypophysitis (3 Grade 1, 5 Grade 2, 7 Grade 3, and 1 Grade 4), hypopituitarism (5 Grade 2 and 1 Grade 3), adrenal insufficiency (including secondary adrenocortical insufficiency and adrenocortical insufficiency acute) (1 Grade 1, 17 Grade 2, and 8 Grade 3), diabetes mellitus (including Type 1 diabetes mellitus, and diabetic ketoacidosis)

(1 Grade 1, 4 Grade 2 and 5 Grade 3 and 2 Grade 4), were reported. Median time to onset of these endocrinopathies was 11.1 weeks (range: 0.1-126.7). Resolution occurred in 278 patients (49.8%). Median time to resolution was 44.1 weeks (range: 0.4-204.4<sup>+</sup>).

In patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy), the incidence of thyroid disorders was 22.9% (479/2094). Grade 2 and Grade 3 thyroid disorders were reported in 12.5% (261/2094) and 1.0% (21/2094) of patients, respectively.

Grade 2 and Grade 3 hypophysitis (including lymphocytic hypophysitis) occurred in 2.0% (42/2094) and 1.6% (33/2094) of patients, respectively. Grade 2 and Grade 3 hypopituitarism occurred in 0.8% ((16/2094)) and 0.5% ((11/2094)) of patients, respectively. Grade 2, Grade 3, and Grade 4 adrenal insufficiency (including secondary adrenocortical insufficiency) occurred in 2.3% (49/2094), 1.5% (32/2094) and 0.2% (4/2094) of patients, respectively. Grade 1, Grade 2, Grade 3, and Grade 4 diabetes mellitus occurred in 0.1% (1/2094), 0.2% (4/2094), <0.1% (1/2094), and 0.1 (3/2094) of patients, respectively, and Grade 4 diabetic ketoacidosis was reported in <0.1% (2/2094) of patients. Median time to onset of these endocrinopathies was 2.1 months (range: 0.0-28.1). Resolution occurred in 201 patients (40.7%). Time to resolution ranged from 0.3 to 257.1<sup>+</sup> weeks.

In patients treated with nivolumab in combination with chemotherapy, the incidence of thyroid disorders was 11.7% (128/1092). Grade 2 thyroid disorder was reported in 5.5% (60/1092) patients. Grade 3 hypophysitis occurred in < 0.1% (1/1092) of patients. Grade 2 and Grade 3 hypopituitarism occurred in 0.3% (3/1092) and 0.3% (3/1092) of patients, respectively. Grade 2, Grade 3 and Grade 4 adrenal insufficiency occurred in 0.7% (8/1092), 0.2% (2/1092) and <0.1% (1/1092) of patients, respectively. Diabetes mellitus including Type 1 diabetes mellitus and fulminant Type 1 diabetes mellitus (1 Grade 2, 2 Grade 3 and 1 Grade 4), and diabetic ketoacidosis (1 Grade 4) were reported. Median time to onset of these endocrinopathies was 14.3 weeks (range: 2.0-124.3). Resolution occurred in 56 patients (38.9%). Time to resolution ranged from 0.4 to 155.7<sup>+</sup> weeks.

In patients treated with nivolumab in combination with cabozantinib, the incidence of thyroid disorders was 43.1% (138/320). Grade 2 and Grade 3 thyroid disorders were reported in 23.1% (74/320) and 0.9% (3/320) of patients, respectively. Hypophysitis occurred in 0.6% (2/320) of patients, all Grade 2. Adrenal insufficiency (including secondary adrenocortical insufficiency) occurred in 4.7% (15/320) of patients. Grade 2 and Grade 3 adrenal insufficiency cases were reported in 2.2% (7/320) and 1.9% (6/320) of patients, respectively. Median time to onset of these endocrinopathies was 12.3 weeks (range: 2.0-89.7 weeks). Resolution occurred in 50 patients (35.2%). Time to resolution ranged from 0.9 to 132.0<sup>+</sup> weeks.

#### Immune-related skin adverse reactions

In patients treated with nivolumab monotherapy, the incidence of rash was 29.5% (1215/4122). The majority of cases were Grade 1 in severity reported in 22.4% (924/4122) of patients. Grade 2 and Grade 3 cases were reported in 5.7% (235/4122) and 1.4% (56/4122) of patients respectively. Median time to onset was 6.3 weeks (range: 0.1-121.1). Resolution occurred in 779 patients (64.6%) with a median time to resolution of 18.1 weeks (0.1-192.7<sup>+</sup>).

In patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy), the incidence of rash was 46.2% (968/2094). Grade 2, Grade 3, and Grade 4 cases were reported in 14.1% (296/2094), 4.6% (97/2094), and <0.1% (2/2094) of patients, respectively. Median time to onset was 0.7 months (range: 0.0-33.8). Resolution occurred in 671 patients (69.6%) with a median time to resolution of 11.1 weeks (range: 0.1-268.7<sup>+</sup>). Among patients treated with nivolumab 1 mg/kg in combination with ipilimumab 3 mg/kg, the incidence of rash was 65.2%, including Grade 2 (20.3%) and Grade 3 (7.8%).

In patients treated with nivolumab in combination with chemotherapy, the incidence of rash was 24.5% (267/1092). Grade 2 and Grade 3 cases were reported in 6.4% (70/1092), and 2.5% (27/1092)

of patients, respectively. Median time to onset was 9.1 weeks (range: 0.1-97.4). Resolution occurred in 166 patients (62.2%) with a median time to resolution of 19.1 weeks (range: 0.1-188.1<sup>+</sup>).

In patients treated with nivolumab in combination with cabozantinib, the incidence of rash was 62.8% (201/320). Grade 2 and Grade 3 cases were reported in 23.1% (74/320) and 10.6% (34/320) of patients, respectively. Median time to onset was 6.14 weeks (range: 0.1-104.4 weeks). Resolution occurred in 137 patients (68.2%) with a median time to resolution of 18.1 weeks (range: 0.1-130.6<sup>+</sup> weeks).

Rare cases of SJS and TEN some of them with fatal outcome have been observed (see sections 4.2 and 4.4).

#### Infusion reactions

In patients treated with nivolumab monotherapy, the incidence of hypersensitivity/infusion reactions was 3.9% (160/4122), including 9 Grade 3 and 3 Grade 4 cases.

In patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy), the incidence of hypersensitivity/infusion reactions was 4.9% (103/2094). Grade 1, Grade 2, Grade 3, and Grade 4 cases were reported in 2.1% (44/2094), 2.5% (53/2094), 0.2% (5/2094), and <0.1% (1/2094) of patients, respectively. Among patients with MPM treated with nivolumab 3 mg/kg in combination with ipilimumab 1 mg/kg, the incidence of hypersensitivity/infusion reactions was 12%.

In patients treated with nivolumab in combination with chemotherapy, the incidence of hypersensitivity/infusion reactions was 10.6% (116/1092). Grade 2, Grade 3, and Grade 4 cases were reported in 6.5% (71/1092), 1.4% (15/1092) and 0.2% (2/1092) of patients, respectively.

In patients treated with nivolumab in combination with cabozantinib, the incidence of hypersensitivity/infusion reactions was 2.5% (8/320). All 8 patients were Grade 1 or 2 in severity. Grade 2 cases were reported in 0.3% (1/320) of patients.

#### Complications of allogeneic HSCT in classical Hodgkin lymphoma

Rapid onset of GVHD has been reported with nivolumab use before and after allogeneic HSCT (see section 4.4).

In 62 evaluated patients from two cHL studies who underwent allogeneic HSCT after discontinuing nivolumab monotherapy, Grade 3 or 4 acute GVHD was reported in 17/62 patients (27.4%). Hyperacute GVHD, defined as acute GVHD occurring within 14 days after stem cell infusion, was reported in four patients (6%). A steroid-requiring febrile syndrome, without an identified infectious cause, was reported in six patients (12%) within the first 6 weeks post-transplantation. Steroids were used in four patients and three patients responded to steroids. Hepatic veno-occlusive disease occurred in two patients, one of whom died of GVHD and multi-organ failure. Nineteen of 62 patients (30.6%) died from complications of allogeneic HSCT after nivolumab. The 62 patients had a median follow-up from subsequent allogeneic HSCT of 38.5 months (range: 0-68 months).

#### Elevated liver enzymes when nivolumab is combined with cabozantinib in RCC

In a clinical study of previously untreated patients with RCC receiving nivolumab in combination with cabozantinib, a higher incidence of Grades 3 and 4 ALT increased (10.1%) and AST increased (8.2%) were observed relative to nivolumab monotherapy in patients with advanced RCC. In patients with Grade  $\geq 2$  increased ALT or AST (n=85): median time to onset was 10.1 weeks (range: 2.0 to 106.6 weeks), 26% received corticosteroids for median duration of 1.4 weeks (range: 0.9 to 75.3 weeks), and resolution to Grades 0-1 occurred in 91% with median time to resolution of 2.3 weeks (range: 0.4 to 108.1<sup>+</sup> weeks). Among the 45 patients with Grade  $\geq 2$  increased ALT or AST who were rechallenged with either nivolumab (n=10) or cabozantinib (n=10) administered as a single agent or with both (n=25), recurrence of Grade  $\geq 2$  increased ALT or AST was observed in

3 patients receiving OPDIVO, 4 patients receiving cabozantinib, and 8 patients receiving both OPDIVO and cabozantinib.

#### Laboratory abnormalities

In patients treated with nivolumab monotherapy, the proportion of patients who experienced a shift from baseline to a Grade 3 or 4 laboratory abnormality was as follows: 3.9% for anaemia (all Grade 3), 0.7% for thrombocytopenia, 0.8% for leucopenia, 9.6% for lymphopenia, 1.0% for neutropenia, 1.9% for increased alkaline phosphatase, 2.7% for increased AST, 2.4% for increased ALT, 0.9% for increased total bilirubin, 0.7% for increased creatinine, 2.7% for hyperglycaemia, 1.2% for hypoglycaemia, 4.2% for increased amylase, 7.4% for increased lipase, 5.2% for hyponatraemia, 1.7% for hyperkalaemia, 1.4% for hypokalaemia, 1.2% for hypercalcaemia, 0.7% for hypermagnesaemia, 0.4% for hypomagnesaemia, 0.7% for hypocalcaemia, 0.9% for hypoalbuminaemia, and <0.1% for hypernatraemia.

In patients treated with nivolumab in combination with ipilimumab (with or without chemotherapy), the proportion of patients who experienced a worsening from baseline to a Grade 3 or 4 laboratory abnormality was as follows: 4.9% for anaemia, 1.5% for thrombocytopenia, 2.3% for leucopenia, 7.3% for lymphopenia, 3.4% for neutropenia, 2.9% for increased alkaline phosphatase, 7.3% for increased AST, 8.4% for increased ALT, 1.2% for increased total bilirubin, 1.6% for increased creatinine, 5.8% for hyperglycaemia, 8.4% for increased amylase, 16.7% for increased lipase, 0.8% for hypocalcaemia, 0.2% for hypernatraemia, 1.0% for hypercalcaemia, 1.9% for hyperkalaemia, 0.5% for hypermagnesaemia, 3.4% for hypokalaemia, and 9.8% for hyponatraemia. Among patients treated with nivolumab 1 mg/kg in combination with ipilimumab 3 mg/kg, a higher proportion of patients experienced a worsening from baseline to Grade 3 or 4 increased ALT (15.3%).

In patients treated with nivolumab in combination with chemotherapy, the proportion of patients who experienced a worsening from baseline to a Grade 3 or 4 laboratory abnormality was as follows: 16.3% for anaemia, 5.8% for thrombocytopenia, 11.5% leukopenia, 15.4% for lymphopenia, 26.1% neutropenia, 3.0% for increased alkaline phosphatase, 4.2% for increased AST, 3.1% for increased ALT, 2.3% for increased bilirubin, 1.4% for increased creatinine, 5.9% for increased amylase, 4.0% for increased lipase, 0.6% for hypernatraemia, 8.7% for hyponatraemia, 1.7% for hyperkalaemia, 7.4% for hypokalaemia, 1.0% for hypercalcaemia, 2.0% for hypocalcaemia, 1.5% for hypomagnesaemia, 3.1% for hyperglycaemia, and 0.6% for hypoglycaemia.

In patients treated with nivolumab in combination with cabozantinib, the proportion of patients who experienced a worsening from baseline to a Grade 3 or 4 laboratory abnormality was as follows: 3.5% for anaemia (all Grade 3), 0.3% for thrombocytopenia, 0.3% for leucopenia, 7.5% for lymphopenia, 3.5% for neutropenia, 3.2% for increased alkaline phosphatase, 8.2% for increased AST, 10.1% for increased ALT, 1.3% for increased total bilirubin, 1.3% for increased creatinine, 11.9% for increased amylase, 15.6% for increased lipase, 3.5% for hyperglycaemia, 0.8% for hypoglycaemia, 2.2% for hypocalcaemia, 0.3% for hypercalcaemia, 5.4% for hyperkalaemia, 4.2% for hypermagnesaemia, 1.9% for hypomagnesaemia 3.2% for hypokalaemia, 12.3% for hyponatraemia, and 21.2% for hypophosphataemia.

#### Immunogenicity

Of the 3529 patients who were treated with nivolumab monotherapy 3 mg/kg or 240 mg every 2 weeks and evaluable for the presence of anti-product-antibodies, 328 patients (9.3%) tested positive for treatment-emergent anti-product-antibodies with 21 patients (0.6%) testing positive for neutralising antibodies.

Co-administration with chemotherapy did not affect nivolumab immunogenicity. Of the patients who were treated with nivolumab 240 mg every 2 weeks or 360 mg every 3 weeks in combination with chemotherapy and evaluable for the presence of anti-product-antibodies, 7.5% tested positive for treatment emergent anti-product-antibodies with 0.5% tested positive for neutralising antibodies.



Of the patients who were treated with nivolumab in combination with ipilimumab and evaluable for the presence of anti-nivolumab antibodies, the incidence of anti-nivolumab antibodies was 26.0% with nivolumab 3 mg/kg and ipilimumab 1 mg/kg every 3 weeks, 24.9% with nivolumab 3 mg/kg every 2 weeks and ipilimumab 1 mg/kg every 6 weeks, and 37.8% with nivolumab 1 mg/kg and ipilimumab 3 mg/kg every 3 weeks. The incidence of neutralising antibodies against nivolumab was 0.8% with nivolumab 3 mg/kg and ipilimumab 1 mg/kg every 3 weeks, 1.5% with nivolumab 3 mg/kg every 2 weeks and ipilimumab 1 mg/kg every 6 weeks, and 4.6% with nivolumab 1 mg/kg and ipilimumab 3 mg/kg every 3 weeks. Of patients evaluable for the presence of anti-ipilimumab antibodies, the incidence of anti-ipilimumab antibodies ranged from 6.3 to 13.7% and neutralising antibodies against ipilimumab ranged from 0 to 0.4%.

Of the patients who were treated with nivolumab in combination with ipilimumab and chemotherapy and evaluable for the presence of anti-nivolumab antibodies or neutralising antibodies against nivolumab, the incidence of anti-nivolumab antibodies was 33.8% and the incidence of neutralising antibodies was 2.6%. Of the patients who were treated with nivolumab in combination with ipilimumab and chemotherapy and evaluable for the presence of anti-ipilimumab antibodies or neutralising antibodies against ipilimumab, the incidence of anti-ipilimumab antibodies was 7.5%, and the neutralising antibodies was 1.6%.

Although the clearance of nivolumab was increased by 20% when anti-nivolumab-antibodies were present, there was no evidence of loss of efficacy or altered toxicity profile in the presence of nivolumab antibodies based on the pharmacokinetic and exposure-response analyses for both monotherapy and combination.

#### Paediatric population

Only limited safety data of nivolumab as monotherapy or in combination with ipilimumab in children below 18 years of age are available (see section 5.1). No new safety signals were observed in clinical study CA209908 of 151 paediatric patients with high-grade primary central nervous system (CNS) malignancies, relative to data available in adult studies across indications.

#### Elderly

No overall differences in safety were reported between elderly ( $\geq 65$  years) and younger patients ( $< 65$  years). Data from SCCHN, adjuvant melanoma, and adjuvant OC or GEJC patients 75 years of age or older are too limited to draw conclusions on this population (see section 5.1). Data from dMMR or MSI-H CRC patients 75 years of age or older are limited (see section 5.1). Data from cHL patients 65 years of age or older are too limited to draw conclusions on this population (see section 5.1). In MPM patients, there was a higher rate of serious adverse reactions and discontinuation rate due to adverse reactions in patients 75 years of age or older (68% and 35%, respectively) relative to all patients who received nivolumab in combination with ipilimumab (54% and 28%, respectively). For patients treated with nivolumab in combination with cabozantinib, data from RCC patients 75 years of age or older are too limited to draw conclusions on this population (see section 5.1).

#### Hepatic or renal impairment

In the non-squamous NSCLC study (CA209057), the safety profile in patients with baseline renal or hepatic impairment was comparable to that in the overall population. These results should be interpreted with caution due to the small sample size within the subgroups.

#### Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via the national reporting system listed below:

HPRA Pharmacovigilance

Website: [www.hpra.ie](http://www.hpra.ie)

## 4.9 Overdose

No cases of overdose have been reported in clinical trials. In case of overdose, patients should be closely monitored for signs or symptoms of adverse reactions, and appropriate symptomatic treatment instituted immediately.

## 5. PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Antineoplastic agents, monoclonal antibodies and antibody drug conjugates, PD-1/PDL-1 (Programmed cell death protein 1/ death ligand 1) inhibitors. ATC code: L01FF01.

#### Mechanism of action

Nivolumab is a human immunoglobulin G4 (IgG4) monoclonal antibody (HuMAb), which binds to the programmed death-1 (PD-1) receptor and blocks its interaction with PD-L1 and PD-L2. The PD-1 receptor is a negative regulator of T-cell activity that has been shown to be involved in the control of T-cell immune responses. Engagement of PD-1 with the ligands PD-L1 and PD-L2, which are expressed in antigen presenting cells and may be expressed by tumours or other cells in the tumour microenvironment, results in inhibition of T-cell proliferation and cytokine secretion. Nivolumab potentiates T-cell responses, including anti-tumour responses, through blockade of PD-1 binding to PD-L1 and PD-L2 ligands. In syngeneic mouse models, blocking PD-1 activity resulted in decreased tumour growth.

Combined nivolumab (anti-PD-1) and ipilimumab (anti-CTLA-4) mediated inhibition results in improved anti-tumour responses in metastatic melanoma. In murine syngeneic tumour models, dual blockade of PD-1 and CTLA-4 resulted in synergistic anti-tumour activity.

#### Clinical efficacy and safety

Based on modelling of dose/exposure efficacy and safety relationships, there are no clinically significant differences in efficacy and safety between a nivolumab dose of 240 mg every 2 weeks or 3 mg/kg every 2 weeks. Additionally, based on these relationships, there were no clinically significant differences between a nivolumab dose of 480 mg every 4 weeks or 3 mg/kg every 2 weeks in adjuvant treatment of melanoma, advanced melanoma and advanced RCC.

#### Melanoma

##### Treatment of advanced melanoma

##### Randomised phase 3 study vs. dacarbazine (CA209066)

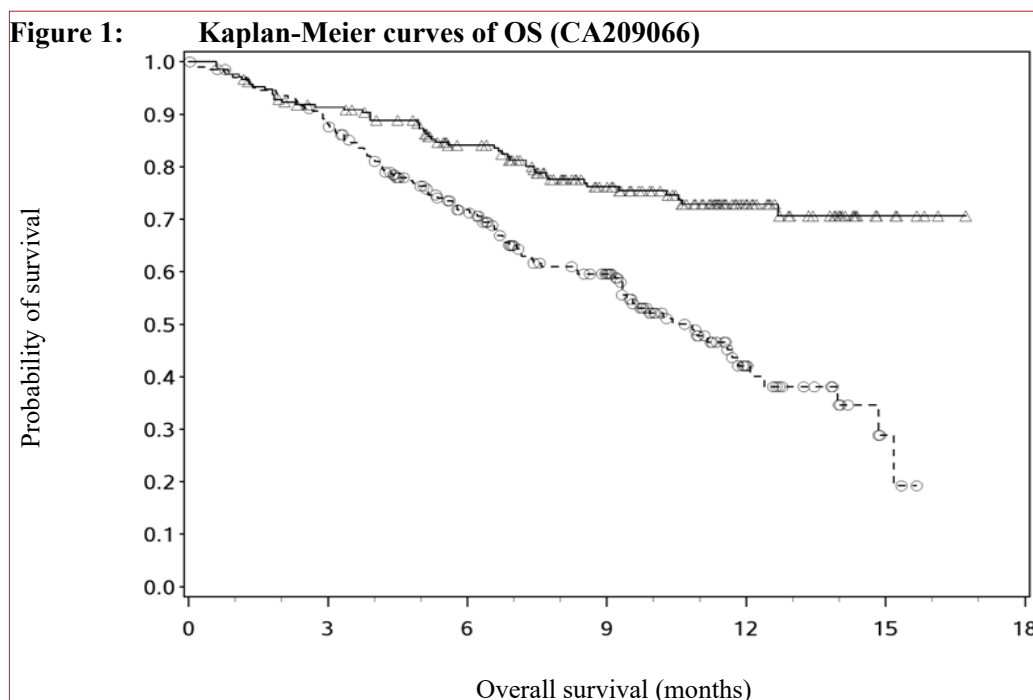
The safety and efficacy of nivolumab 3 mg/kg for the treatment of advanced (unresectable or metastatic) melanoma were evaluated in a phase 3, randomised, double-blind study (CA209066). The study included adult patients (18 years or older) with confirmed, treatment-naive, Stage III or IV BRAF wild-type melanoma and an ECOG performance-status score of 0 or 1. Patients with active autoimmune disease, ocular melanoma, or active brain or leptomeningeal metastases were excluded from the study.

A total of 418 patients were randomised to receive either nivolumab (n = 210) administered intravenously over 60 minutes at 3 mg/kg every 2 weeks or dacarbazine (n = 208) at 1000 mg/m<sup>2</sup> every 3 weeks. Randomisation was stratified by tumour PD-L1 status and M stage (M0/M1a/M1b versus M1c). Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. Treatment after disease progression was permitted for patients who had a clinical benefit and did not have substantial adverse events with the study drug, as determined by the investigator. Tumour assessments, according to the Response Evaluation Criteria in Solid Tumours

(RECIST), version 1.1, were conducted 9 weeks after randomisation and continued every 6 weeks for the first year and then every 12 weeks thereafter. The primary efficacy outcome measure was OS. Key secondary efficacy outcome measures were investigator-assessed PFS and objective response rate (ORR).

Baseline characteristics were balanced between the two groups. The median age was 65 years (range: 18-87), 59% were men, and 99.5% were white. Most patients had ECOG performance score of 0 (64%) or 1 (34%). Sixty-one percent of patients had M1c stage disease at study entry. Seventy-four percent of patients had cutaneous melanoma, and 11% had mucosal melanoma; 35% of patients had PD-L1 positive melanoma ( $\geq 5\%$  tumour cell membrane expression). Sixteen percent of patients had received prior adjuvant therapy; the most common adjuvant treatment was interferon (9%). Four percent of patients had a history of brain metastasis, and 37% of patients had a baseline LDH level greater than ULN at study entry.

The Kaplan-Meier curves for OS are shown in Figure 1.



Number of subjects at risk							
Nivolumab							
210	185	150	105	45	8	0	
Dacarbazine							
208	177	123	82	22	3	0	

—△— Nivolumab (events: 50/210), median and 95% CI: N.A.  
 - -○- - - Dacarbazine (events: 96/208), median and 95% CI: 10.84 (9.33, 12.09)

The observed OS benefit was consistently demonstrated across subgroups of patients including baseline ECOG performance status, M stage, history of brain metastases, and baseline LDH level. Survival benefit was observed regardless of whether patients had tumours that were designated PD-L1 negative or PD-L1 positive (tumour membrane expression cut off of 5% or 10%).

Data available indicate that the onset of nivolumab effect is delayed such that benefit of nivolumab above chemotherapy may take 2-3 months.

Efficacy results are shown in Table 9.

**Table 9: Efficacy results (CA209066)**

	<b>nivolumab (n = 210)</b>	<b>dacarbazine (n = 208)</b>
<b>Overall survival</b>		
Events	50 (23.8%)	96 (46.2%)
Hazard ratio		0.42
99.79% CI		(0.25, 0.73)
95% CI		(0.30, 0.60)
p-value		< 0.0001
Median (95% CI)	Not reached	10.8 (9.33, 12.09)
Rate (95% CI)		
At 6 months	84.1 (78.3, 88.5)	71.8 (64.9, 77.6)
At 12 months	72.9 (65.5, 78.9)	42.1 (33.0, 50.9)
<b>Progression-free survival</b>		
Events	108 (51.4%)	163 (78.4%)
Hazard ratio		0.43
95% CI		(0.34, 0.56)
p-value		< 0.0001
Median (95% CI)	5.1 (3.48, 10.81)	2.2 (2.10, 2.40)
Rate (95% CI)		
At 6 months	48.0 (40.8, 54.9)	18.5 (13.1, 24.6)
At 12 months	41.8 (34.0, 49.3)	NA
<b>Objective response</b>		
(95% CI)	84 (40.0%) (33.3, 47.0)	29 (13.9%) (9.5, 19.4)
Odds ratio (95% CI)		4.06 (2.52, 6.54)
p-value		< 0.0001
Complete response (CR)	16 (7.6%)	2 (1.0%)
Partial response (PR)	68 (32.4%)	27 (13.0%)
Stable disease (SD)	35 (16.7%)	46 (22.1%)
<b>Median duration of response</b>		
Months (range)	Not reached (0 <sup>+</sup> -12.5 <sup>+</sup> )	6.0 (1.1-10.0 <sup>+</sup> )
<b>Median time to response</b>		
Months (range)	2.1 (1.2-7.6)	2.1 (1.8-3.6)

“+” denotes a censored observation.

#### Randomised phase 3 study vs. chemotherapy (CA209037)

The safety and efficacy of nivolumab 3 mg/kg for the treatment of advanced (unresectable or metastatic) melanoma were evaluated in a phase 3, randomised, open-label study (CA209037). The study included adult patients who had progressed on or after ipilimumab and if BRAF V600 mutation positive had also progressed on or after BRAF kinase inhibitor therapy. Patients with active autoimmune disease, ocular melanoma, active brain or leptomeningeal metastases or a known history of prior ipilimumab-related high-grade (Grade 4 per CTCAE v4.0) adverse reactions, except for resolved nausea, fatigue, infusion reactions, or endocrinopathies, were excluded from the study.

A total of 405 patients were randomised to receive either nivolumab (n = 272) administered intravenously over 60 minutes at 3 mg/kg every 2 weeks or chemotherapy (n = 133) which consisted of the investigator's choice of either dacarbazine (1000 mg/m<sup>2</sup> every 3 weeks) or carboplatin (AUC 6 every 3 weeks) and paclitaxel (175 mg/m<sup>2</sup> every 3 weeks). Randomisation was stratified by BRAF and tumour PD-L1 status and best response to prior ipilimumab.

The co-primary efficacy outcome measures were confirmed ORR in the first 120 patients treated with nivolumab, as measured by independent radiology review committee (IRRC) using RECIST, version 1.1, and comparison of OS of nivolumab to chemotherapy. Additional outcome measures included duration and timing of response.

The median age was 60 years (range: 23-88). Sixty-four percent of patients were men and 98% were white. ECOG performance scores were 0 for 61% of patients and 1 for 39% of patients. The majority (75%) of patients had M1c stage disease at study entry. Seventy-three percent of patients had cutaneous melanoma and 10% had mucosal melanoma. The number of prior systemic regimens received was 1 for 27% of patients, 2 for 51% of patients, and > 2 for 21% of patients. Twenty-two percent of patients had tumours that tested BRAF mutation positive and 50% of patients had tumours that were considered PD-L1 positive. Sixty-four percent of patients had no prior clinical benefit (CR/PR or SD) on ipilimumab. Baseline characteristics were balanced between groups except for the proportions of patients who had a history of brain metastasis (19% and 13% in the nivolumab group and chemotherapy group, respectively) and patients with LDH greater than ULN at baseline (51% and 35%, respectively).

At the time of this final ORR analysis, results from 120 nivolumab-treated patients and 47 chemotherapy-treated patients who had a minimum of 6 months of follow-up were analysed. Efficacy results are presented in Table 10.

**Table 10: Best overall response, time and duration of response (CA209037)**

	nivolumab (n = 120)	chemotherapy (n = 47)
<b>Confirmed objective response (IRRC)</b> (95% CI)	38 (31.7%) (23.5, 40.8)	5 (10.6%) (3.5, 23.1)
Complete response (CR)	4 (3.3%)	0
Partial response (PR)	34 (28.3%)	5 (10.6%)
Stable disease (SD)	28 (23.3%)	16 (34.0%)
<b>Median duration of response</b> Months (range)	Not reached	3.6 (Not available)
<b>Median time to response</b> Months (range)	2.1 (1.6-7.4)	3.5 (2.1-6.1)

Data available indicate that the onset of nivolumab effect is delayed such that benefit of nivolumab above chemotherapy may take 2-3 months.

**Updated analysis (24-month follow-up)**

Among all randomised patients, the ORR was 27.2% (95% CI: 22.0, 32.9) in the nivolumab group and 9.8% (95% CI: 5.3, 16.1) in the chemotherapy group. Median durations of response were 31.9 months (range: 1.4<sup>+</sup>-31.9) and 12.8 months (range: 1.3<sup>+</sup>-13.6<sup>+</sup>), respectively. The PFS HR for nivolumab vs. chemotherapy was 1.03 (95% CI: 0.78, 1.36). The ORR and PFS were assessed by IRRC per RECIST version 1.1.

There was no statistically significant difference between nivolumab and chemotherapy in the final OS analysis. The primary OS analysis was not adjusted to account for subsequent therapies, with

54 (40.6%) patients in the chemotherapy arm subsequently receiving an anti-PD1 treatment. OS may be confounded by dropout, imbalance of subsequent therapies and differences in baseline factors. More patients in the nivolumab arm had poor prognostic factors (elevated LDH and brain metastases) than in the chemotherapy arm.

Efficacy by BRAF status: Objective responses to nivolumab (according to the definition of the co-primary endpoint) were observed in patients with or without BRAF mutation-positive melanoma. The ORRs in the BRAF mutation-positive subgroup were 17% (95% CI: 8.4, 29.0) for nivolumab and 11% (95% CI: 2.4, 29.2) for chemotherapy, and in the BRAF wild-type subgroup were 30% (95% CI: 24.0, 36.7) and 9% (95% CI: 4.6, 16.7), respectively.

The PFS HRs for nivolumab vs. chemotherapy were 1.58 (95% CI: 0.87, 2.87) for BRAF mutation-positive patients and 0.82 (95% CI: 0.60, 1.12) for BRAF wild-type patients. The OS HRs for nivolumab vs. chemotherapy were 1.32 (95% CI: 0.75, 2.32) for BRAF mutation-positive patients and 0.83 (95% CI: 0.62, 1.11) for BRAF wild-type patients.

Efficacy by tumour PD-L1 expression: Objective responses to nivolumab were observed regardless of tumour PD-L1 expression. However, the role of this biomarker (tumour PD-L1 expression) has not been fully elucidated.

In patients with tumour PD-L1 expression  $\geq 1\%$ , ORR was 33.5% for nivolumab (n = 179; 95% CI: 26.7, 40.9) and 13.5% for chemotherapy (n = 74; 95% CI: 6.7, 23.5). In patients with tumour PD-L1 expression  $<1\%$ , ORR per IRRC was 13.0% (n = 69; 95% CI: 6.1, 23.3) and 12.0% (n = 25; 95% CI: 2.5, 31.2), respectively.

The PFS HRs for nivolumab vs. chemotherapy were 0.76 (95% CI: 0.54, 1.07) in patients with tumour PD-L1 expression  $\geq 1\%$  and 1.92 (95% CI: 1.05, 3.5) in patients with tumour PD-L1 expression  $<1\%$ .

The OS HRs for nivolumab vs. chemotherapy were 0.69 (95% CI: 0.49, 0.96) in patients with tumour PD-L1 expression  $\geq 1\%$  and 1.52 (95% CI: 0.89, 2.57) in patients with tumour PD-L1 expression  $<1\%$ .

These subgroup analyses should be interpreted with caution given the small size of the subgroups and lack of statistically significant difference in OS in the all randomised population.

#### Open-label phase 1 dose-escalation study (MDX1106-03)

The safety and tolerability of nivolumab were investigated in a phase 1, open-label dose-escalation study in various tumour types, including malignant melanoma. Of the 306 previously treated patients enrolled in the study, 107 had melanoma and received nivolumab at a dose of 0.1 mg/kg, 0.3 mg/kg, 1 mg/kg, 3 mg/kg, or 10 mg/kg for a maximum of 2 years. In this patient population, objective response was reported in 33 patients (31%) with a median duration of response of 22.9 months (95% CI: 17.0, NR). The median PFS was 3.7 months (95% CI: 1.9, 9.3). The median OS was 17.3 months (95% CI: 12.5, 37.8), and the estimated OS rates were 42% (95% CI: 32, 51) at 3 years, 35% (95% CI: 26, 44) at 4 years, and 34% (95% CI: 25, 43) at 5 years (minimum follow-up of 45 months).

#### Single-arm phase 2 study (CA209172)

Study CA209172 was a single-arm, open label study of nivolumab monotherapy in patients with stage III (unresectable) or stage IV metastatic melanoma after prior treatment containing an anti-CTLA-4 monoclonal antibody. Safety was the primary endpoint and efficacy was a secondary endpoint. Of the 1008 treated patients, 103 (10%) had ocular/uveal melanoma, 66 (7%) had an ECOG performance score of 2, 165 (16%) had asymptomatic treated and untreated CNS metastases, 13 (1.3%) had treated leptomeningeal metastases, 25 (2%) had autoimmune disease, and 84 (8%) had Grade 3-4 immune-related AEs with prior anti-CTLA-4 therapy. No new safety signals were identified in all treated patients and the overall safety profile of nivolumab was similar across subgroups. Efficacy results based on investigator-assessed response rates at week 12 are presented in Table 11 below.

**Table 11: Response rate at week 12 - all response evaluable patients and by subgroup (CA209172)**

	Total	Ocular/ Uveal melanoma	ECOG PS 2	CNS metastasis	Autoimmune disease	Grade 3-4 irAEs with anti-CTLA-4
N	161/588	4/61	4/20	20/73	3/16	13/46
(%) <sup>a</sup>	(27.4)	(6.6)	(20.0)	(27.4)	(18.8)	(28.3)

<sup>a</sup> Responses were assessed per RECIST 1.1 for 588/1008 (58.3%) of patients who continued treatment through week 12 and had a follow-up scan at week 12.

*Randomised phase 3 study of nivolumab in combination with ipilimumab or nivolumab as monotherapy vs. ipilimumab as monotherapy (CA209067)*

The safety and efficacy of nivolumab 1 mg/kg in combination with ipilimumab 3 mg/kg or nivolumab 3 mg/kg vs. ipilimumab 3 mg/kg monotherapy for the treatment of advanced (unresectable or metastatic) melanoma were evaluated in a phase 3, randomised, double-blind study (CA209067). The differences between the two nivolumab-containing groups were evaluated descriptively. The study included adult patients with confirmed unresectable Stage III or Stage IV melanoma. Patients were to have ECOG performance status score of 0 or 1. Patients who had not received prior systemic anticancer therapy for unresectable or metastatic melanoma were enrolled. Prior adjuvant or neoadjuvant therapy was allowed if it was completed at least 6 weeks prior to randomisation. Patients with active autoimmune disease, ocular/uveal melanoma, or active brain or leptomeningeal metastases were excluded from the study.

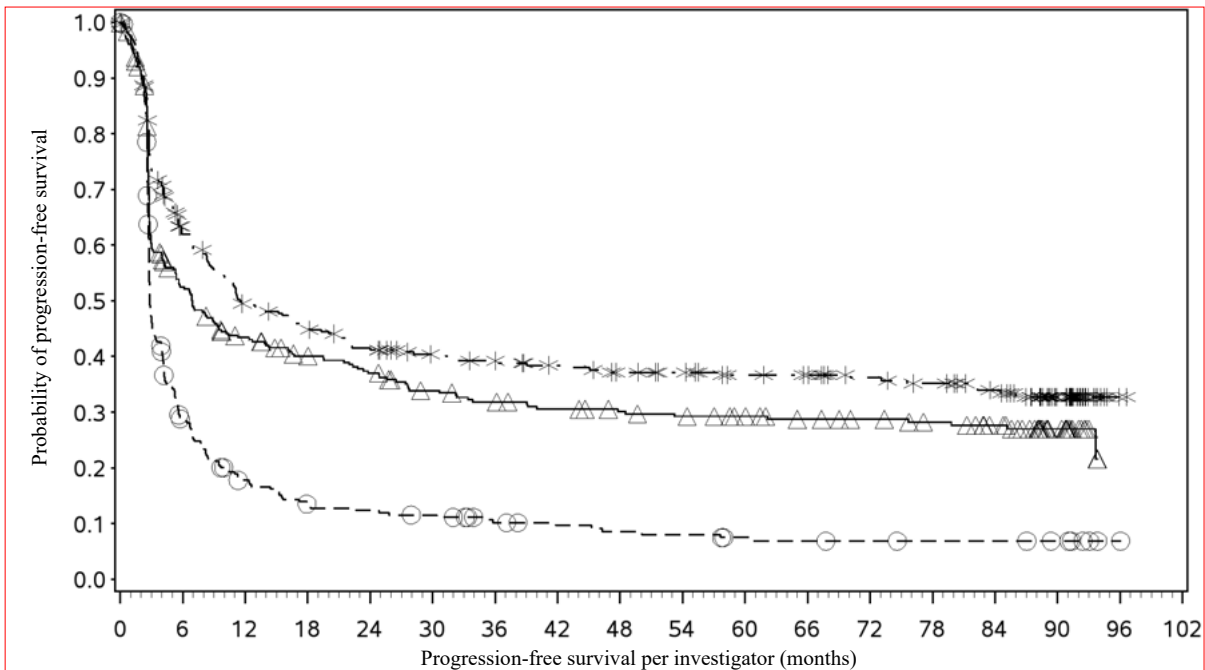
A total of 945 patients were randomised to receive nivolumab in combination with ipilimumab (n = 314), nivolumab monotherapy (n = 316), or ipilimumab monotherapy (n = 315). Patients in the combination arm received nivolumab 1 mg/kg over 60 minutes and ipilimumab 3 mg/kg over 90 minutes administered intravenously every 3 weeks for the first 4 doses, followed by nivolumab 3 mg/kg as monotherapy every 2 weeks. Patients in the nivolumab monotherapy arm received nivolumab 3 mg/kg every 2 weeks. Patients in the comparator arm received ipilimumab 3 mg/kg and nivolumab-matched placebo intravenously every 3 weeks for 4 doses followed by placebo every 2 weeks. Randomisation was stratified by PD-L1 expression ( $\geq 5\%$  vs.  $< 5\%$  tumour cell membrane expression), BRAF status, and M stage per the American Joint Committee on Cancer (AJCC) staging system. Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. Tumour assessments were conducted 12 weeks after randomisation then every 6 weeks for the first year, and every 12 weeks thereafter. The primary outcome measures were progression-free survival and OS. ORR and the duration of response were also assessed.

Baseline characteristics were balanced across the three treatment groups. The median age was 61 years (range: 18 to 90 years), 65% of patients were men, and 97% were white. ECOG performance status score was 0 (73%) or 1 (27%). The majority of the patients had AJCC Stage IV disease (93%); 58% had M1c disease at study entry. Twenty-two percent of patients had received prior adjuvant therapy. Thirty-two percent of patients had BRAF mutation-positive melanoma; 26.5% of patients had PD-L1  $\geq 5\%$  tumour cell membrane expression. Four percent of patients had a history of brain metastasis, and 36% of patients had a baseline LDH level greater than ULN at study entry. Among patients with quantifiable tumour PD-L1 expression, the distribution of patients was balanced across the three treatment groups. Tumour PD-L1 expression was determined using the PD-L1 IHC 28-8 pharmDx assay.

At primary analysis (minimum follow-up 9 months) the median PFS was 6.9 months in the nivolumab group as compared with 2.9 months in the ipilimumab group (HR = 0.57, 99.5% CI: 0.43, 0.76;  $p < 0.0001$ ). The median PFS was 11.5 months in the nivolumab in combination with ipilimumab group, as compared with 2.9 months in the ipilimumab group (HR = 0.42, 99.5% CI: 0.31, 0.57;  $p < 0.0001$ ).

PFS results from descriptive analysis (with minimum follow up of 90 months) are shown in Figure 2 (all randomised population), Figure 3 (at the tumour PD-L1 5% cut off), and Figure 4 (at the tumour PD-L1 1% cut off).

**Figure 2: Progression-free survival (CA209067)**



**Number of subjects at risk**

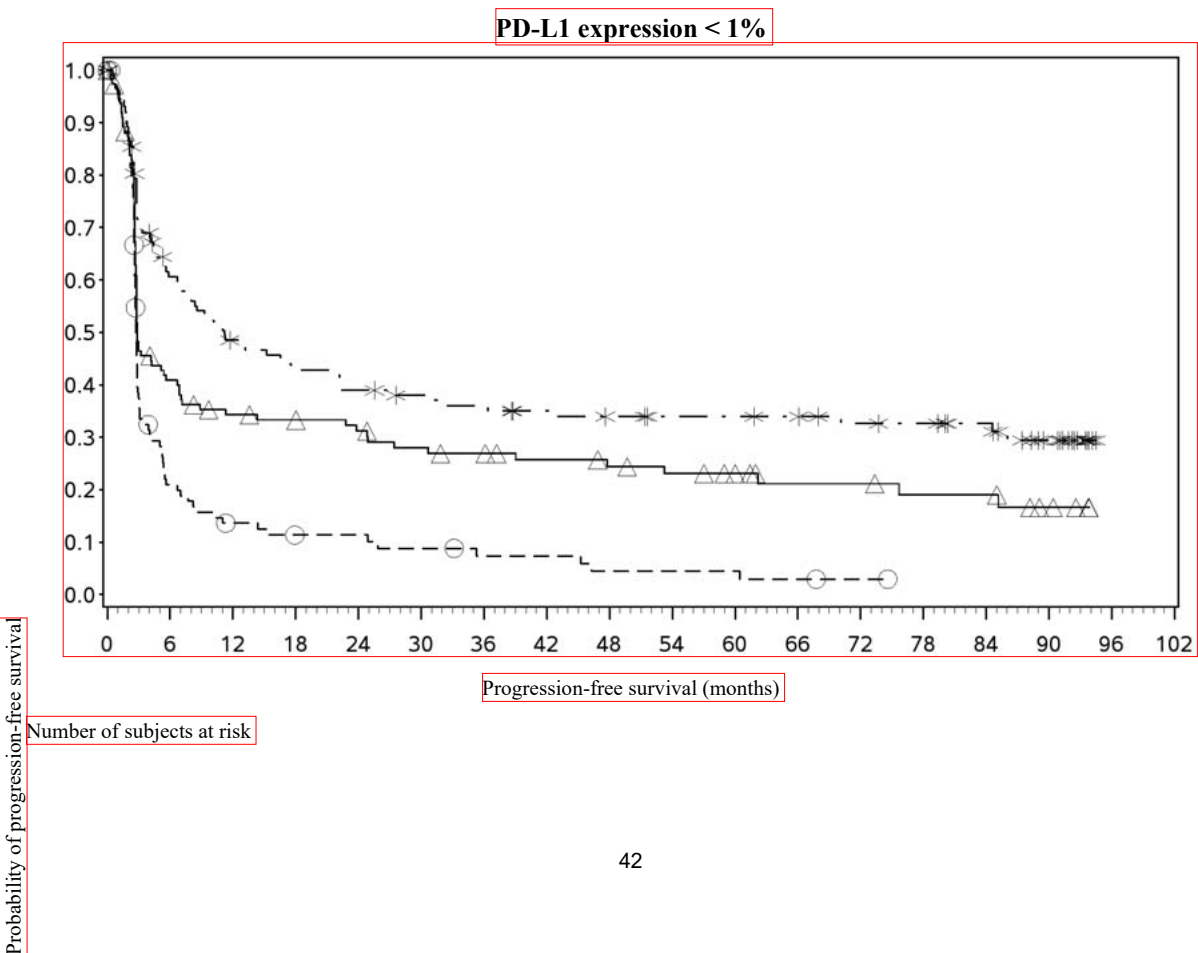
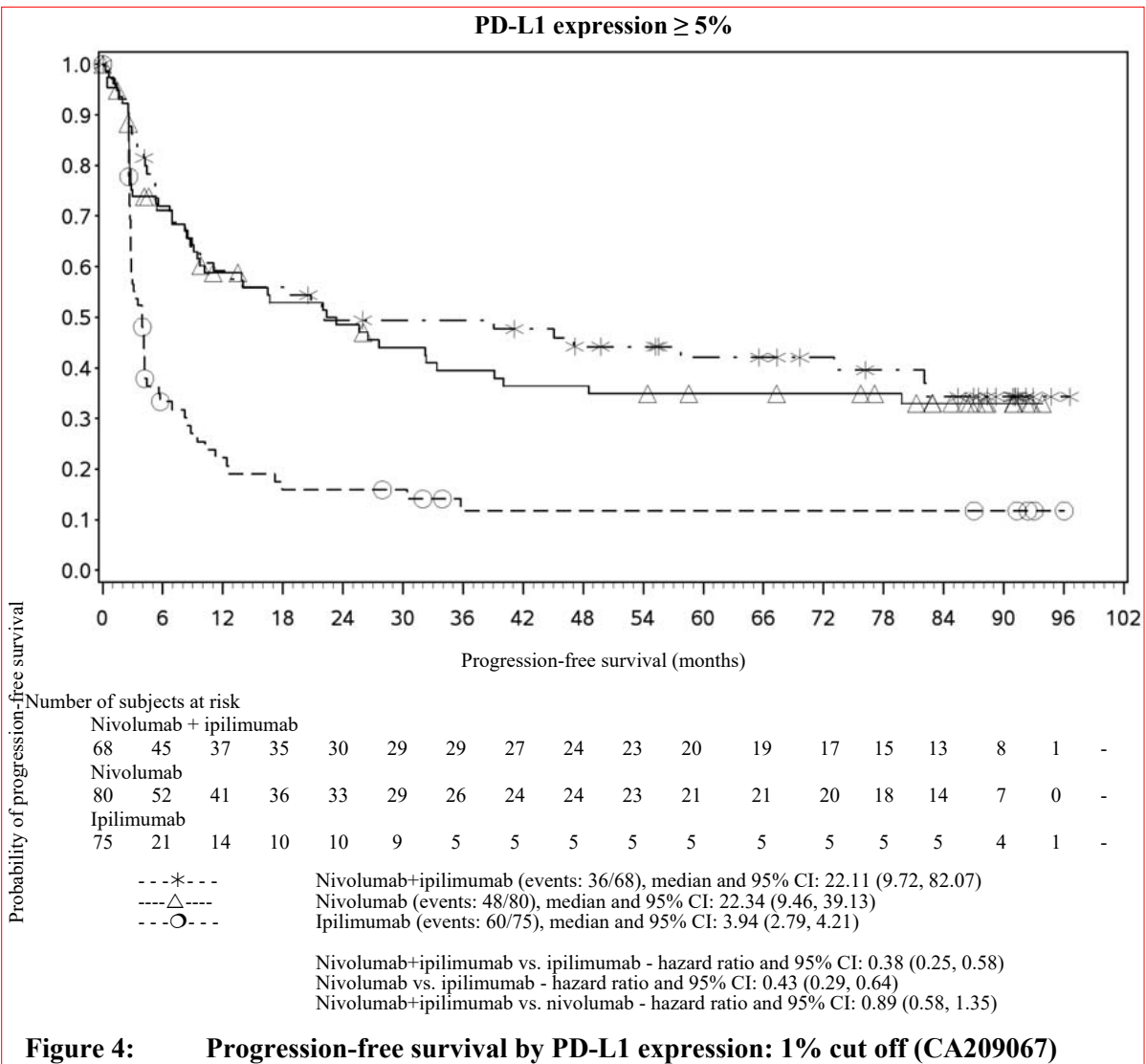
Nivolumab + ipilimumab																	
314	175	138	126	112	103	99	93	87	84	78	76	70	66	57	33	1	-
Nivolumab																	
316	151	120	106	97	84	78	73	69	66	62	57	54	50	44	21	0	-
Ipilimumab																	
315	78	46	34	31	28	21	18	16	15	12	11	10	9	9	7	1	-

- - \* - - Nivolumab+ipilimumab (events: 189/314), median and 95% CI: 11.50 (8.90, 20.04).  
 PFS rate at 12 months and 95% CI: 49% (44, 55), PFS rate at 60 months and 95% CI: 36% (32, 42), PFS rate at 90 months and 95% CI: 33% (27, 39)  
 —△— Nivolumab (events: 208/316), median and 95% CI: 6.93 (5.13, 10.18).  
 PFS rate at 12 months and 95% CI: 42% (36, 47), PFS rate at 60 months and 95% CI: 29% (24, 35), PFS rate at 90 months and 95% CI: 27% (22, 33)  
 - - ○ - - Ipilimumab (events: 261/315), median and 95% CI: 2.86 (2.79, 3.09).  
 PFS rate at 12 months and 95% CI: 18% (14, 23), PFS rate at 60 months and 95% CI: 8% (5, 12), PFS rate at 90 months and 95% CI: 7% (4, 11)

Nivolumab+ipilimumab vs. ipilimumab - hazard ratio and 95% CI: 0.42 (0.35, 0.51)  
 Nivolumab vs. ipilimumab - hazard ratio and 95% CI: 0.53 (0.44, 0.64)  
 Nivolumab+ipilimumab vs. nivolumab - hazard ratio and 95% CI: 0.79 (0.65, 0.97)

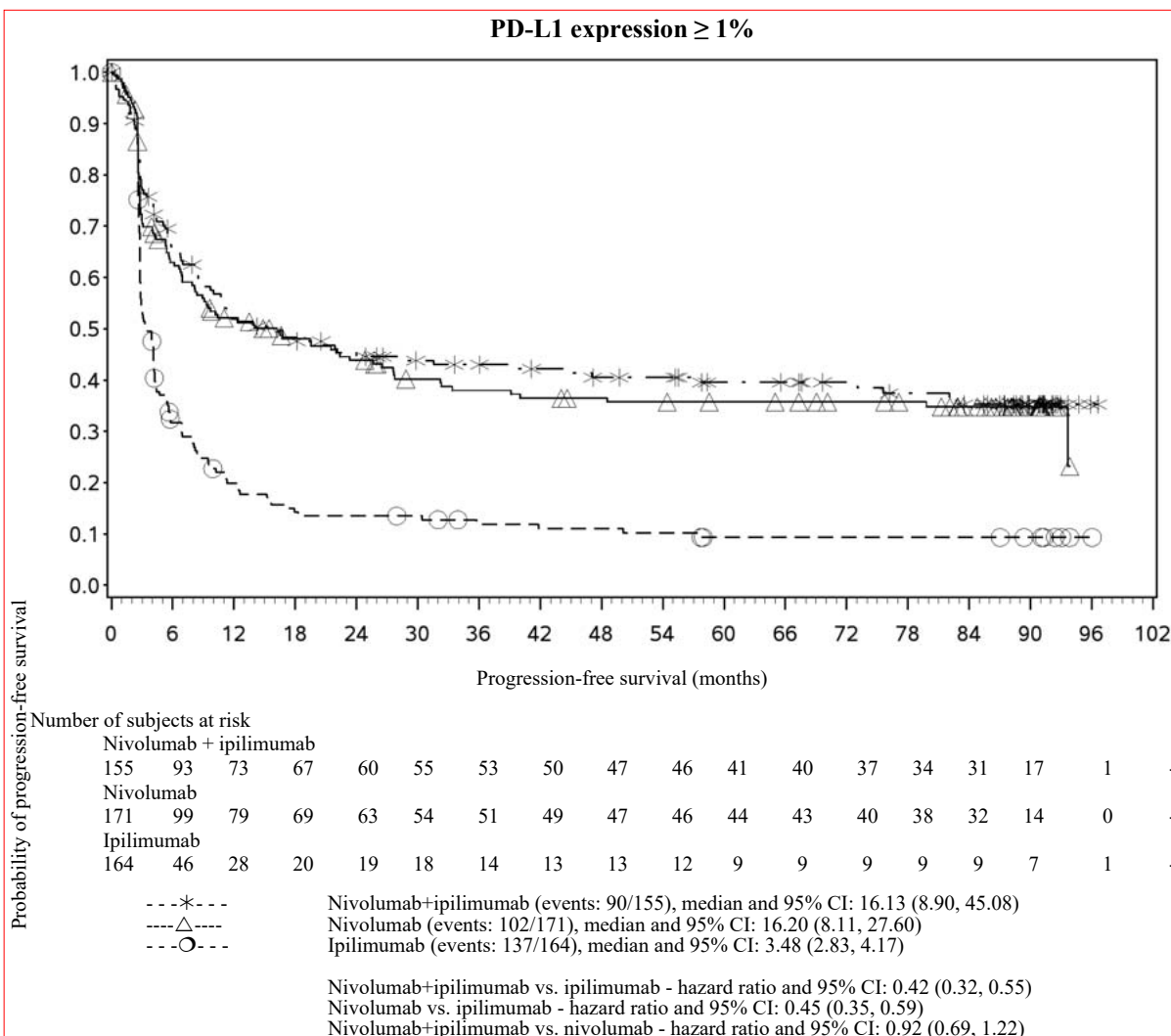






Nivolumab + ipilimumab																																																																
123	65	51	46	41	38	36	33	31	29	29	28	25	24	21	13	0																																																
Nivolumab																																																																
117	44	35	33	30	26	24	21	19	17	15	11	11	9	9	5	0																																																
Ipilimumab																																																																
113	20	12	9	9	7	5	5	3	3	3	2	1	0	0	0	0																																																
<table border="0"> <tr> <td>---*</td><td>---</td><td colspan="14">Nivolumab+ipilimumab (events: 76/123), median and 95% CI: 11.17 (6.93, 22.18)</td> </tr> <tr> <td>---</td><td>△---</td><td colspan="14">Nivolumab (events: 85/117), median and 95% CI: 2.83 (2.76, 5.62)</td> </tr> <tr> <td>---</td><td>○---</td><td colspan="14">Ipilimumab (events: 94/113), median and 95% CI: 2.73 (2.66, 2.83)</td> </tr> </table>																	---*	---	Nivolumab+ipilimumab (events: 76/123), median and 95% CI: 11.17 (6.93, 22.18)														---	△---	Nivolumab (events: 85/117), median and 95% CI: 2.83 (2.76, 5.62)														---	○---	Ipilimumab (events: 94/113), median and 95% CI: 2.73 (2.66, 2.83)													
---*	---	Nivolumab+ipilimumab (events: 76/123), median and 95% CI: 11.17 (6.93, 22.18)																																																														
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---	○---	Ipilimumab (events: 94/113), median and 95% CI: 2.73 (2.66, 2.83)																																																														

Nivolumab+ipilimumab vs. ipilimumab - hazard ratio and 95% CI: 0.39 (0.28, 0.53)  
 Nivolumab vs. ipilimumab - hazard ratio and 95% CI: 0.59 (0.44, 0.79)  
 Nivolumab+ipilimumab vs. nivolumab - hazard ratio and 95% CI: 0.66 (0.48, 0.90)

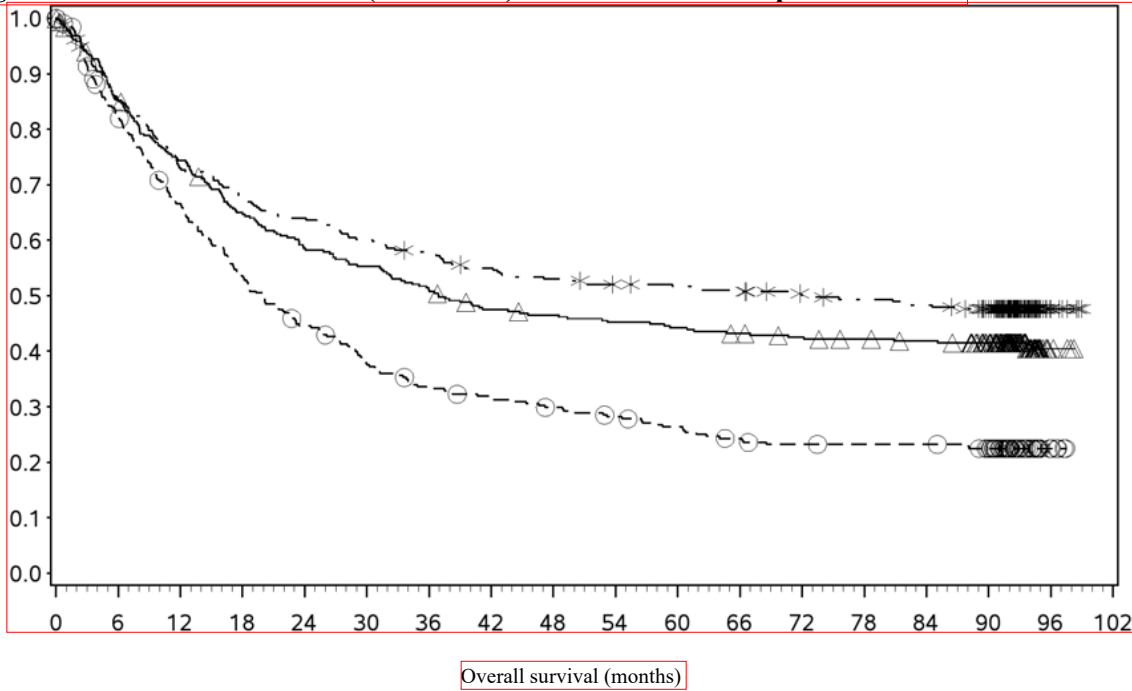


The final (primary) OS analysis occurred when all patients had a minimum follow-up of 28 months. At 28 months, median OS was not reached in the nivolumab group as compared with 19.98 months in the ipilimumab group (HR = 0.63, 98% CI: 0.48, 0.81; p-value: < 0.0001). Median OS was not reached in the nivolumab in combination with ipilimumab group as compared with the ipilimumab group (HR = 0.55, 98% CI: 0.42, 0.72; p-value: < 0.0001).

OS results at an additional descriptive analysis undertaken at a minimum follow-up of 90 months show outcomes consistent with the original primary analysis. OS results from this follow-up analysis are shown in Figure 5 (all randomised), Figure 6 and 7 (at the tumour PD-L1 5% and 1% cut off).

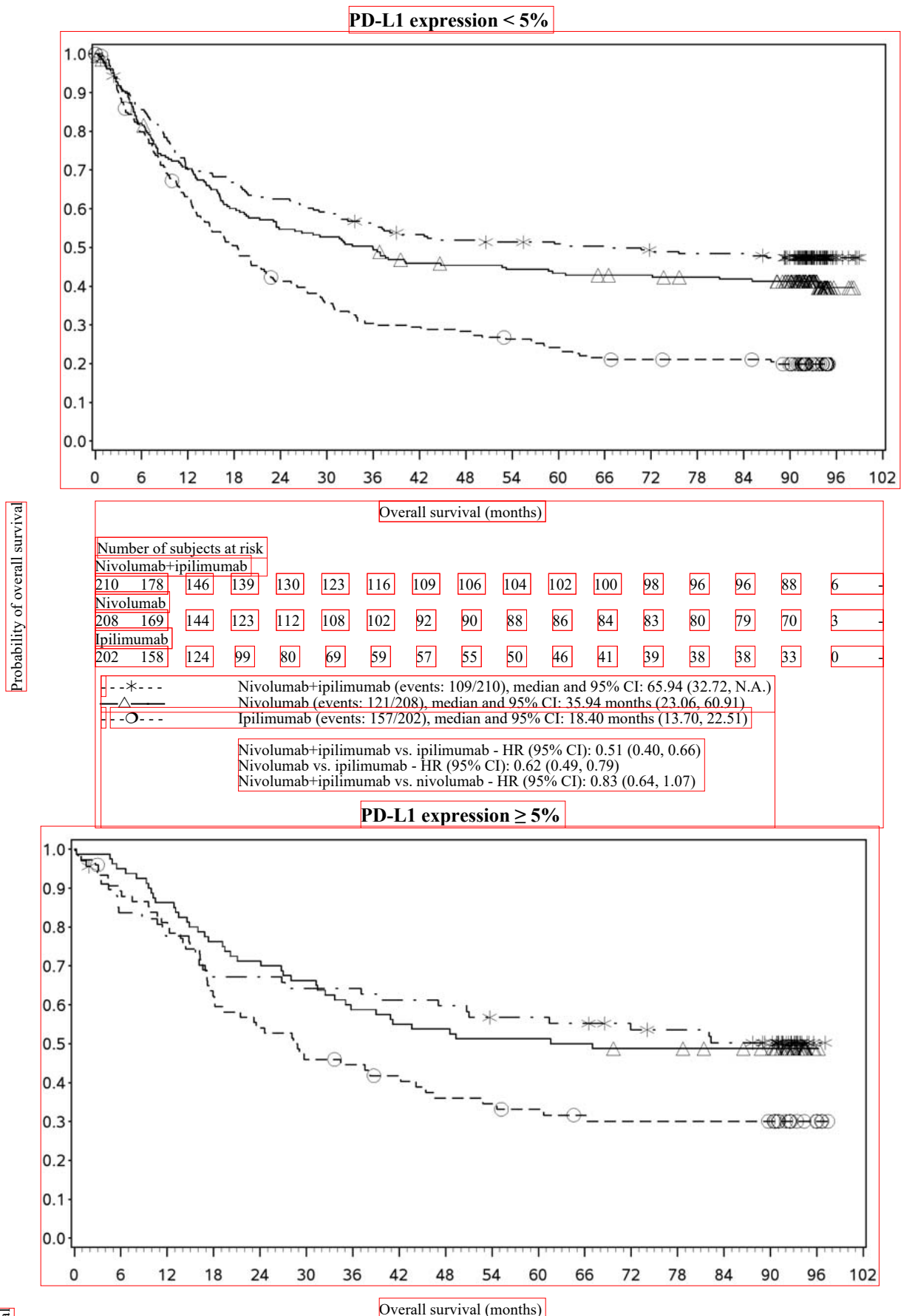
The OS analysis was not adjusted to account for subsequent therapies received. Subsequent systemic therapy was received by 36.0%, 49.1%, and 66.3% of patients in the combination, nivolumab monotherapy, and ipilimumab arms, respectively. Subsequent immunotherapy (including anti-PD1 therapy, anti-CTLA-4 antibody, or other immunotherapy) was received by 19.1%, 34.2%, and 48.3% of patients in the combination, nivolumab monotherapy, and ipilimumab arms, respectively.

**Figure 5: Overall survival (CA209067) - Minimum follow-up of 90 months**



Probability of overall survival	Number of subjects at risk																
	Nivolumab+ipilimumab																
	314	265	227	210	199	187	179	169	163	158	156	153	147	144	141	129	7
	Nivolumab																
	316	266	231	201	181	171	158	145	141	137	134	130	126	123	120	107	4
	Ipilimumab																
	315	253	203	163	135	113	100	94	87	81	75	68	64	63	63	57	5
	Nivolumab+ipilimumab (events: 162/314), median and 95% CI: 72.08 (38.18, N.A.) OS rate and 95% CI at 12 months: 73% (68, 78), 24 months: 64% (59, 69), 36 months: 58% (52, 63), 60 months: 52% (46, 57), and 90 months: 48% (42, 53)																
	Nivolumab (events: 182/316), median and 95% CI: 36.93 months (28.25, 58.71) OS rate and 95% CI at 12 months: 74% (69, 79), 24 months: 59% (53, 64), 36 months: 52% (46, 57), 60 months: 44% (39, 50), and 90 months: 42% (36, 47)																
	Ipilimumab (events: 235/315), median and 95% CI: 19.94 months (16.85, 24.61) OS rate and 95% CI at 12 months: 67% (61, 72), 24 months: 45% (39, 50), 36 months: 34% (29, 39), 60 months: 26% (22, 31), and 90 months: 22% (18, 27)																
	Nivolumab+ipilimumab vs ipilimumab - HR (95% CI): 0.53 (0.44, 0.65)																
	Nivolumab vs ipilimumab - HR (95% CI): 0.63 (0.52, 0.77)																
	Nivolumab+ipilimumab vs nivolumab - HR (95% CI): 0.84 (0.68, 1.04)																

**Figure 6: Overall survival by PD-L1 expression: 5% cut off (CA209067) - Minimum follow-up of 90 months**

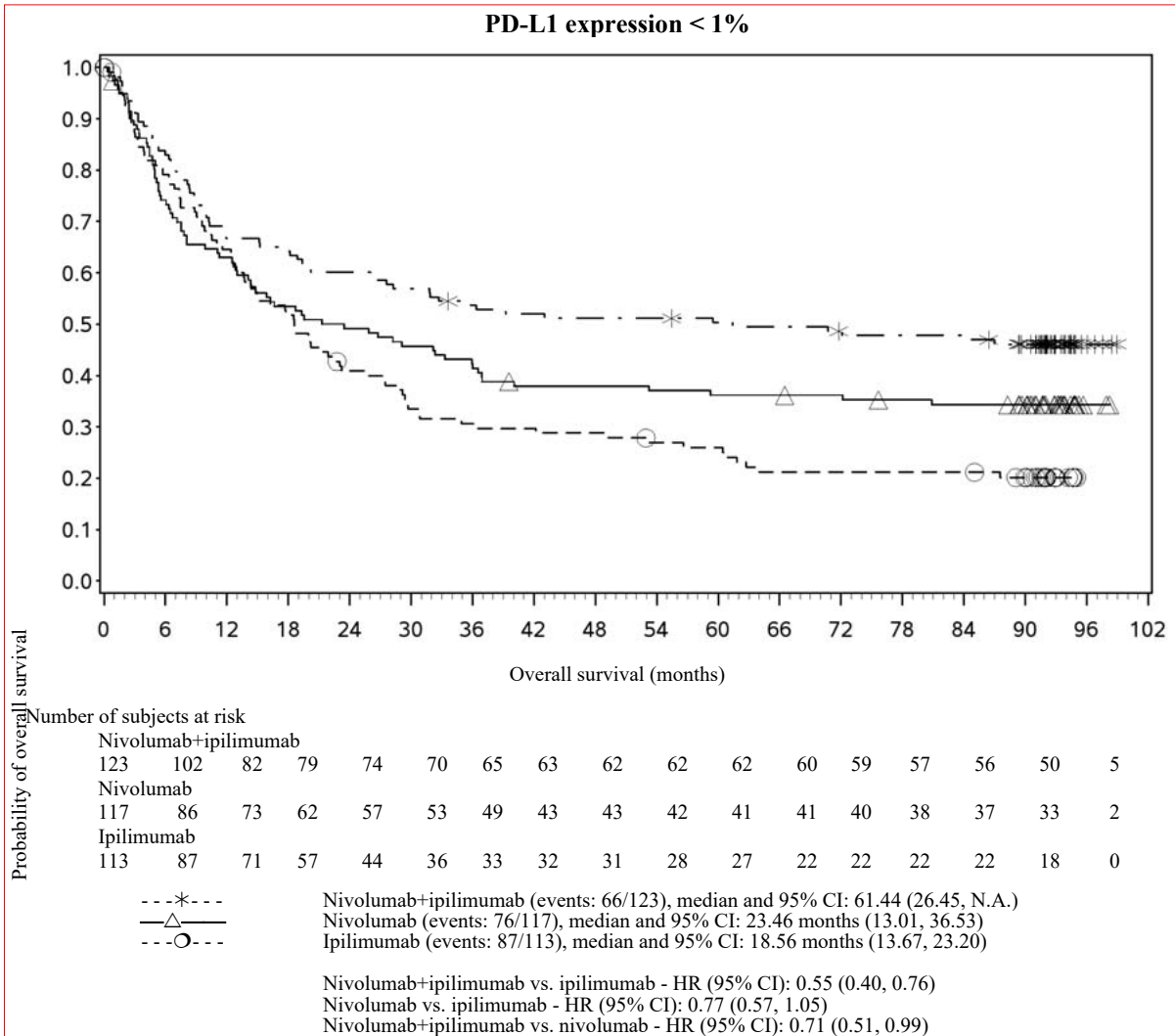


Nivolumab+ipilimumab																
68	56	52	45	45	43	43	41	40	37	37	36	33	32	30	27	1
Nivolumab																
80	76	69	61	57	53	47	44	43	41	41	40	38	38	36	33	1
Ipilimumab																
75	66	60	46	40	34	32	29	25	24	22	20	19	19	19	18	4

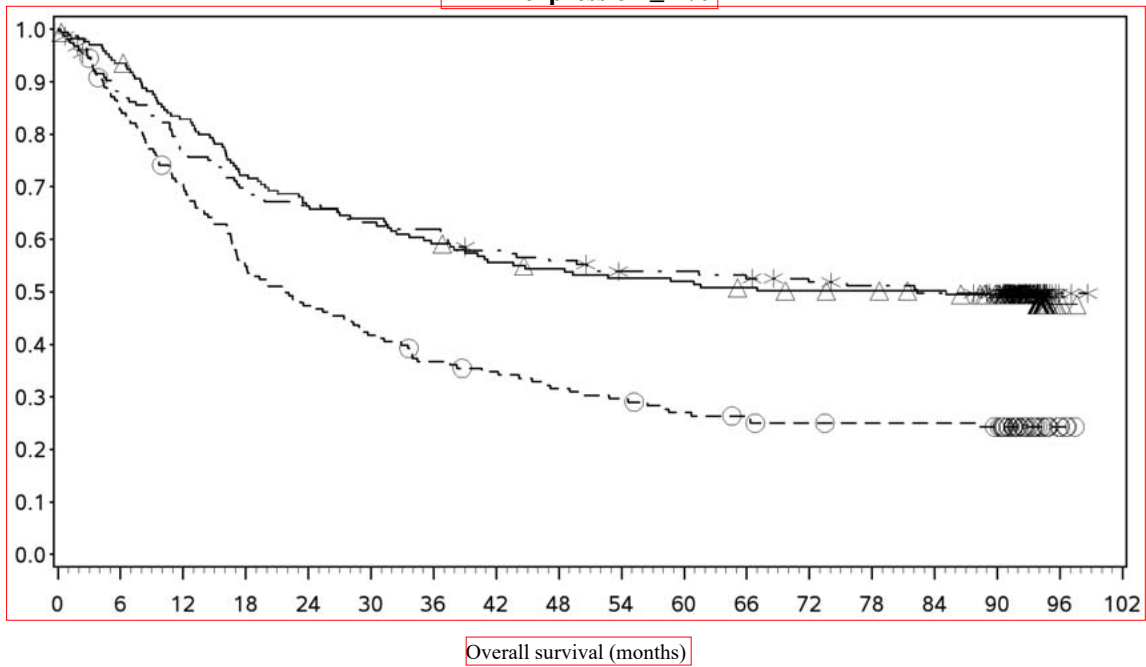
- - \* - - Nivolumab+ipilimumab (events: 33/68), median and 95% CI: N.A. (39.06, N.A.)  
 - - △ - - Nivolumab (events: 41/80), median and 95% CI: 64.28 months (33.64, N.A.)  
 - - ○ - - Ipilimumab (events: 51/75), median and 95% CI: 28.88 months (18.10, 44.16)

Nivolumab+ipilimumab vs. ipilimumab - HR (95% CI): 0.61 (0.39, 0.94)  
 Nivolumab vs. ipilimumab - HR (95% CI): 0.61 (0.41, 0.93)  
 Nivolumab+ipilimumab vs. nivolumab - HR (95% CI): 0.99 (0.63, 1.57)

**Figure 7: Overall survival by PD-L1 expression: 1% cut off (CA209067) - Minimum follow-up of 90 months**



PD-L1 expression  $\geq 1\%$



Probability of overall survival	Number of subjects at risk																
	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
Nivolumab+ipilimumab	155	132	116	105	101	96	94	87	84	79	79	77	74	72	70	65	2
Nivolumab	171	159	140	122	112	108	100	93	90	87	86	83	81	80	78	70	2
Ipilimumab	164	137	113	88	76	67	58	54	49	46	41	39	36	35	35	33	4

---*---	Nivolumab+ipilimumab (events: 76/155), median and 95% CI: 82.30 (39.06, N.A.)
---△---	Nivolumab (events: 86/171), median and 95% CI: 85.09 months (39.00, N.A.)
---○---	Ipilimumab (events: 121/164), median and 95% CI: 21.49 months (16.85, 29.08)

Nivolumab+ipilimumab vs. ipilimumab - HR (95% CI): 0.52 (0.39, 0.70)	
Nivolumab vs. ipilimumab - HR (95% CI): 0.52 (0.39, 0.69)	
Nivolumab+ipilimumab vs. nivolumab - HR (95% CI): 1.01 (0.74, 1.37)	



Minimum follow-up for the analysis of ORR was 90 months. Responses are summarised in Table 12.

**Table 12: Objective response (CA209067)**

	<b>nivolumab + ipilimumab (n = 314)</b>	<b>nivolumab (n = 316)</b>	<b>ipilimumab (n = 315)</b>
<b>Objective response</b>	183 (58%)	142 (45%)	60 (19%)
(95% CI)	(52.6, 63.8)	(39.4, 50.6)	(14.9, 23.8)
<b>Odds ratio (vs. ipilimumab)</b>	6.35	3.5	
(95% CI)	(4.38, 9.22)	(2.49, 5.16)	
<b>Complete response (CR)</b>	71(23%)	59 (19%)	19 (6%)
<b>Partial response (PR)</b>	112 (36%)	83 (26%)	41 (13%)
<b>Stable disease (SD)</b>	38 (12%)	29 (9%)	69 (22%)
<b>Duration of response</b>			
<b>Median (range), months</b>	N.A. (69.1-N.A.)	90.8 (45.7-N.A.)	19.3 (8.8-47.4)
<b>Proportion ≥ 12 months in duration</b>	68%	73%	44%
<b>Proportion ≥ 24 months in duration</b>	58%	63%	30%
<b>ORR (95% CI) by tumour PD-L1 expression</b>			
< 5%	56% (48.7, 62.5) n = 210	43% (36, 49.8) n = 208	18% (12.8, 23.8) n = 202
≥ 5%	72% (59.9, 82.3) n = 68	59% (47.2, 69.6) n = 80	21% (12.7, 32.3) n = 75
< 1%	54% (44.4, 62.7) n = 123	36% (27.2, 45.3) n = 117	18% (11.2, 26.0) n = 113
≥ 1%	65% (56.4, 72) n = 155	55% (47.2, 62.6) n = 171	20% (13.7, 26.4) n = 164

Both nivolumab-containing arms demonstrated a significant PFS and OS benefit and greater ORR compared with ipilimumab alone. The observed PFS results at 18 months of follow-up and ORR and OS results at 28 months of follow-up were consistently demonstrated across subgroups of patients including baseline ECOG performance status, BRAF status, M stage, age, history of brain metastases, and baseline LDH level. This observation was maintained with the OS results with a minimum follow-up of 90 months.

Among 131 patients who discontinued the combination due to adverse reaction after 28 months of follow-up, the ORR was 71% (93/131) with 20% (26/131) achieving a complete response and median OS was not reached.

Both nivolumab-containing arms demonstrated greater objective response rates than ipilimumab regardless of PD-L1 expression levels. ORRs were higher for the combination of nivolumab and ipilimumab relative to nivolumab monotherapy across tumour PD-L1 expression levels (Table 15) after 90 months of follow-up, with a best overall response of complete response correlating to an improved survival rate.

After 90 months of follow-up, median durations of response for patients with tumour PD-L1 expression level ≥ 5% were 78.19 months(range: 18.07-N.A.) in the combination arm,77.21 months (range: 26.25-N.A.) in the nivolumab monotherapy arm and 31.28 months (range: 6.08-N.A.) in the ipilimumab arm. At tumour PD-L1 expression <5%, median durations of response were not reached (range: 61.93-N.A.) in the combination arm, were 90.84 months (range: 50.43-N.A.) in the nivolumab monotherapy arm and 19.25 months (range: 5.32-47.44) in the ipilimumab monotherapy arm.

No clear cut off for PD-L1 expression can reliably be established when considering the relevant endpoints of tumour response and PFS and OS. Results from exploratory multivariate analyses

identified patient and tumour characteristics (ECOG performance status, M stage, baseline LDH, BRAF mutation status, PD-L1 status, and gender) which might contribute to the survival outcome.

#### Efficacy by BRAF status:

After 90 months of follow-up, BRAF[V600] mutation-positive and BRAF wild-type patients randomised to nivolumab in combination with ipilimumab had a median PFS of 16.76 months (95% CI: 8.28, 32.0) and 11.7 months (95% CI: 7.0, 19.32), while those in the nivolumab monotherapy arm had a median PFS of 5.62 months (95% CI: 2.79, 9.46) and 8.18 months (95% CI: 5.13, 19.55), respectively. BRAF[V600] mutation-positive and BRAF wild-type patients randomised to ipilimumab monotherapy had a median PFS of 3.09 months (95% CI: 2.79, 5.19) and 2.83 months (95% CI: 2.76, 3.06), respectively.

After 90 months of follow-up, BRAF[V600] mutation-positive and BRAF wild-type patients randomised to nivolumab in combination with ipilimumab had an ORR of 67.0% (95% CI: 57.0, 75.9; n = 103) and 54.0% (95% CI: 47.1, 60.9; n = 211), while those in the nivolumab monotherapy arm had an ORR of 37.87% (95% CI: 28.2, 48.1; n = 98) and 48.2% (95% CI: 41.4, 55.0; n = 218), respectively. BRAF[V600] mutation-positive and BRAF wild-type patients randomised to ipilimumab monotherapy had an ORR of 23.0% (95% CI: 15.2, 32.5; n = 100) and 17.2% (95% CI: 12.4, 22.9; n = 215).

After 90 months of follow-up, in BRAF [V600] mutation-positive patients median OS was not reached in the combination arm and 45.5 months in the nivolumab monotherapy arm. Median OS for BRAF [V600] mutation-positive patients in the ipilimumab monotherapy arm was 24.6 months. In BRAF wild-type patients median OS was 39.06 months in the combination arm, 34.37 months in the nivolumab monotherapy arm and 18.5 months in the ipilimumab monotherapy arm. The OS HRs for nivolumab in combination with ipilimumab vs. nivolumab monotherapy were 0.66 (95% CI: 0.44, 0.98) for BRAF[V600] mutation-positive patients and 0.95 (95% CI: 0.74, 1.22) for BRAF wild-type patients.

#### Randomised phase 2 study of nivolumab in combination with ipilimumab and ipilimumab (CA209069)

Study CA209069 was a randomised, Phase 2, double-blind study comparing the combination of nivolumab and ipilimumab with ipilimumab alone in 142 patients with advanced (unresectable or metastatic) melanoma with similar inclusion criteria to study CA209067 and the primary analysis in patients with BRAF wild-type melanoma (77% of patients). Investigator assessed ORR was 61% (95% CI: 48.9, 72.4) in the combination arm (n = 72) versus 11% (95% CI: 3.0, 25.4) for the ipilimumab arm (n = 37). The estimated 2 and 3 year OS rates were 68% (95% CI: 56, 78) and 61% (95% CI: 49, 71), respectively, for the combination (n = 73) and 53% (95% CI: 36, 68) and 44% (95% CI: 28, 60), respectively, for ipilimumab (n = 37).

#### Adjuvant treatment of melanoma

#### Randomised phase 3 study of nivolumab vs ipilimumab 10 mg/kg (CA209238)

The safety and efficacy of nivolumab 3 mg/kg as a single agent for the treatment of patients with completely resected melanoma were evaluated in a phase 3, randomised, double-blind study (CA209238). The study included adult patients, who had an ECOG performance status score of 0 or 1, with Stage IIIB/C or Stage IV American Joint Committee on Cancer (AJCC), 7<sup>th</sup> edition, histologically confirmed melanoma that is completely surgically resected. Per the AJCC 8<sup>th</sup> edition, this corresponds to patients with lymph node involvement or metastases. Patients were enrolled regardless of their tumour PD-L1 status. Patients with prior autoimmune disease, and any condition requiring systemic treatment with either corticosteroids ( $\geq 10$  mg daily prednisone or equivalent) or other immunosuppressive medications, as well as patients with prior therapy for melanoma (except patients with surgery, adjuvant radiotherapy after neurosurgical resection for lesions of the central nervous system, and prior adjuvant interferon completed  $\geq 6$  months prior to randomisation) prior therapy with, anti-PD-1, anti-PD-L1, anti-PD-L2, anti-CD137, or anti CTLA-4 antibody (including ipilimumab or any other antibody or drug specifically targeting T cell co-stimulation or checkpoint pathways), were excluded from the study.

A total of 906 patients were randomised to receive either nivolumab 3 mg/kg (n = 453) administered every 2 weeks or ipilimumab 10 mg/kg (n = 453) administered every 3 weeks for 4 doses then every

12 weeks beginning at week 24 for up to 1 year. Randomisation was stratified by tumour PD-L1 expression ( $\geq 5\%$  vs.  $< 5\%$ /indeterminate), and stage of disease per the AJCC staging system. Tumour assessments were conducted every 12 weeks for the first 2 years then every 6 months thereafter. The primary endpoint was recurrence-free survival (RFS). RFS, assessed by investigator, was defined as the time between the date of randomisation and the date of first recurrence (local, regional, or distant metastasis), new primary melanoma, or death due to any cause, whichever occurred first.

Baseline characteristics were generally balanced between the two groups. The median age was 55 years (range: 18-86), 58% were men, and 95% were white. Baseline ECOG performance status score was 0 (90%) or 1 (10%). The majority of patients had AJCC Stage III disease (81%), and 19% had Stage IV disease. Forty-eight percent of patients had macroscopic lymph nodes and 32% had tumour ulceration. Forty-two percent of patients were BRAF V600 mutation positive while 45% were BRAF wild type and 13% BRAF were status unknown. For tumour PD-L1 expression, 34% of patients had PD-L1 expression  $\geq 5\%$  and 62% had  $< 5\%$  as determined by clinical trial assay. Among patients with quantifiable tumour PD-L1 expression, the distribution of patients was balanced across the treatment groups. Tumour PD-L1 expression was determined using the PD-L1 IHC 28-8 pharmDx assay.

At a primary pre-specified interim analysis (minimum follow-up 18 months) a statistically significant improvement in RFS with nivolumab compared to ipilimumab with HR of 0.65 (97.56% CI: 0.51, 0.83; stratified logrank  $p < 0.0001$ ) was demonstrated. At an updated descriptive RFS analysis, with minimum follow-up of 24 months RFS improvement was confirmed with HR of 0.66 (95% CI: 0.54, 0.81;  $p < 0.0001$ ) and OS was not mature. Efficacy results with minimum follow-up of 36 months (RFS pre-specified final analysis) and 48 months (OS pre-specified final analysis) are shown in Table 13 and Figure 8 and 9 (all randomised population).

**Table 13: Efficacy results (CA209238)**

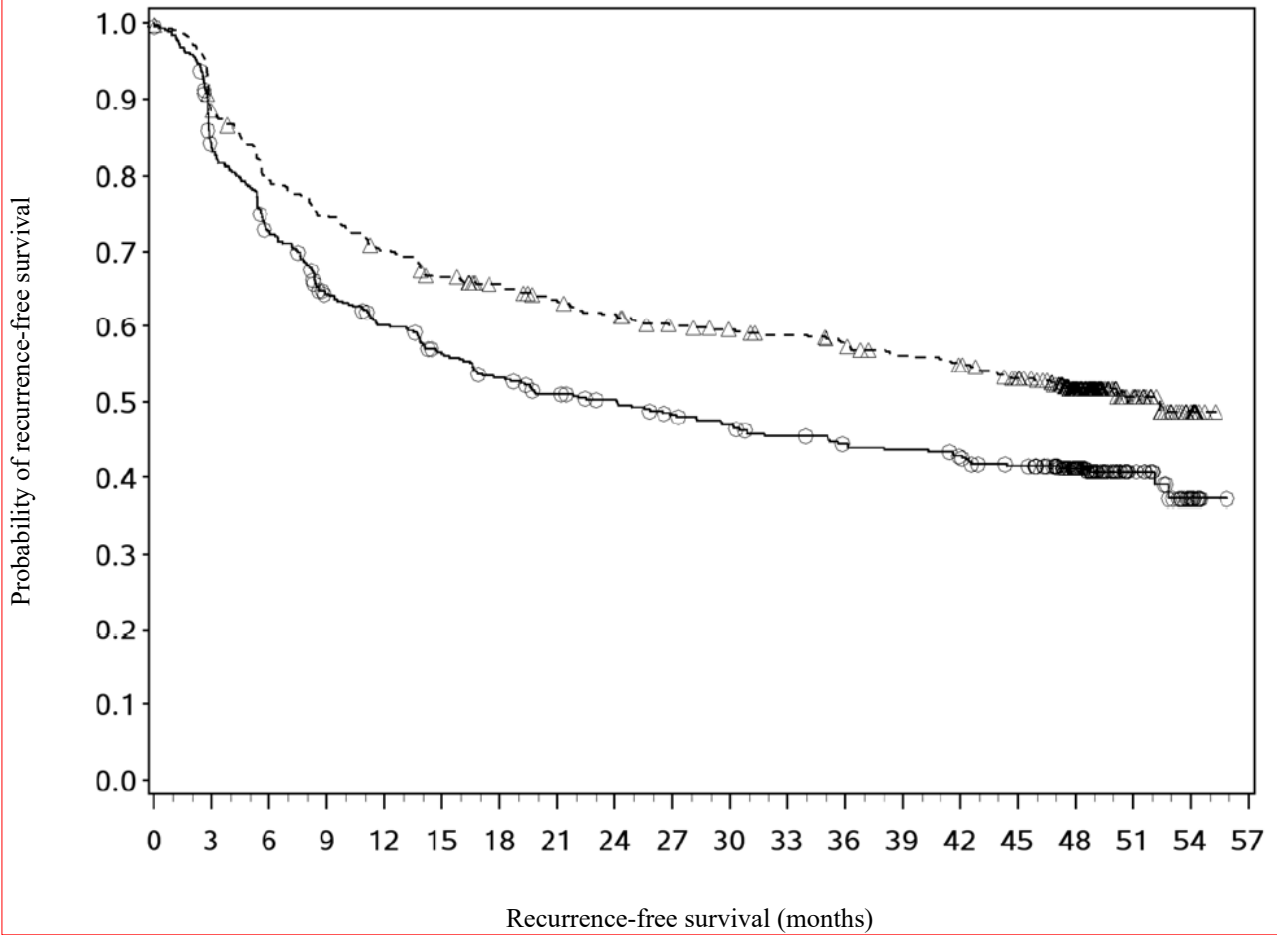
	nivolumab (n = 453)	ipilimumab 10 mg/kg (n = 453)
<b>Final pre-specified analysis</b>		
<b>Recurrence-free survival with minimum follow-up 36 months</b>		
Events	188 (41.5%)	239 (52.8%)
Hazard ratio <sup>a</sup>		0.68
95% CI		(0.56, 0.82)
p-value		$p < 0.0001$
Median (95% CI) months	NR (38.67, NR)	24.87 (16.62, 35.12)
<b>Recurrence-free survival with minimum follow-up 48 months</b>		
Events	212 (46.8%)	253 (55.8%)
Hazard ratio <sup>a</sup>		0.71
95% CI		(0.60, 0.86)
Median (95% CI) months	52.37 (42.51, NR)	24.08 (16.56, 35.09)
Rate (95% CI) at 12 months	70.4 (65.9, 74.4)	60.0 (55.2, 64.5)
Rate (95% CI) at 18 months	65.8 (61.2, 70.0)	53.0 (48.1, 57.6)
Rate (95% CI) at 24 months	62.6 (57.9, 67.0)	50.2 (45.3, 54.8)
Rate (95% CI) at 36 months	57.6 (52.8, 62.1)	44.4 (39.6, 49.1)
Rate (95% CI) at 48 months	51.7 (46.8, 56.3)	41.2 (36.4, 45.9)

	nivolumab (n = 453)	ipilimumab 10 mg/kg (n = 453)
<b>Final pre-specified analysis</b>		
<b>Overall survival with minimum follow-up 48 months</b>		
Events	100 (22.1%)	111 (24.5%)
Hazard ratio <sup>a</sup>		0.87
95.03% CI		(0.66, 1.14)
p-value		0.3148
Median (95% CI) months	Not Reached	Not Reached
Rate (95% CI) at 12 months	96.2 (93.9, 97.6)	95.3 (92.8, 96.9)
Rate (95% CI) at 18 months	91.9 (88.9, 94.1)	91.8 (88.8, 94.0)
Rate (95% CI) at 24 months	88.0 (84.6, 90.7)	87.8 (84.4, 90.6)
Rate (95% CI) at 36 months	81.7 (77.8, 85.1)	81.6 (77.6, 85.0)
Rate (95% CI) at 48 months	77.9 (73.7, 81.5)	76.6 (72.2, 80.3)

<sup>a</sup> Derived from a stratified proportional hazards model.

With a minimum follow-up of 36 months, the trial demonstrated a statistically significant improvement in RFS for patients randomised to the nivolumab arm compared with the ipilimumab 10 mg/kg arm. RFS benefit was consistently demonstrated across subgroups, including tumour PD-L1 expression, BRAF status, and stage of disease. With a minimum follow up of 48 months, shown in Figure 8, the trial continued to demonstrate improvement in RFS in the nivolumab arm compared with the ipilimumab arm. RFS benefit was sustained across all subgroups.

**Figure 8: Recurrence-free survival (CA209238)**



**Number of subjects at risk**

**Nivolumab**

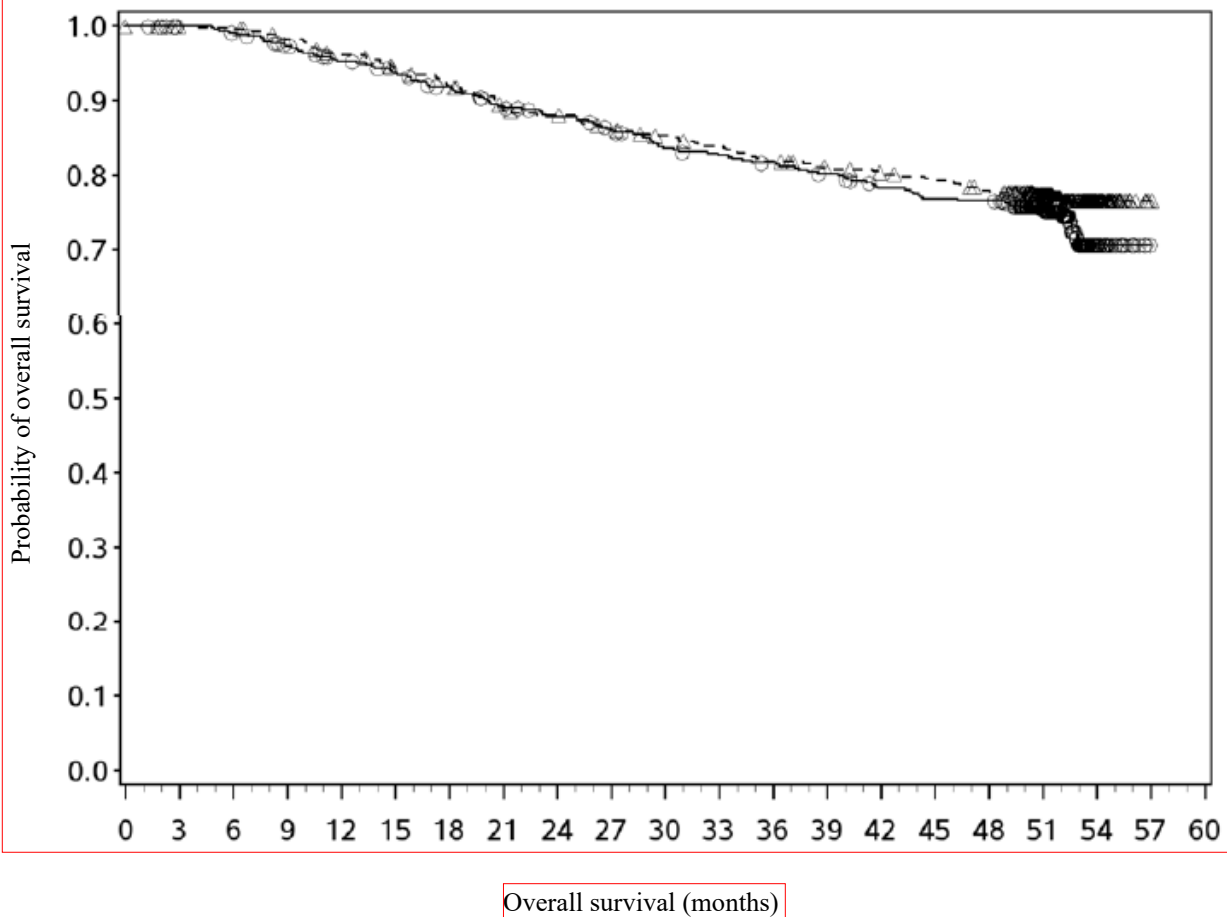
453 395 354 332 311 293 283 271 262 250 245 240 233 224 218 206 147 37 11 0

**Ipilimumab**

453 366 316 273 253 234 220 208 201 191 185 177 171 168 163 154 113 32 10 0

---△--- Nivolumab      —○— Ipilimumab

**Figure 9: Overall survival (CA209238)**



Number of subjects at risk	
Nivolumab	453 450 447 438 427 416 405 388 383 373 366 359 350 341 337 332 324 237 45 1 0
Ipilimumab	453 447 442 430 416 407 395 382 373 363 350 345 340 333 322 316 315 218 40 0 0

--△-- Nivolumab      —○— Ipilimumab

With a minimum follow-up of 48 months, shown in Figure 9, median OS was not reached in either group (HR = 0.87, 95.03% CI: 0.66, 1.14; p-value: 0.3148). The overall survival data are confounded by the effects of effective subsequent anti-cancer therapies. Subsequent systemic therapy was received by 33% and 42% of patients in the nivolumab and ipilimumab arms, respectively. Subsequent immunotherapy (including anti-PD1 therapy, anti-CTLA-4 antibody, or other immunotherapy) was received by 23% and 34% of patients in the nivolumab and ipilimumab arms, respectively.

Quality of life (QoL) with nivolumab remained stable and close to baseline values during treatment, as assessed by valid and reliable scales like the European Organization for Research and Treatment of Cancer (EORTC) QLQ-C30 and the EQ-5D utility index and visual analog scale (VAS).

Non-small cell lung cancer

First-line treatment of NSCLC

Randomised phase 3 study of nivolumab in combination with ipilimumab and 2 cycles of platinum-based chemotherapy vs. 4 cycles of platinum-based chemotherapy (CA2099LA)

The safety and efficacy of nivolumab 360 mg every 3 weeks in combination with ipilimumab 1 mg/kg every 6 weeks and 2 cycles of platinum-based chemotherapy were evaluated in a phase 3, randomised, open-label study (CA2099LA). The study included patients (18 years or older) with histologically confirmed non-squamous or squamous Stage IV or recurrent NSCLC (per the 7<sup>th</sup> International

Association for the Study of Lung Cancer classification), ECOG performance status 0 or 1, and no prior anticancer therapy (including EGFR and ALK inhibitors). Patients were enrolled regardless of their tumour PD-L1 status.

Patients with sensitising EGFR mutations or ALK translocations, active (untreated) brain metastases, carcinomatous meningitis, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the study. Patients with treated brain metastases were eligible if neurologically returned to baseline at least 2 weeks prior to enrolment, and either off corticosteroids, or on a stable or decreasing dose of < 10 mg daily prednisone equivalents. Randomisation was stratified by histology (squamous vs non-squamous), tumour PD-L1 expression level ( $\geq 1\%$  vs  $< 1\%$ ), and gender (male vs female).

A total of 719 patients were randomised to receive either nivolumab in combination with ipilimumab and platinum-based chemotherapy (n = 361) or platinum-based chemotherapy (n = 358). Patients in the nivolumab in combination with ipilimumab and platinum-based chemotherapy arm received nivolumab 360 mg administered intravenously over 30 minutes every 3 weeks in combination with ipilimumab 1 mg/kg administered intravenously over 30 minutes every 6 weeks and platinum-based chemotherapy administered every 3 weeks for 2 cycles. Patients in the chemotherapy arm received platinum-based chemotherapy administered every 3 weeks for 4 cycles; non-squamous patients could receive optional pemetrexed maintenance therapy. Platinum-based chemotherapy consisted of carboplatin (AUC 5 or 6) and pemetrexed 500 mg/m<sup>2</sup>; or cisplatin 75 mg/m<sup>2</sup> and pemetrexed 500 mg/m<sup>2</sup> for non-squamous NSCLC; or carboplatin (AUC 6) and paclitaxel 200 mg/m<sup>2</sup> for squamous NSCLC.

Treatment continued until disease progression, unacceptable toxicity, or for up to 24 months. Treatment could continue beyond disease progression if the patient was clinically stable and was considered to be deriving clinical benefit by the investigator. Patients who discontinued combination therapy because of an adverse event attributed to ipilimumab were permitted to continue nivolumab monotherapy. Tumour assessments were performed every 6 weeks after first dose of study treatment for the first 12 months, then every 12 weeks until disease progression or study treatment was discontinued.

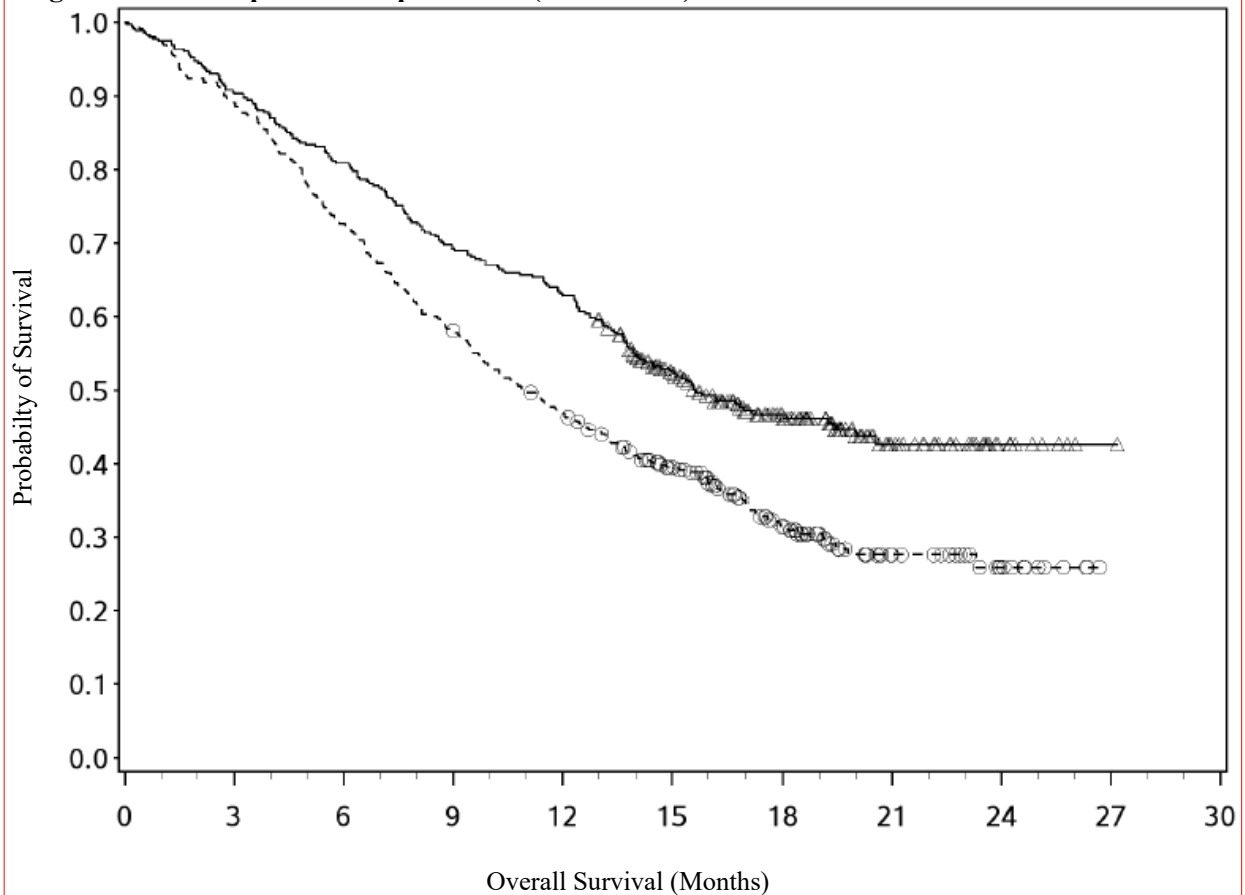
CA2099LA baseline characteristics were generally balanced across all treatment groups. The median age was 65 years (range: 26-86) with 51%  $\geq 65$  years of age and 10%  $\geq 75$  years of age. The majority of patients were white (89%) and male (70%). Baseline ECOG performance status was 0 (31%) or 1 (68%), 57% of patients with PD-L1  $\geq 1\%$  and 37% with PD-L1  $< 1\%$ , 31% had squamous and 69% had non-squamous histology, 17% had brain metastases, and 86% were former/current smokers. No patients received prior immunotherapy.

CA2099LA primary efficacy outcome measure was OS. Additional efficacy endpoints were PFS, ORR, and duration of response as assessed by BICR.

The study demonstrated a statistically significant benefit in OS, PFS, and ORR for patients randomised to nivolumab in combination with ipilimumab and platinum-based chemotherapy as compared to platinum-based chemotherapy alone at the prespecified interim analysis when 351 events were observed (87% of the planned number of events for final analysis). Minimum follow-up for OS was 8.1 months.

Efficacy results are shown in Figure 10 (updated OS analysis with a minimum follow-up of 12.7 months) and Table 14 (primary analysis with a minimum follow-up of 8.1 months). An updated efficacy analysis was performed when all patients had a minimum follow-up of 12.7 months (see Figure 10). At the time of this analysis, the hazard ratio for OS was 0.66 (95% CI: 0.55, 0.80) and the hazard ratio for PFS was 0.68 (95% CI: 0.57, 0.82).

**Figure 10: Kaplan-Meier plot of OS (CA2099LA)**



**Number of subjects at risk**

Nivolumab + ipilimumab + chemotherapy											
361	326	292	250	227	153	86	33	10	1	0	
Chemotherapy											
358	319	260	208	166	116	67	26	11	0	0	

—△—	Nivolumab + ipilimumab + chemotherapy (events: 190/361), median and 95% CI: 15.64 (13.93, 19.98)
---○---	Chemotherapy (events: 242/358), median and 95% CI: 10.91 (9.46, 12.55)

**Table 14: Efficacy results (CA2099LA)**

	nivolumab + ipilimumab + chemotherapy (n = 361)	chemotherapy (n = 358)
<b>Overall survival</b>		
Events	156 (43.2%)	195 (54.5%)
Hazard ratio (96.71% CI) <sup>a</sup>	0.69 (0.55, 0.87)	
Stratified log-rank p-value <sup>b</sup>	0.0006	
Median (months) (95% CI)	14.1 (13.24, 16.16)	10.7 (9.46, 12.45)
Rate (95% CI) at 6 months	80.9 (76.4, 84.6)	72.3 (67.4, 76.7)



	nivolumab + ipilimumab + chemotherapy (n = 361)		chemotherapy (n = 358)
<b>Progression-free survival</b>			
Events	232 (64.3%)		249 (69.6%)
Hazard ratio (97.48% CI) <sup>a</sup>		0.70 (0.57, 0.86)	
Stratified log-rank p-value <sup>c</sup>		0.0001	
Median (months) <sup>d</sup> (95% CI)	6.83 (5.55, 7.66)		4.96 (4.27, 5.55)
Rate (95% CI) at 6 months	51.7 (46.2, 56.8)		35.9 (30.5, 41.3)
<b>Overall response rate<sup>e</sup></b>			
(95% CI)	136 (37.7%) (32.7, 42.9)		90 (25.1%) (20.7, 30.0)
Stratified CMH test p-value <sup>f</sup>		0.0003	
Complete response (CR)	7 (1.9%)		3 (0.8%)
Partial response (PR)	129 (35.7%)		87 (24.3%)
<b>Duration of response</b>			
Median (months) (95% CI) <sup>d</sup>	10.02 (8.21, 13.01)		5.09 (4.34, 7.00)
% with duration ≥ 6 months <sup>g</sup>	74		41

<sup>a</sup> Based on a stratified Cox proportional hazard model.

<sup>b</sup> p-value is compared with the allocated alpha of 0.0329 for this interim analysis.

<sup>c</sup> p-value is compared with the allocated alpha of 0.0252 for this interim analysis.

<sup>d</sup> Kaplan-Meier estimate.

<sup>e</sup> Proportion with complete or partial response; CI based on the Clopper and Pearson Method.

<sup>f</sup> p-value is compared with the allocated alpha of 0.025 for this interim analysis.

<sup>g</sup> Based on Kaplan-Meier estimates of duration of response.

CMH = Cochran-Mantel-Haenszel

Subsequent systemic therapy was received by 28.8% and 41.1% of patients in the combination and chemotherapy arms, respectively. Subsequent immunotherapy (including anti-PD-1, anti-PD-L1, and anti-CTLA4) was received by 3.9% and 27.9% of patients in the combination and chemotherapy arms, respectively.

In study CA2099LA, subgroup descriptive analysis relative to chemotherapy, OS benefit was shown in patients treated with nivolumab in combination with ipilimumab and chemotherapy with squamous histology (HR [95% CI] 0.65 [0.46, 0.93], n = 227) and in patients with non-squamous histology (HR [95% CI] 0.72 [0.55, 0.93], n = 492).

Table 15 summarises efficacy results of OS, PFS, and ORR by tumour PD-L1 expression in pre-specified subgroup analyses.

**Table 15: Efficacy results by tumour PD-L1 expression (CA2099LA)**

	nivolumab + ipilimumab + chemotherapy		nivolumab + ipilimumab + chemotherapy		nivolumab + ipilimumab + chemotherapy		nivolumab + ipilimumab + chemotherapy	
	PD-L1 < 1% (n = 264)		PD-L1 ≥ 1% (n = 406)		PD-L1 ≥ 1% to 49% (n = 233)		PD-L1 ≥ 50% (n = 173)	
OS hazard ratio (95% CI) <sup>a</sup>	0.65 (0.46, 0.92)		0.67 (0.51, 0.89)		0.69 (0.48, 0.98)		0.64 (0.41, 1.02)	
PFS hazard ratio (95% CI) <sup>a</sup>	0.77 (0.57, 1.03)		0.67 (0.53, 0.85)		0.71 (0.52, 0.97)		0.59 (0.40, 0.86)	
ORR %	31.1	20.9	41.9	27.6	37.8	24.5	48.7	30.9

<sup>a</sup> Hazard ratio based on unstratified Cox proportional hazards model.

A total of 70 NSCLC patients aged ≥ 75 years were enrolled in study CA2099LA (37 patients in the nivolumab in combination with ipilimumab and chemotherapy arm and 33 patients in the chemotherapy arm). A HR of 1.36 (95% CI: 0.74, 2.52) in OS and a HR of 1.12 (95% CI: 0.64, 1.96) in PFS was observed for nivolumab in combination with ipilimumab and chemotherapy vs. chemotherapy within this study subgroup. ORR was 27.0% in the nivolumab in combination with ipilimumab and chemotherapy arm and 15.2% in the chemotherapy arm. Forty-three percent of patients aged ≥ 75 years discontinued treatment with nivolumab in combination with ipilimumab and chemotherapy. Efficacy and safety data of nivolumab in combination with ipilimumab and chemotherapy are limited in this patient population.

In a subgroup analysis, a reduced survival benefit for nivolumab in combination with ipilimumab and chemotherapy compared to chemotherapy was observed in patients who were never smokers. However, due to the small numbers of patients, no definitive conclusions can be drawn from these data.

#### Treatment of NSCLC after prior chemotherapy

##### Squamous NSCLC

##### Randomised phase 3 study vs. docetaxel (CA209017)

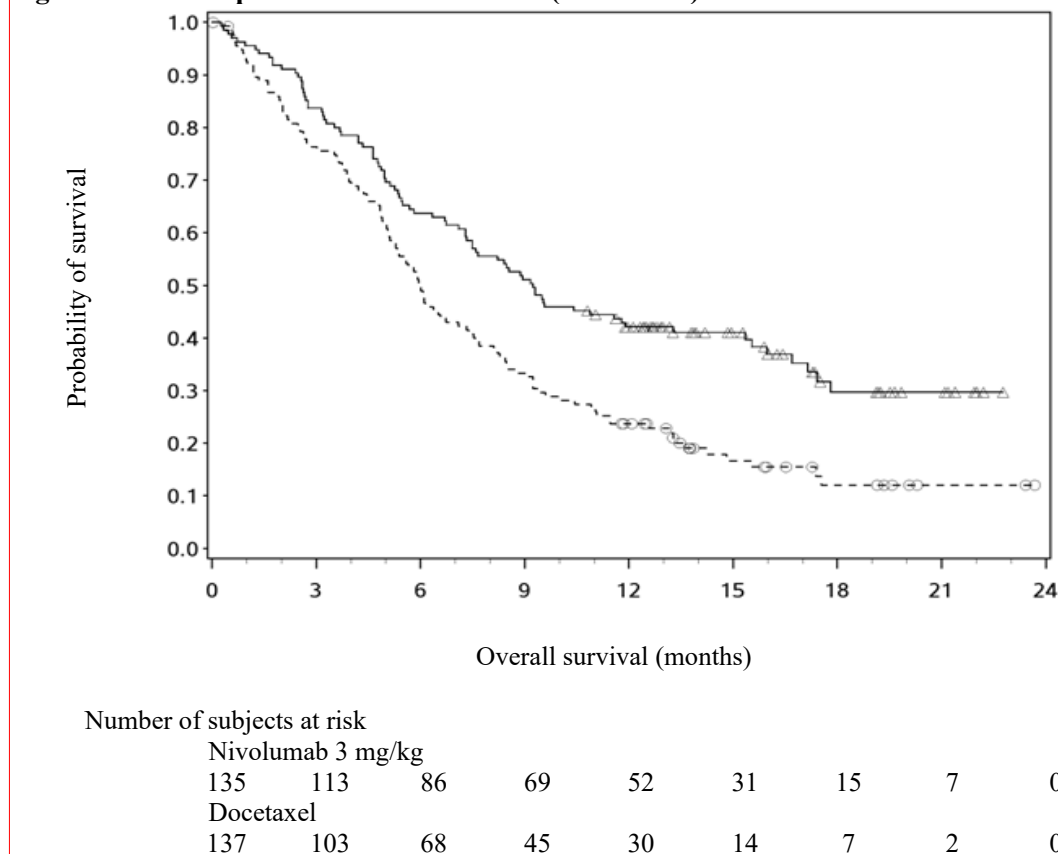
The safety and efficacy of nivolumab 3 mg/kg as a single agent for the treatment of advanced or metastatic squamous NSCLC were evaluated in a phase 3, randomised, open-label study (CA209017). The study included patients (18 years or older) who have experienced disease progression during or after one prior platinum doublet-based chemotherapy regimen and an ECOG performance status score of 0 or 1. Patients were enrolled regardless of their tumour PD-L1 status. Patients with active autoimmune disease, symptomatic interstitial lung disease, or active brain metastases were excluded from the study. Patients with treated brain metastases were eligible if neurologically returned to baseline at least 2 weeks prior to enrolment, and either off corticosteroids, or on a stable or decreasing dose of < 10 mg daily prednisone equivalents.

A total of 272 patients were randomised to receive either nivolumab 3 mg/kg (n = 135) administered intravenously over 60 minutes every 2 weeks or docetaxel (n = 137) 75 mg/m<sup>2</sup> every 3 weeks. Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. Tumour assessments, according to the RECIST, version 1.1, were conducted 9 weeks after randomisation and continued every 6 weeks thereafter. The primary efficacy outcome measure was OS. Key secondary efficacy outcome measures were investigator-assessed ORR and PFS. In addition, symptom improvement and overall health status were assessed using the Lung cancer symptom score (LCSS) average symptom burden index and the EQ-5D Visual Analogue Scale (EQ-VAS), respectively.

Baseline characteristics were generally balanced between the two groups. The median age was 63 years (range: 39-85) with 44%  $\geq$  65 years of age and 11%  $\geq$  75 years of age. The majority of patients were white (93%) and male (76%). Thirty-one percent had progressive disease reported as the best response to their most recent prior regimen and 45% received nivolumab within 3 months of completing their most recent prior regimen. Baseline ECOG performance status score was 0 (24%) or 1 (76%).

The Kaplan-Meier curves for OS are shown in Figure 11.

**Figure 11: Kaplan-Meier curves of OS (CA209017)**



—△— Nivolumab 3 mg/kg (events: 86/135), median and 95% CI: 9.23 (7.33, 13.27)

- -○- - Docetaxel (events: 113/137), median and 95% CI: 6.01 (5.13, 7.33)

The observed OS benefit was consistently demonstrated across subgroups of patients. Survival benefit was observed regardless of whether patients had tumours that were designated PD-L1 negative or PD-L1 positive (tumour membrane expression cut off of 1%, 5% or 10%). However, the role of this biomarker (tumour PD-L1 expression) has not been fully elucidated. With a minimum of 62.6 months follow-up, OS benefit remains consistently demonstrated across subgroups.

Study CA209017 included a limited number of patients  $\geq$  75 years (11 in the nivolumab group and 18 in the docetaxel group). Nivolumab showed numerically less effect on OS (HR 1.85; 95% CI: 0.76, 4.51), PFS (HR = 1.76; 95%-CI: 0.77, 4.05) and ORR (9.1% vs. 16.7%). Because of the small sample size, no definitive conclusions can be drawn from these data.

Efficacy results are shown in Table 16.

**Table 16: Efficacy results (CA209017)**

	<b>nivolumab (n = 135)</b>	<b>docetaxel (n = 137)</b>
<b>Primary analysis</b>		
Minimum follow-up: 10.6 months		
<b>Overall survival</b>		
Events	86 (63.7%)	113 (82.5%)
Hazard ratio		0.59
96.85% CI		(0.43, 0.81)
p-value		0.0002
Median (95% CI) months	9.23 (7.33, 13.27)	6.01 (5.13, 7.33)
Rate (95% CI) at 12 months	42.1 (33.7, 50.3)	23.7 (16.9, 31.1)
<b>Confirmed objective response</b>		
(95% CI)	27 (20.0%) (13.6, 27.7)	12 (8.8%) (4.6, 14.8)
Odds ratio (95% CI)		2.64 (1.27, 5.49)
p-value		0.0083
Complete response (CR)	1 (0.7%)	0
Partial response (PR)	26 (19.3%)	12 (8.8%)
Stable disease (SD)	39 (28.9%)	47 (34.3%)
<b>Median duration of response</b>		
Months (range)	Not reached (2.9-20.5 <sup>+</sup> )	8.4 (1.4 <sup>+</sup> -15.2 <sup>+</sup> )
<b>Median time to response</b>		
Months (range)	2.2 (1.6-11.8)	2.1 (1.8-9.5)
<b>Progression-free survival</b>		
Events	105 (77.8%)	122 (89.1%)
Hazard ratio		0.62
95% CI		(0.47, 0.81)
p-value		< 0.0004
Median (95% CI) (months)	3.48 (2.14, 4.86)	2.83 (2.10, 3.52)
Rate (95% CI) at 12 months	20.8 (14.0, 28.4)	6.4 (2.9, 11.8)
<b>Updated analysis</b>		
Minimum follow-up: 24.2 months		
<b>Overall survival<sup>a</sup></b>		
Events	110 (81.4%)	128 (93.4%)
Hazard ratio		0.62
95% CI		(0.47, 0.80)
Rate (95% CI) at 24 months	22.9 (16.2, 30.3)	8 (4.3, 13.3)
<b>Confirmed objective response</b>		
(95% CI)	20.0% (13.6, 27.7)	8.8% (4.6, 14.8)
<b>Median duration of response</b>		
Months (range)	25.2 (2.9-30.4)	8.4 (1.4 <sup>+</sup> -18.0 <sup>+</sup> )

	<b>nivolumab</b> (n = 135)	<b>docetaxel</b> (n = 137)
<b>Progression-free survival</b>		
Rate (95% CI) at 24 months	15.6 (9.7, 22.7)	All patients had either progressed, were censored, or lost to follow-up
	<b>Updated analysis</b> Minimum follow-up: 62.6 months	
<b>Overall survival<sup>a</sup></b>		
Events	118 (87.4%)	133 (97.1%)
Hazard ratio		0.62
95% CI		(0.48, 0.79)
Rate (95% CI) at 60 months	12.3 (7.4, 18.5)	3.6 (1.4, 7.8)
<b>Confirmed objective response</b>		
(95% CI)	20.0% (13.6, 27.7)	8.8% (4.6, 14.8)
<b>Median duration of response</b>		
Months (range)	25.2 (2.9-70.6 <sup>+</sup> )	7.5 (0.0 <sup>+</sup> -18.0 <sup>+</sup> )
<b>Progression-free survival</b>		
Rate (95% CI) at 60 months	9.4 (4.8, 15.8)	All patients had either progressed, were censored, or lost to follow-up

<sup>a</sup> Six patients (4%) randomised to docetaxel crossed over at any time to receive nivolumab treatment.

<sup>+++</sup> Denotes a censored observation.

The rate of disease-related symptom improvement, as measured by LCSS, was similar between the nivolumab group (18.5%) and the docetaxel group (21.2%). The average EQ-VAS increased over time for both treatment groups, indicating better overall health status for patients remaining on treatment.

#### Single-arm phase 2 study (CA209063)

Study CA209063 was a single-arm, open-label study conducted in 117 patients with locally advanced or metastatic squamous NSCLC after two or more lines of therapy; otherwise similar inclusion criteria as study CA209017 were applied. Nivolumab 3 mg/kg showed an ORR of 14.5% (95% CI: 8.7,22.2%), a median OS of 8.21 months (95% CI: 6.05,10.9), and a median PFS of 1.87 months (95% CI 1.77,3.15). The PFS was measured by RECIST, version 1.1. The estimated 1-year survival rate was 41%.

#### Single-arm phase 2 study (CA209171)

Study CA209171 was a single-arm, open label study of nivolumab monotherapy in patients with previously treated advanced or metastatic squamous NSCLC. Safety was the primary endpoint and efficacy was a secondary endpoint. Of the 811 treated patients, 103 (13%) had an ECOG performance score of 2, 686 (85%) were < 75 years old and 125 (15%) were ≥ 75 years old. No new safety signals were identified in all treated patients and the overall safety profile of nivolumab was similar across subgroups. Efficacy results based on investigator-assessed ORR are presented in Table 17 below.

**Table 17: ORR based on response evaluable patients – total and by subgroup (CA209171)**

<b>Results</b>	<b>Total</b>	<b>ECOG PS 2</b>	<b>&lt; 75 years</b>	<b>≥ 75 years</b>
N responders/ N evaluable <sup>a</sup>	66/671	1/64	55/568	11/103
(%)	(9.8)	(6.1)	(9.7)	(10.7)
95% CI <sup>b</sup>	(7.7, 12.3)	(0.0, 8.4)	(7.4, 12.4)	(5.5, 18.3)

<sup>a</sup> includes confirmed and unconfirmed responses, scans were mandatory only at week 8/9 and week 52.

<sup>b</sup> CR+PR, confidence interval based on the Clopper and Pearson method

## Non-squamous NSCLC

### Randomised phase 3 study vs. docetaxel (CA209057)

The safety and efficacy of nivolumab 3 mg/kg as a single agent for the treatment of advanced or metastatic non-squamous NSCLC were evaluated in a phase 3, randomised, open-label study (CA209057). The study included patients (18 years or older) who have experienced disease progression during or after one prior platinum doublet-based chemotherapy regimen which may have included maintenance therapy and who had an ECOG performance status score of 0 or 1. An additional line of TKI therapy was allowed for patients with known EGFR mutation or ALK translocation. Patients were enrolled regardless of their tumour PD-L1 status. Patients with active autoimmune disease, symptomatic interstitial lung disease, or active brain metastases were excluded from the study. Patients with treated brain metastases were eligible if neurologically returned to baseline at least 2 weeks prior to enrolment, and either off corticosteroids, or on a stable or decreasing dose of < 10 mg daily prednisone equivalents.

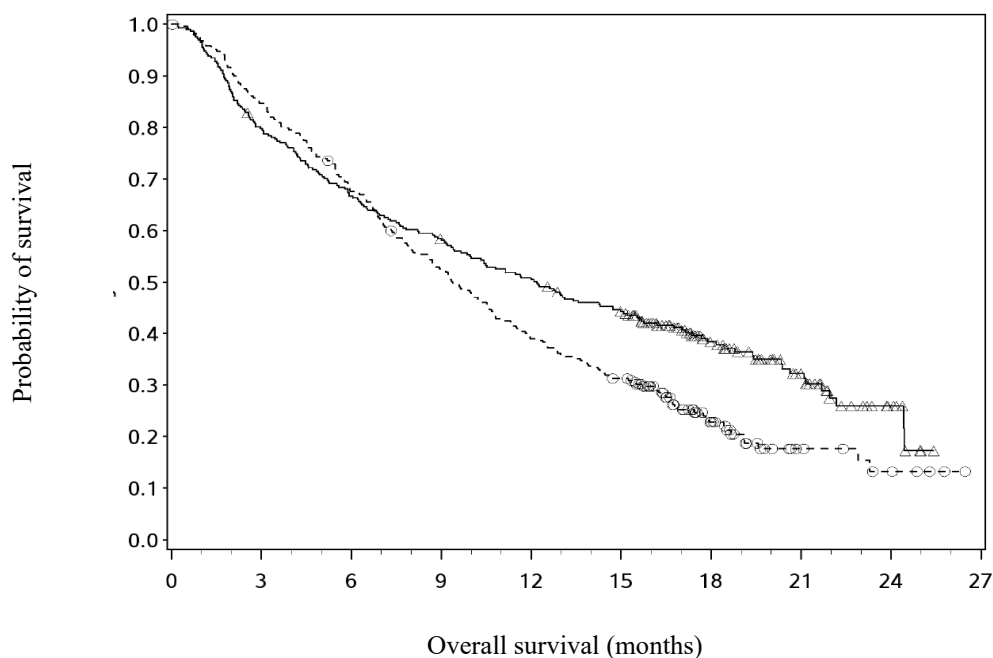
A total of 582 patients were randomised to receive either nivolumab 3 mg/kg administered intravenously over 60 minutes every 2 weeks (n = 292) or docetaxel 75 mg/m<sup>2</sup> every 3 weeks (n = 290). Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. Tumour assessments were conducted according to the RECIST version 1.1. The primary efficacy outcome measure was OS. Key secondary efficacy outcome measures were investigator-assessed ORR and PFS. Additional prespecified subgroup analyses were conducted to evaluate the efficacy of tumour PD-L1 expression at predefined levels of 1%, 5% and 10%. Assessment according to discrete PD-L1 expression intervals were not included in the prespecified analyses due to the small sample sizes within the intervals.

Pre-study tumour tissue specimens were systematically collected prior to randomisation in order to conduct pre-planned analyses of efficacy according to tumour PD-L1 expression. Tumour PD-L1 expression was determined using the PD-L1 IHC 28-8 pharmDx assay.

The median age was 62 years (range: 21 to 85) with 34% ≥ 65 years of age and 7% ≥ 75 years of age. The majority of patients were white (92%) and male (55%). Baseline ECOG performance status was 0 (31%) or 1 (69%). Seventy-nine percent of patients were former/current smokers.

The Kaplan-Meier curves for OS are shown in Figure 12.

**Figure 12: Kaplan-Meier curves of OS (CA209057)**



Number of subjects at risk											
Nivolumab 3 mg/kg		292	232	194	169	146	123	62	32	9	0
Docetaxel		290	244	194	150	111	88	34	10	5	0

—△— Nivolumab 3 mg/kg (events: 190/292), median and 95% CI: 12.19 (9.66, 14.98)  
 ---○--- Docetaxel (events: 223/290), median and 95% CI: 9.36 (8.05, 10.68)

The trial demonstrated a statistically significant improvement in OS for patients randomised to nivolumab as compared with docetaxel at the prespecified interim analysis when 413 events were observed (93% of the planned number of events for final analysis). Efficacy results are shown in Table 18.

**Table 18: Efficacy results (CA209057)**

	<b>nivolumab</b> (n = 292)	<b>docetaxel</b> (n = 290)
<b>Prespecified interim analysis</b>		
Minimum follow-up: 13.2 months		
<b>Overall survival</b>		
Events	190 (65.1%)	223 (76.9%)
Hazard ratio <sup>a</sup> (95.92% CI)		0.73 (0.59, 0.89)
p-value <sup>b</sup>		0.0015
Median (95% CI) months	12.19 (9.66, 14.98)	9.36 (8.05, 10.68)
Rate (95% CI) at 12 months	50.5 (44.6, 56.1)	39.0 (33.3, 44.6)

	<b>nivolumab</b> <b>(n = 292)</b>	<b>docetaxel</b> <b>(n = 290)</b>
<b>Confirmed objective response</b>	56 (19.2%)	36 (12.4%)
(95% CI)	(14.8, 24.2)	(8.8, 16.8)
Odds ratio (95% CI)		1.68 (1.07, 2.64)
p-value		0.0246
<b>Complete response (CR)</b>	4 (1.4%)	1 (0.3%)
<b>Partial response (PR)</b>	52 (17.8%)	35 (12.1%)
<b>Stable disease (SD)</b>	74 (25.3%)	122 (42.1%)
<b>Median duration of response</b>		
Months (range)	17.15 (1.8-22.6 <sup>+</sup> )	5.55 (1.2 <sup>+</sup> -15.2 <sup>+</sup> )
<b>Median time to response</b>		
Months (range)	2.10 (1.2-8.6)	2.61 (1.4-6.3)
<b>Progression-free survival</b>		
Events	234 (80.1%)	245 (84.5%)
Hazard ratio		0.92
95% CI		(0.77, 1.11)
p-value		0.3932
Median (95% CI) (months)	2.33 (2.17, 3.32)	4.21 (3.45, 4.86)
Rate (95% CI) at 12 months	18.5 (14.1, 23.4)	8.1 (5.1, 12.0)
<b>Updated analysis</b>		
Minimum follow-up: 24.2 months		
<b>Overall survival<sup>a</sup></b>		
Events	228 (78.1%)	247 (85.1%)
Hazard ratio <sup>a</sup>		0.75
(95% CI)		(0.63, 0.91)
Rate (95% CI) at 24 months	28.7 (23.6, 34.0)	15.8 (11.9, 20.3)
<b>Confirmed objective response</b>	19.2%	12.4%
(95% CI)	(14.8, 24.2)	(8.8, 16.8)
<b>Median duration of response</b>		
Months (range)	17.2 (1.8-33.7 <sup>+</sup> )	5.6 (1.2 <sup>+</sup> -16.8)
<b>Progression-free survival</b>		
Rate (95% CI) at 24 months	11.9 (8.3, 16.2)	1.0 (0.2, 3.3)



	nivolumab (n = 292)	docetaxel (n = 290)
<b>Updated analysis</b>		
Minimum follow-up: 62.7 months		
<b>Overall survival<sup>d</sup></b>		
Events	250 (85.6%)	279 (96.2%)
Hazard ratio <sup>a</sup> (95% CI)		0.70 (0.58, 0.83)
Rate (95% CI) at 60 months	14.0 (10.2, 18.3)	2.1 (0.9, 4.4)
<b>Confirmed objective response</b>		
(95% CI)	19.5% (15.1, 24.5)	12.4% (8.8, 16.8)
<b>Median duration of response</b>		
Months (range)	17.2 (1.8-70.4 <sup>+</sup> )	5.6 (0.0 <sup>+</sup> -33.4)
<b>Progression-free survival</b>		
Rate (95% CI) at 60 months	7.5 (4.5, 11.4)	All patients had either progressed, were censored, or lost to follow-up
<sup>a</sup>	Derived from a stratified proportional hazards model.	
<sup>b</sup>	P-value is derived from a log-rank test stratified by prior maintenance therapy and line of therapy; the corresponding O'Brien-Fleming efficacy boundary significance level is 0.0408.	
<sup>c</sup>	Sixteen patients (6%) randomised to docetaxel crossed over at any time to receive nivolumab treatment.	
<sup>d</sup>	Seventeen patients (6%) randomised to docetaxel crossed over at any time to receive nivolumab treatment.	
<sup>+</sup>	Denotes a censored observation.	

Quantifiable tumour PD-L1 expression was measured in 79% of patients in the nivolumab group and 77% of patients in the docetaxel group. Tumour PD-L1 expression levels were balanced between the two treatment groups (nivolumab vs. docetaxel) at each of the predefined tumour PD-L1 expression levels of  $\geq 1\%$  (53% vs. 55%),  $\geq 5\%$  (41% vs. 38%), or  $\geq 10\%$  (37% vs. 35%).

Patients with tumour PD-L1 expression by all predefined expression levels in the nivolumab group demonstrated greater likelihood of improved survival compared to docetaxel, whereas survival was similar to docetaxel in patients with low or no tumour PD-L1 expression. In terms of ORR, increasing PD-L1 expression was associated with larger ORR. Comparable to the overall population, median duration of response was increased with nivolumab vs. docetaxel for patients with no PD-L1 expression (18.3 months vs. 5.6 months) and for patients with PD-L1 expression (16.0 months vs. 5.6 months).

Table 19 summarises results of ORR and OS by tumour PD-L1 expression.

**Table 19: ORR and OS by tumour PD-L1 expression (CA209057)**

PD-L1 expression	nivolumab	docetaxel	Odds ratio (95% CI)
<b>ORR by tumour PD-L1 expression</b>			
Minimum follow-up: 13.2 months			
< 1%	10/108 (9.3%) 95% CI: 4.5, 16.4	15/101 (14.9%) 95% CI: 8.6, 23.3	0.59 (0.22, 1.48)
$\geq 1\%$	38/123 (30.9%) 95% CI: 22.9, 39.9	15/123 (12.2%) 95% CI: 7.0, 19.3	3.22 (1.60, 6.71)
$\geq 1\%$ to < 10% <sup>a</sup>	6/37 (16.2%) 95% CI: 6.2, 32.0	5/44 (11.4%) 95% CI: 3.8, 24.6	1.51 (0.35, 6.85)
$\geq 10\%$ to < 50% <sup>a</sup>	5/20 (25.0%) 95% CI: 8.7, 49.1	7/33 (21.2%) 95% CI: 9.0, 38.9	1.24 (0.26, 5.48)
$\geq 50\%$ <sup>a</sup>	27/66 (40.9%) 95% CI: 29.0, 53.7	3/46 (6.5%) 95% CI: 1.4, 17.9	9.92 (2.68, 54.09)

PD-L1 expression	nivolumab	docetaxel	
<b>OS by tumour PD-L1 expression</b>			
Minimum follow-up: 13.2 months			
	<b>Number of events (number of patients)</b>		<b>Unstratified hazard ratio (95% CI)</b>
< 1%	77 (108)	75 (101)	0.90 (0.66, 1.24)
≥ 1%	68 (123)	93 (123)	0.59 (0.43, 0.82)
≥ 1% to < 10% <sup>a</sup>	27 (37)	30 (44)	1.33 (0.79, 2.24)
≥ 10% to < 50% <sup>a</sup>	11 (20)	26 (33)	0.61 (0.30, 1.23)
≥ 50% <sup>a</sup>	30 (66)	37 (46)	0.32 (0.20, 0.53)
<b>Updated analysis</b>			
Minimum follow-up: 24.2 months			
< 1%	91 (108)	86 (101)	0.91 (0.67, 1.22)
≥ 1%	87 (123)	103 (123)	0.62 (0.47, 0.83)
<b>Updated analysis</b>			
Minimum follow-up: 62.7 months			
< 1%	100 (109)	96 (101)	0.87 (0.66, 1.16)
≥ 1%	96 (122)	119 (123)	0.55 (0.42, 0.73)

<sup>a</sup> Post-hoc analysis; results should be interpreted with caution as the subgroup samples sizes are small and, at the time of the analysis, the PD-L1 IHC 28-8 pharmDx assay was not analytically validated at the 10% or 50% expression levels.

A higher proportion of patients experienced death within the first 3 months in the nivolumab arm (59/292, 20.2%) as compared to the docetaxel arm (44/290, 15.2%). Results of a post-hoc, exploratory multivariate analysis indicated that nivolumab-treated patients with poorer prognostic features and/or aggressive disease when combined with lower (e.g., < 50%) or no tumour PD-L1 expression may be at higher risk of death within the first 3 months.

In subgroup analyses, survival benefit compared to docetaxel was not shown for patients who were never-smokers or whose tumours harboured EGFR activating mutations; however, due to the small numbers of patients, no definitive conclusions can be drawn from these data.

### *Malignant pleural mesothelioma*

#### Randomised phase 3 study of nivolumab in combination with ipilimumab vs. chemotherapy (CA209743)

The safety and efficacy of nivolumab 3 mg/kg every 2 weeks in combination with ipilimumab 1 mg/kg every 6 weeks were evaluated in a phase 3, randomised, open-label study (CA209743). The study included patients (18 years or older) with histologically confirmed and previously untreated malignant pleural mesothelioma of epithelioid or non-epithelioid histology, ECOG performance status 0 or 1, and no palliative radiotherapy within 14 days of first study therapy. Patients were enrolled regardless of their tumour PD-L1 status.

Patients with primitive peritoneal, pericardial, testis, or tunica vaginalis mesothelioma, interstitial lung disease, active autoimmune disease, medical conditions requiring systemic immunosuppression, and brain metastasis (unless surgically resected or treated with stereotaxic radiotherapy and no evolution within 3 months prior to inclusion in the study) were excluded from the trial. Randomisation was stratified by histology (epithelioid vs. sarcomatoid or mixed histology subtypes) and gender (male vs. female).

A total of 605 patients were randomised to receive either nivolumab in combination with ipilimumab (n = 303) or chemotherapy (n = 302). Patients in the nivolumab in combination with ipilimumab arm received nivolumab 3 mg/kg over 30 minutes by intravenous infusion every 2 weeks in combination with ipilimumab 1 mg/kg over 30 minutes by intravenous infusion every 6 weeks for up to 2 years.

Patients in the chemotherapy arm received chemotherapy for up to 6 cycles (each cycle was 21 days). Chemotherapy consisted of cisplatin 75 mg/m<sup>2</sup> and pemetrexed 500 mg/m<sup>2</sup> or carboplatin 5 AUC and pemetrexed 500 mg/m<sup>2</sup>.

Treatment continued until disease progression, unacceptable toxicity, or for up to 24 months. Treatment could continue beyond disease progression if the patient was clinically stable and was considered to be deriving clinical benefit by the investigator. Patients who discontinued combination therapy because of an adverse reaction attributed to ipilimumab were permitted to continue nivolumab monotherapy. Tumour assessments were performed every 6 weeks after first dose of study treatment for the first 12 months, then every 12 weeks until disease progression or study treatment was discontinued.

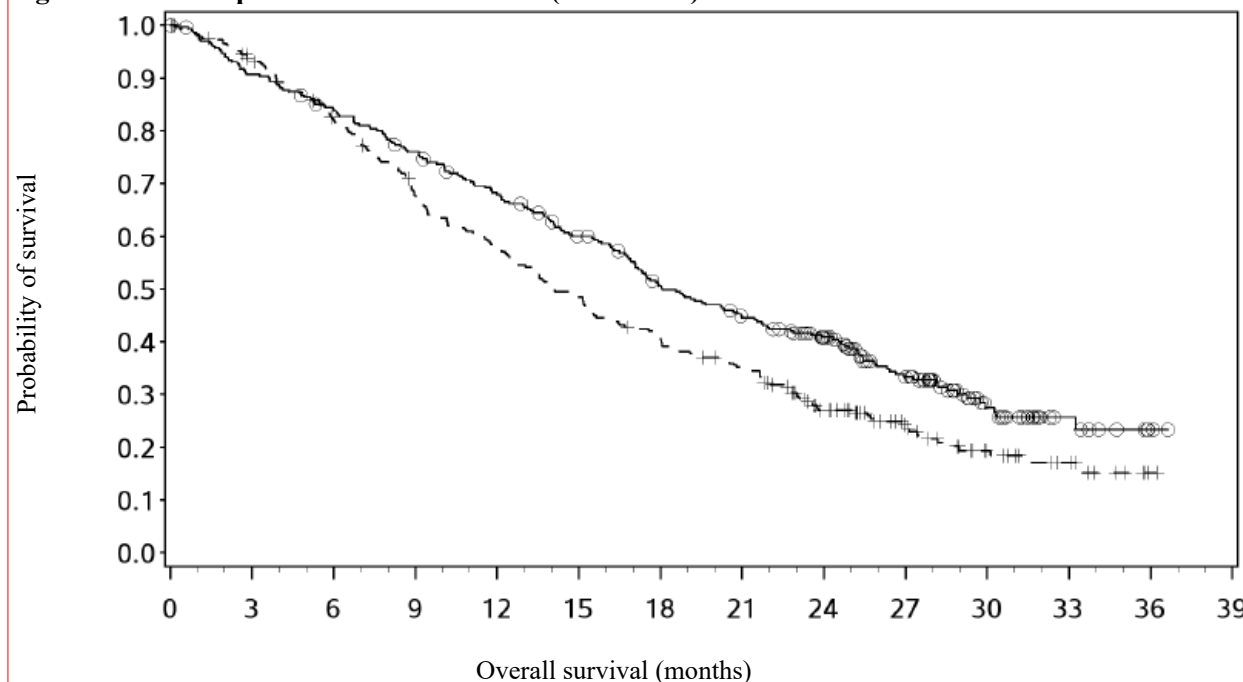
CA209743 baseline characteristics were generally balanced across all treatment groups. The median age was 69 years (range: 25-89) with 72% ≥ 65 years of age and 26% ≥ 75 years of age. The majority of patients were white (85%) and male (77%). Baseline ECOG performance status was 0 (40%) or 1 (60%), 80% of patients with PD-L1 ≥ 1% and 20% with PD-L1 < 1%, 75% had epithelioid and 25% had non-epithelioid histology.

CA209743 primary efficacy outcome measure was OS. Key secondary efficacy endpoints were PFS, ORR, and duration of response as assessed by Blinded Independent Central Review (BICR) utilising modified RECIST criteria for pleural mesothelioma. Descriptive analyses for these secondary endpoints are presented in Table 20.

The study demonstrated a statistically significant improvement in OS for patients randomised to nivolumab in combination with ipilimumab as compared to chemotherapy at the prespecified interim analysis when 419 events were observed (89% of the planned number of events for final analysis). Minimum follow-up for OS was 22 months.

Efficacy results are shown in Figure 13 and Table 20.

**Figure 13: Kaplan-Meier curves of OS (CA209743)**



Number of subjects at risk														
Nivolumab + ipilimumab														
	303	273	251	226	200	173	143	124	101	65	30	11	2	0
Chemotherapy														
	302	268	233	190	162	136	113	95	62	38	20	11	1	0

---○--- Nivolumab + ipilimumab (events: 200/303), median and 95% CI: 18.07 (16.82, 21.45)  
 ---+--- Chemotherapy (events: 219/302), median and 95% CI: 14.09 (12.45, 16.23)

**Table 20: Efficacy results (CA209743)**

	nivolumab + ipilimumab (n = 303)	chemotherapy (n = 302)
<b>Overall survival</b>		
Events	200 (66%)	219 (73%)
Hazard ratio (96.6% CI) <sup>a</sup>		0.74 (0.60, 0.91)
Stratified log-rank p-value <sup>b</sup>		0.002
Median (months) <sup>c</sup> (95% CI)	18.1 (16.8, 21.5)	14.1 (12.5, 16.2)
Rate (95% CI) at 24 months <sup>c</sup>	41% (35.1, 46.5)	27% (21.9, 32.4)
<b>Progression-free survival</b>		
Events	218 (72%)	209 (69%)
Hazard ratio (95% CI) <sup>a</sup>		1.0 (0.82, 1.21)
Median (months) <sup>c</sup> (95% CI)	6.8 (5.6, 7.4)	7.2 (6.9, 8.1)

	nivolumab + ipilimumab (n = 303)	chemotherapy (n = 302)
<b>Overall response rate</b>	40%	43%
(95% CI)	(34.1, 45.4)	(37.1, 48.5)
Complete response (CR)	1.7%	0
Partial response (PR)	38%	43%
<b>Duration of response</b>		
Median (months) <sup>c</sup>	11.0	6.7
(95% CI)	(8.1, 16.5)	(5.3, 7.1)

<sup>a</sup> Stratified Cox proportional hazard model.

<sup>b</sup> p-value is compared with the allocated alpha of 0.0345 for this interim analysis.

<sup>c</sup> Kaplan-Meier estimate.

Subsequent systemic therapy was received by 44.2% and 40.7% of patients in the combination and chemotherapy arms, respectively. Subsequent immunotherapy (including anti-PD-1, anti-PD-L1, and anti-CTLA-4) was received by 3.3% and 20.2% of patients in the combination and chemotherapy arms, respectively.

Table 21 summarises efficacy results of OS, PFS, and ORR by histology in prespecified subgroup analyses.

**Table 21: Efficacy results by histology (CA209743)**

	Epithelioid (n = 471)		Non-epithelioid (n = 134)	
	nivolumab + ipilimumab (n = 236)	chemotherapy (n = 235)	nivolumab + ipilimumab (n = 67)	chemotherapy (n = 67)
<b>Overall survival</b>				
Events	157	164	43	55
Hazard ratio (95% CI) <sup>a</sup>		0.85 (0.68, 1.06)		0.46 (0.31, 0.70)
Median (months) (95% CI)	18.73 (17.05, 21.72)	16.23 (14.09, 19.15)	16.89 (11.83, 25.20)	8.80 (7.62, 11.76)
Rate (95% CI) at 24 months	41.2 (34.7, 47.6)	31.8 (25.7, 38.1)	39.5 (27.5, 51.2)	9.7 (3.8, 18.9)
<b>Progression-free survival</b>				
Hazard ratio (95% CI) <sup>a</sup>		1.14 (0.92, 1.41)		0.58 (0.38, 0.90)
Median (months) (95% CI)	6.18 (5.49, 7.03)	7.66 (7.03, 8.31)	8.31 (3.84, 11.01)	5.59 (5.13, 7.16)
<b>Overall response rate</b>				
(95% CI) <sup>b</sup>	38.6% (32.3, 45.1)	47.2% (40.7, 53.8)	43.3% (31.2, 56.0)	26.9% (16.8, 39.1)
<b>Duration of response</b>				
Median (months) (95% CI) <sup>c</sup>	8.44 (7.16, 14.59)	6.83 (5.59, 7.13)	24.02 (8.31, N.A.)	4.21 (2.79, 7.03)

<sup>a</sup> Hazard ratio based on unstratified Cox proportional hazards model.

<sup>b</sup> Confidence interval based on the Clopper and Pearson method

<sup>c</sup> Median computed using Kaplan-Meier method

Table 22 summarises efficacy results of OS, PFS, and ORR by baseline tumour PD-L1 expression in prespecified subgroup analyses.

**Table 22: Efficacy results by tumour PD-L1 expression (CA209743)**

	PD-L1 < 1% (n = 135)		PD-L1 ≥ 1% (n = 451)	
	nivolumab + ipilimumab (n = 57)	chemotherapy (n = 78)	nivolumab + ipilimumab (n = 232)	chemotherapy (n = 219)
<b>Overall survival</b>				
Events	40	58	150	157
Hazard ratio (95% CI) <sup>a</sup>		0.94 (0.62, 1.40)		0.69 (0.55, 0.87)
Median (months) (95% CI) <sup>b</sup>	17.3 (10.1, 24.3)	16.5 (13.4, 20.5)	18.0 (16.8, 21.5)	13.3 (11.6, 15.4)
Rate (95% CI) at 24 months	38.7 (25.9, 51.3)	24.6 (15.5, 35.0)	40.8 (34.3, 47.2)	28.3 (22.1, 34.7)
<b>Progression-free survival</b>				
Hazard ratio (95% CI) <sup>a</sup>		1.79 (1.21, 2.64)		0.81 (0.64, 1.01)
Median (months) (95% CI) <sup>b</sup>	4.1 (2.7, 5.6)	8.3 (7.0, 11.1)	7.0 (5.8, 8.5)	7.1 (6.2, 7.6)
<b>Overall response rate</b>				
(95% CI) <sup>c</sup>	21.1% (11.4, 33.9)	38.5% (27.7, 50.2)	43.5% (37.1, 50.2)	44.3% (37.6, 51.1)

<sup>a</sup> Hazard ratio based on unstratified Cox proportional hazards model.

<sup>b</sup> Median computed using Kaplan-Meier method.

<sup>c</sup> Confidence interval based on the Clopper and Pearson method.

A total of 157 MPM patients aged ≥ 75 years were enrolled in study CA209743 (78 in the nivolumab in combination with ipilimumab arm and 79 in the chemotherapy arm). A HR of 1.02 (95% CI: 0.70, 1.48) in OS was observed for nivolumab in combination with ipilimumab vs. chemotherapy within this study subgroup. A higher rate of serious adverse reactions and discontinuation rate due to adverse reactions in patients 75 years of age or older relative to all patients who received nivolumab in combination with ipilimumab was shown (see section 4.8). However, due to the exploratory nature of this subgroup analysis, no definitive conclusions can be drawn.

### Renal cell carcinoma

#### Randomised phase 3 study of nivolumab as monotherapy vs. everolimus (CA209025)

The safety and efficacy of nivolumab 3 mg/kg as a single agent for the treatment of advanced RCC with a clear cell component was evaluated in a Phase 3, randomised, open-label study (CA209025). The study included patients (18 years or older) who have experienced disease progression during or after 1 or 2 prior anti-angiogenic therapy regimens and no more than 3 total prior systemic treatment regimens. Patients had to have a Karnofsky Performance Score (KPS) ≥ 70%. This study included patients regardless of their tumour PD-L1 status. Patients with any history of or concurrent brain metastases, prior treatment with a mammalian target of rapamycin (mTOR) inhibitor, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the study.

A total of 821 patients were randomised to receive either nivolumab 3 mg/kg (n = 410) administered intravenously over 60 minutes every 2 weeks or everolimus (n = 411) 10 mg daily, administered orally. Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. The first tumour assessments were conducted 8 weeks after randomisation and continued every 8 weeks thereafter for the first year and then every 12 weeks until progression or treatment discontinuation, whichever occurred later. Tumour assessments were continued after

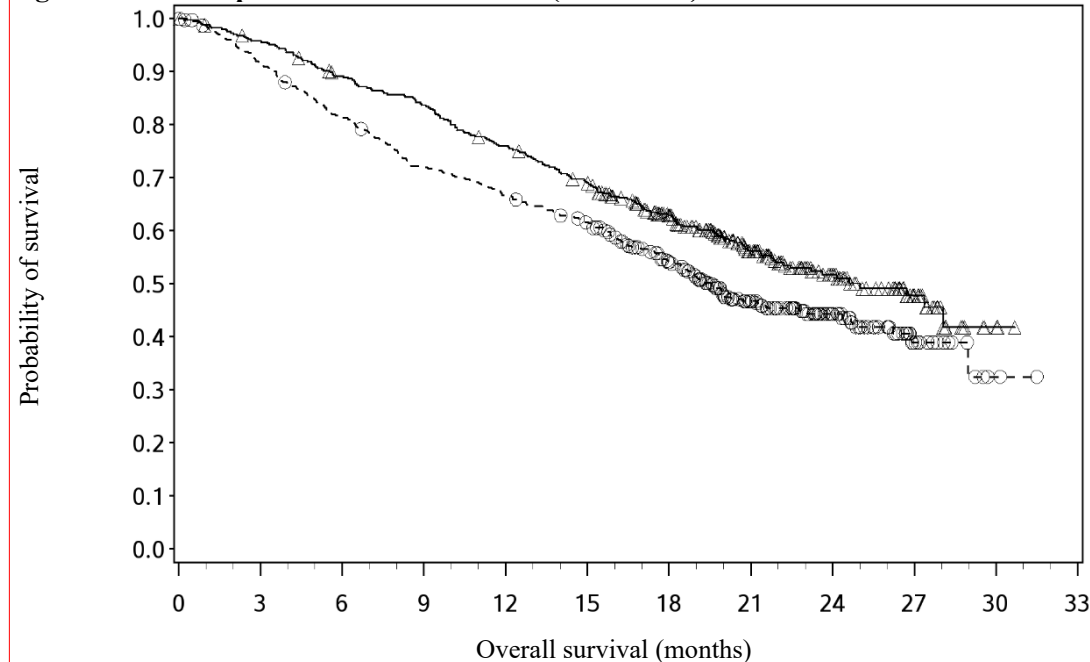
treatment discontinuation in patients who discontinued treatment for reasons other than progression. Treatment beyond initial investigator-assessed RECIST, version 1.1-defined progression was permitted if the patient had a clinical benefit and was tolerating study drug as determined by the investigator. The primary efficacy outcome measure was OS. Secondary efficacy assessments included investigator-assessed ORR and PFS.

Baseline characteristics were generally balanced between the two groups. The median age was 62 years (range: 18-88) with 40% ≥ 65 years of age and 9% ≥ 75 years of age. The majority of patients were male (75%) and white (88%), all Memorial Sloan Kettering Cancer Center (MSKCC) risk groups were represented, and 34% and 66% of patients had a baseline KPS of 70 to 80% and 90 to 100%, respectively. The majority of patients (72%) were treated with one prior anti-angiogenic therapy. The median duration of time from initial diagnosis to randomisation was 2.6 years in both the nivolumab and everolimus groups. The median duration of treatment was 5.5 months (range: 0-29.6+ months) in nivolumab-treated patients and was 3.7 months (range: 6 days-25.7+ months) in everolimus-treated patients.

Nivolumab was continued beyond progression in 44% of patients.

The Kaplan-Meier curves for OS are shown in Figure 14.

**Figure 14: Kaplan-Meier curves of OS (CA209025)**



Number of subjects at risk													
Nivolumab													
	410	389	359	337	305	275	213	139	73	29	3	0	
Everolimus													
	411	366	324	287	265	241	187	115	61	20	2	0	

—△— Nivolumab 3 mg/kg (events: 183/410), median and 95% CI: 25.00 (21.75, N.A.)  
 ---○--- Everolimus 10 mg (events: 215/411), median and 95% CI: 19.55 (17.64, 23.06)

The trial demonstrated a statistically significant improvement in OS for patients randomised to nivolumab as compared with everolimus at the prespecified interim analysis when 398 events were observed (70% of the planned number of events for final analysis) (Table 23 and Figure 14). OS benefit was observed regardless of tumour PD-L1 expression level. Efficacy results are shown in Table 23.

**Table 23: Efficacy results (CA209025)**

	nivolumab (n = 410)	everolimus (n = 411)
<b>Overall survival</b>		
Events	183 (45%)	215 (52%)
Hazard ratio		0.73
98.52% CI		(0.57, 0.93)
p-value		0.0018
Median (95% CI)	25.0 (21.7, NE)	19.6 (17.6, 23.1)
Rate (95% CI)		
At 6 months	89.2 (85.7, 91.8)	81.2 (77.0, 84.7)
At 12 months	76.0 (71.5, 79.9)	66.7 (61.8, 71.0)
<b>Objective response</b>	103 (25.1%)	22 (5.4%)
(95% CI)	(21.0, 29.6)	(3.4, 8.0)
Odds ratio (95% CI)		5.98 (3.68, 9.72)
p-value		< 0.0001
Complete response (CR)	4 (1.0%)	2 (0.5%)
Partial response (PR)	99 (24.1%)	20 (4.9%)
Stable disease (SD)	141 (34.4%)	227 (55.2%)
<b>Median duration of response</b>		
Months (range)	11.99 (0.0-27.6 <sup>+</sup> )	11.99 (0.0 <sup>+</sup> -22.2 <sup>+</sup> )
<b>Median time to response</b>		
Months (range)	3.5 (1.4-24.8)	3.7 (1.5-11.2)
<b>Progression-free survival</b>		
Events	318 (77.6%)	322 (78.3%)
Hazard ratio		0.88
95% CI		(0.75, 1.03)
p-value		0.1135
Median (95% CI)	4.6 (3.71, 5.39)	4.4 (3.71, 5.52)

<sup>+</sup> denotes a censored observation.

NE = non-estimable

The median time to onset of objective response was 3.5 months (range: 1.4-24.8 months) after the start of nivolumab treatment. Forty-nine (47.6%) responders had ongoing responses with a duration ranging from 0.0-27.6<sup>+</sup> months.

Overall survival could be accompanied by an improvement over time in disease related symptoms and non-disease specific QoL as assessed using valid and reliable scales in the Functional Assessment of Cancer Therapy-Kidney Symptom Index-Disease Related Symptoms (FKSI-DRS) and the EuroQoL EQ-5D. Apparently meaningful symptom improvement (MID = 2 point change in FKSI-DRS score;  $p < 0.001$ ) and time to improvement (HR = 1.66 (1.33, 2.08),  $p < 0.001$ ) were significantly better for patients on the nivolumab arm. While both arms of the study received active therapy, the QoL data should be interpreted in the context of the open-label study design and therefore cautiously taken.

#### Phase 3b/4 safety study (CA209374)

Additional safety and descriptive efficacy data are available from study CA209374, an open-label Phase 3b/4 safety study of nivolumab monotherapy (treated with 240 mg every 2 weeks) for the



treatment of patients with advanced or metastatic RCC (n = 142), including 44 patients with non-clear cell histology.

In subjects with non-clear cell histology, at a minimum follow-up of approximately 16.7 months ORR and median duration of response were 13.6% and 10.2 months, respectively. Clinical activity was observed regardless of tumour PD-L1 expression status.

*Randomised phase 3 study of nivolumab in combination with ipilimumab vs. sunitinib (CA209214)*

The safety and efficacy of nivolumab 3 mg/kg in combination with ipilimumab 1 mg/kg for the treatment of advanced/metastatic RCC was evaluated in a phase 3, randomised, open-label study (CA209214). The study included patients (18 years or older) with previously untreated, advanced or metastatic renal cell carcinoma with a clear-cell component. The primary efficacy population included those intermediate/poor risk patients with at least 1 or more of 6 prognostic risk factors as per the International Metastatic RCC Database Consortium (IMDC) criteria (less than one year from time of initial renal cell carcinoma diagnosis to randomisation, Karnofsky performance status <80%, haemoglobin less than the lower limit of normal, corrected calcium of greater than 10 mg/dL, platelet count greater than the upper limit of normal, and absolute neutrophil count greater than the upper limit of normal). This study included patients regardless of their tumour PD-L1 status. Patients with Karnofsky performance status < 70% and patients with any history of or concurrent brain metastases, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the study. Patients were stratified by IMDC prognostic score and region.

A total of 1096 patients were randomised in the trial, of which 847 patients had intermediate/poor-risk RCC and received either nivolumab 3 mg/kg (n = 425) administered intravenously over 60 minutes in combination with ipilimumab 1 mg/kg administered intravenously over 30 minutes every 3 weeks for 4 doses followed by nivolumab monotherapy 3 mg/kg every 2 weeks or sunitinib (n = 422) 50 mg daily, administered orally for 4 weeks followed by 2 weeks off, every cycle. Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. The first tumour assessments were conducted 12 weeks after randomisation and continued every 6 weeks thereafter for the first year and then every 12 weeks until progression or treatment discontinuation, whichever occurred later. Treatment beyond initial investigator-assessed RECIST, version 1.1-defined progression was permitted if the patient had a clinical benefit and was tolerating study drug as determined by the investigator. The primary efficacy outcome measures were OS, ORR and PFS as determined by a BICR in intermediate/poor risk patients.

Baseline characteristics were generally balanced between the two groups. The median age was 61 years (range: 21-85) with 38% ≥ 65 years of age and 8% ≥ 75 years of age. The majority of patients were male (73%) and white (87%), and 31% and 69% of patients had a baseline KPS of 70 to 80% and 90 to 100%, respectively. The median duration of time from initial diagnosis to randomisation was 0.4 years in both the nivolumab 3 mg/kg in combination with ipilimumab 1 mg/kg and sunitinib groups. The median duration of treatment was 7.9 months (range: 1 day-21.4+ months) in nivolumab with ipilimumab-treated patients and was 7.8 months (range: 1 days-20.2+ months) in sunitinib-treated patients. Nivolumab with ipilimumab was continued beyond progression in 29% of patients.

Efficacy results for the intermediate/poor risk patients are shown in Table 24 (primary analysis with a minimum follow-up of 17.5 months and with a minimum follow-up of 60 months) and in Figure 15 (minimum follow-up of 60 months).

OS results at an additional descriptive analysis undertaken at a minimum follow-up of 60 months show outcomes consistent with the original primary analysis.

**Table 24: Efficacy results in intermediate/poor risk patients (CA209214)**

	nivolumab + ipilimumab (n = 425)	sunitinib (n = 422)
<b>Primary analysis</b>		
minimum follow-up: 17.5 months		
<b>Overall survival</b>		
Events	140 (33%)	188 (45%)
Hazard ratio <sup>a</sup>		0.63
99.8% CI		(0.44, 0.89)
p-value <sup>b, c</sup>		< 0.0001
Median (95% CI)	NE (28.2, NE)	25.9 (22.1, NE)
Rate (95% CI)		
At 6 months	89.5 (86.1, 92.1)	86.2 (82.4, 89.1)
At 12 months	80.1 (75.9, 83.6)	72.1 (67.4, 76.2)
<b>Progression-free survival</b>		
Events	228 (53.6%)	228 (54.0%)
Hazard ratio <sup>a</sup>		0.82
99.1% CI		(0.64, 1.05)
p-value <sup>b, h</sup>		0.0331
Median (95% CI)	11.6 (8.71, 15.51)	8.4 (7.03, 10.81)
<b>Confirmed objective response (BICR)</b>		
	177 (41.6%)	112 (26.5%)
(95% CI)	(36.9, 46.5)	(22.4, 31.0)
Difference in ORR (95% CI) <sup>d</sup>		16.0 (9.8, 22.2)
p-value <sup>e, f</sup>		< 0.0001
Complete response (CR)	40 (9.4%)	5 (1.2%)
Partial response (PR)	137 (32.2%)	107 (25.4%)
Stable disease (SD)	133 (31.3%)	188 (44.5%)
<b>Median duration of response<sup>g</sup></b>		
Months (range)	NE (1.4 <sup>+</sup> -25.5 <sup>+</sup> )	18.17 (1.3 <sup>+</sup> -23.6 <sup>+</sup> )
<b>Median time to response</b>		
Months (range)	2.8 (0.9-11.3)	3.0 (0.6-15.0)
<b>Updated analysis*</b>		
minimum follow-up: 60 months		
<b>Overall survival</b>		
Events	242 (57%)	282 (67%)
Hazard ratio <sup>a</sup>		0.68
95% CI		(0.58, 0.81)
Median (95% CI)	46.95 (35.35, 57.43)	26.64 (22.08, 33.54)
Rate (95% CI)		
At 24 months	66.3 (61.5, 70.6)	52.4 (47.4, 57.1)
At 36 months	54.6 (49.7, 59.3)	43.7 (38.7, 48.5)
At 48 months	49.9 (44.9, 54.6)	35.8 (31.1, 40.5)
At 60 months	43.0 (38.1, 47.7)	31.3 (26.8, 35.9)

	nivolumab + ipilimumab (n = 425)		sunitinib (n = 422)
<b>Progression-free survival</b>			
Events	245 (57.6%)		253 (60.0%)
Hazard ratio <sup>a</sup>		0.73	
95% CI		(0.61, 0.87)	
Median (95% CI)	11.6 (8.44, 16.63)		8.3 (7.03, 10.41)
<b>Confirmed objective response (BICR)</b>	179 (42.1%)		113 (26.8%)
(95% CI)	(37.4, 47.0)		(22.6, 31.3)
Difference in ORR (95% CI) <sup>d,e</sup>		16.2 (10.0, 22.5)	
Complete response (CR)	48 (11.3%)		9 (2.1%)
Partial response (PR)	131 (30.8%)		104 (24.6%)
Stable disease (SD)	131 (30.8%)		187 (44.3%)
<b>Median duration of response<sup>g</sup></b>			
Months (range)	NE (50.89-NE)		19.38 (15.38-25.10)
<b>Median time to response</b>			
Months (range)	2.8 (0.9-35.0)		3.1 (0.6-23.6)

<sup>a</sup> Based on a stratified proportional hazards model.

<sup>b</sup> Based on a stratified log-rank test.

<sup>c</sup> p-value is compared to alpha 0.002 in order to achieve statistical significance.

<sup>d</sup> Strata adjusted difference.

<sup>e</sup> Based on the stratified DerSimonian-Laird test.

<sup>f</sup> p-value is compared to alpha 0.001 in order to achieve statistical significance.

<sup>g</sup> Computed using Kaplan-Meier method.

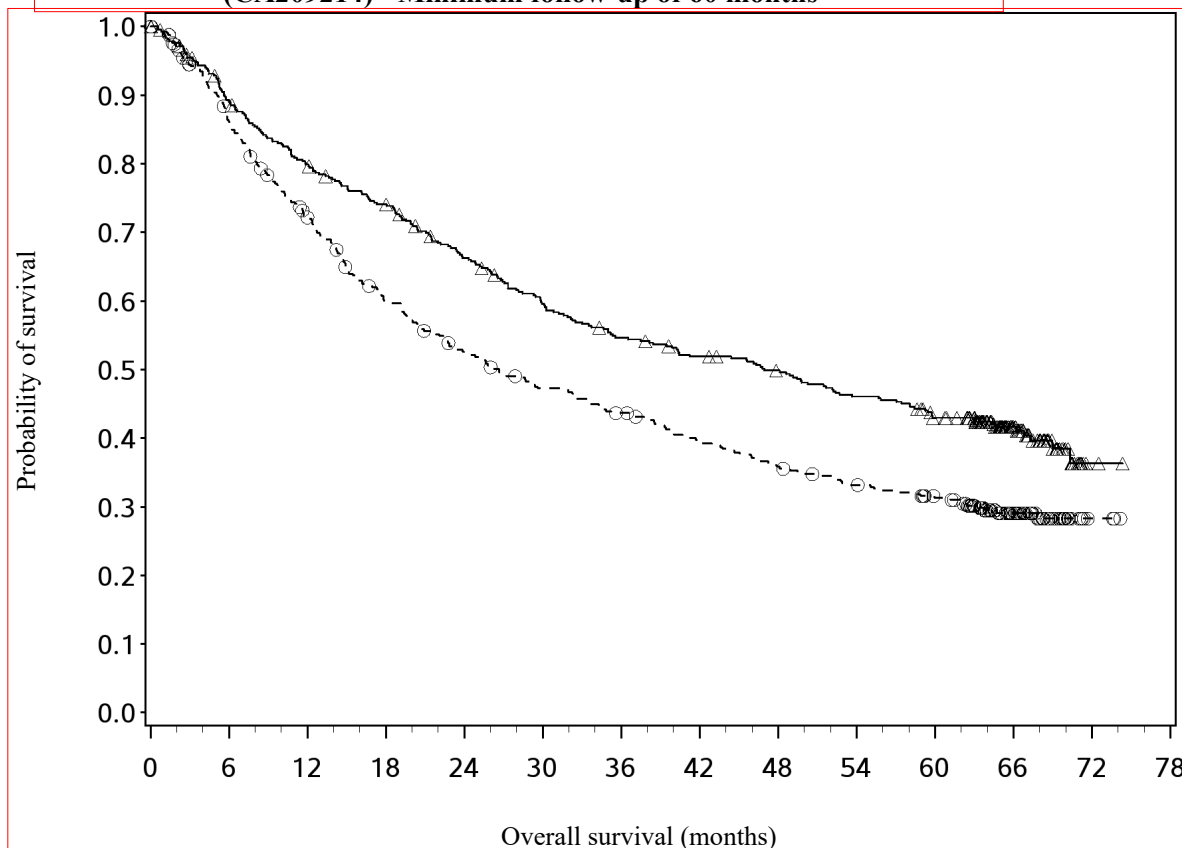
<sup>h</sup> p-value is compared to alpha 0.009 in order to achieve statistical significance.

<sup>+,\*</sup> denotes a censored observation.

NE = non-estimable

\* Descriptive analysis based on data cut-off: 26-Feb-2021.

**Figure 15: Kaplan-Meier curves of OS in intermediate/poor risk patients (CA209214) - Minimum follow-up of 60 months**



Number of subjects at risk

Nivolumab + ipilimumab														
425	372	332	306	270	241	220	207	196	181	163	79	2	0	0
Sunitinib														
422	353	291	237	206	184	169	151	137	125	112	58	3	0	0

—△— Nivolumab + ipilimumab (events: 242/425), median and 95.0% CI: 46.95 (35.35, 57.43)  
 ---○--- Sunitinib (events: 282/422), median and 95.0% CI: 26.64 (22.08, 33.54)

An updated descriptive OS analysis was performed when all patients had a minimum follow-up of 24 months. At the time of this analysis, the hazard ratio was 0.66 (99.8% CI 0.48-0.91) with 166/425 events in the combination arm and 209/422 events in the sunitinib arm. In intermediate/poor-risk patients, OS benefit was observed in the nivolumab in combination with ipilimumab arm vs. sunitinib regardless of tumour PD-L1 expression. Median OS for tumour PD-L1 expression  $\geq 1\%$  was not reached for nivolumab in combination with ipilimumab, and was 19.61 months in the sunitinib arm (HR = 0.52; 95% CI: 0.34, 0.78). For tumour PD-L1 expression  $< 1\%$ , the median OS was 34.7 months for the nivolumab in combination with ipilimumab, and was 32.2 months in the sunitinib arm (HR = 0.70; 95% CI: 0.54, 0.92).

CA209214 also randomised 249 favourable risk patients as per IMDC criteria to nivolumab plus ipilimumab (n = 125) or to sunitinib (n = 124). These patients were not evaluated as part of the primary efficacy population. At a minimum of 24 months follow-up, OS in favourable risk patients receiving nivolumab plus ipilimumab compared to sunitinib had a hazard ratio of 1.13 (95% CI: 0.64, 1.99; p = 0.6710). With 60 months minimum follow-up, the HR for OS was 0.94 (95% CI: 0.65, 1.37).

There are no data on the use of nivolumab in combination with ipilimumab in patients with only a non clear-cell histology in first-line RCC.

Patients  $\geq 75$  years of age represented 8% of all intermediate/poor risk patients in CA209214, and the combination of nivolumab and ipilimumab showed numerically less effect on OS (HR 0.97, 95% CI: 0.48, 1.95) in this subgroup versus the overall population at a minimum follow-up of 17.5 months. Because of the small size of this subgroup, no definitive conclusions can be drawn from these data.

***Randomised phase 3 study of nivolumab in combination with cabozantinib vs. sunitinib (CA2099ER)***

The safety and efficacy of nivolumab 240 mg in combination with cabozantinib 40 mg for the first-line treatment of advanced/metastatic RCC was evaluated in a phase 3, randomised, open-label study (CA2099ER). The study included patients (18 years or older) with advanced or metastatic RCC with a clear cell component, Karnofsky Performance Status (KPS)  $\geq 70\%$ , and measurable disease as per RECIST v1.1 regardless of their PD-L1 status or IMDC risk group. The study excluded patients with autoimmune disease or other medical conditions requiring systemic immunosuppression, patients who had prior treatment with an anti-PD-1, anti PD-L1, anti-PD-L2, anti-CD137, or anti-CTLA-4 antibody, poorly controlled hypertension despite antihypertensive therapy, active brain metastases and uncontrolled adrenal insufficiency. Patients were stratified by IMDC prognostic score, PD-L1 tumour expression, and region.

A total of 651 patients were randomised to receive either nivolumab 240 mg (n = 323) administered intravenously every 2 weeks in combination with cabozantinib 40 mg once daily orally or sunitinib (n = 328) 50 mg daily, administered orally for 4 weeks followed by 2 weeks off. Treatment continued until disease progression or unacceptable toxicity with nivolumab administration for up to 24 months. Treatment beyond initial investigator-assessed RECIST version 1.1-defined progression was permitted if the patient had a clinical benefit and was tolerating study drug, as determined by the investigator. First tumour assessment post-baseline was performed at 12 weeks ( $\pm 7$  days) following randomisation. Subsequent tumour assessments occurred at every 6 weeks ( $\pm 7$  days) until Week 60, then every 12 weeks ( $\pm 14$  days) until radiographic progression, confirmed by the BICR. The primary efficacy outcome measure was PFS as determined by a BICR. Additional efficacy measures included OS and ORR as key secondary endpoints.

Baseline characteristics were generally balanced between the two groups. The median age was 61 years (range: 28-90) with 38.4%  $\geq 65$  years of age and 9.5%  $\geq 75$  years of age. The majority of patients were male (73.9%) and white (81.9%). Eight percent of patients were Asian, 23.2% and 76.5% of patients had a baseline KPS of 70 to 80% and 90 to 100%, respectively. Patient distribution by IMDC risk categories was 22.6% favourable, 57.6% intermediate, and 19.7% poor. For tumour PD-L1 expression, 72.5% of patients had PD-L1 expression  $< 1\%$  or indeterminate and 24.9% of patients had PD-L1 expression  $\geq 1\%$ . 11.5% of patients had tumours with sarcomatoid features. The median duration of treatment was 14.26 months (range: 0.2-27.3 months) in nivolumab with cabozantinib-treated patients and was 9.23 months (range: 0.8-27.6 months) in sunitinib-treated patients.

The study demonstrated a statistically significant benefit in PFS, OS, and ORR for patients randomised to nivolumab in combination with cabozantinib as compared to sunitinib. Efficacy results from the primary analysis (minimum follow-up 10.6 months; median follow-up 18.1 months) are shown in Table 25.

**Table 25: Efficacy results (CA2099ER)**

	<b>nivolumab + cabozantinib (n = 323)</b>	<b>sunitinib (n = 328)</b>
<b>Progression-free survival</b>		
Events	144 (44.6%)	191 (58.2%)
Hazard ratio <sup>a</sup>		0.51
95% CI		(0.41, 0.64)
p-value <sup>b, c</sup>		$< 0.0001$
Median (95% CI) <sup>d</sup>	16.59 (12.45, 24.94)	8.31 (6.97, 9.69)

	<b>nivolumab + cabozantinib (n = 323)</b>	<b>sunitinib (n = 328)</b>
<b>Overall survival</b>		
Events	67 (20.7%)	99 (30.2%)
Hazard ratio <sup>a</sup>		0.60
95% CI		(0.40, 0.89)
p-value <sup>b,c,e</sup>		0.0010
Median (95% CI)	N.E.	N.E. (22.6, N.E.)
Rate (95% CI)		
At 6 months	93.1 (89.7, 95.4)	86.2 (81.9, 89.5)
<b>Confirmed objective response (BICR)</b>		
	180 (55.7%)	89 (27.1%)
(95% CI) <sup>f</sup>	(50.1, 61.2)	(22.4, 32.3)
Difference in ORR (95% CI) <sup>g</sup>		28.6 (21.7, 35.6)
p-value <sup>h</sup>		< 0.0001
Complete response (CR)	26 (8.0%)	15 (4.6%)
Partial response (PR)	154 (47.7%)	74 (22.6%)
Stable disease (SD)	104 (32.2%)	138 (42.1%)
<b>Median duration of response<sup>d</sup></b>		
Months (range)	20.17 (17.31, N.E.)	11.47 (8.31, 18.43)
<b>Median time to response</b>		
Months (range)	2.83 (1.0-19.4)	4.17 (1.7-12.3)

<sup>a</sup> Stratified Cox proportional hazards model. Hazard ratio is nivolumab and cabozantinib over sunitinib.

<sup>b</sup> Log-rank test stratified by IMDC prognostic risk score (0, 1-2, 3-6), PD-L1 tumour expression ( $\geq 1\%$  versus  $< 1\%$  or indeterminate) and region (US/Canada/W Europe/N Europe, ROW) as entered in the IRT.

<sup>c</sup> 2-sided p-values from stratified regular log-rank test.

<sup>d</sup> Based on Kaplan-Meier estimates.

<sup>e</sup> Boundary for statistical significance p-value  $< 0.0111$ .

<sup>f</sup> CI based on the Clopper and Pearson method.

<sup>g</sup> Strata adjusted difference in objective response rate (nivolumab + cabozantinib - sunitinib) based on DerSimonian and Laird.

<sup>h</sup> 2-sided p-value from CMH test.

NE = non-estimable

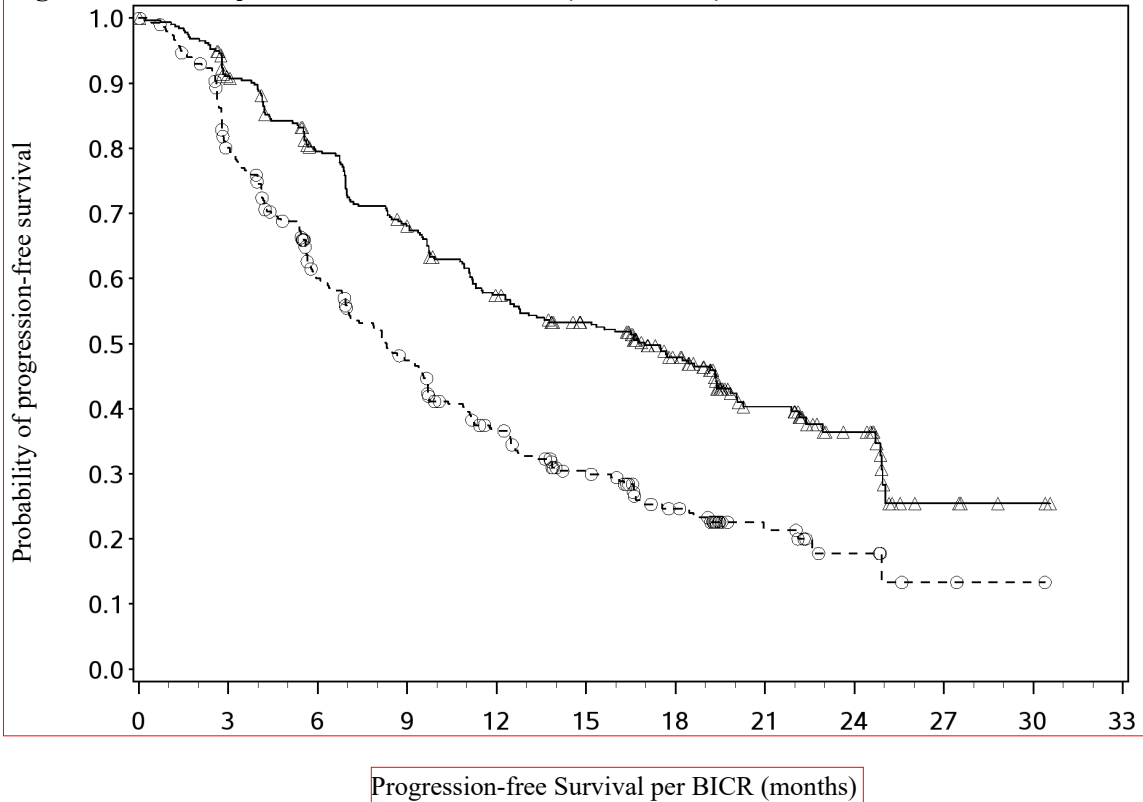
The primary analysis of PFS included censoring for new anti-cancer treatment (Table 28). Results for PFS with and without censoring for new anti-cancer treatment were consistent.

PFS benefit was observed in the nivolumab in combination with cabozantinib arm vs. sunitinib regardless of the IMDC risk category. Median PFS for the favourable risk group was not reached for nivolumab in combination with cabozantinib, and was 12.81 months in the sunitinib arm (HR = 0.60; 95% CI: 0.37, 0.98). Median PFS for the intermediate risk group was 17.71 months for nivolumab in combination with cabozantinib and was 8.38 months in the sunitinib arm (HR = 0.54; 95% CI: 0.41, 0.73). Median PFS for the poor risk group was 12.29 months for nivolumab in combination with cabozantinib and was 4.21 months in the sunitinib arm (HR = 0.36; 95% CI: 0.23, 0.58).

PFS benefit was observed in the nivolumab in combination with cabozantinib arm vs. sunitinib regardless of tumour PD-L1 expression. Median PFS for tumour PD-L1 expression  $\geq 1\%$  was 13.08 months for nivolumab in combination with cabozantinib, and was 4.67 months in the sunitinib arm (HR = 0.45; 95% CI: 0.29, 0.68). For tumour PD-L1 expression  $< 1\%$ , the median PFS was 19.84 months for nivolumab in combination with cabozantinib, and 9.26 months in the sunitinib arm (HR = 0.50; 95% CI: 0.38, 0.65).

An updated PFS and OS analysis were performed when all patients had a minimum follow-up of 16.0 months and a median follow-up of 23.5 months (see Figures 16 and 17). The PFS hazard ratio was 0.52 (95% CI: 0.43, 0.64). The OS hazard ratio was 0.66 (95% CI: 0.50, 0.87). Updated efficacy data (PFS and OS) in subgroups for the IMDC risk categories and PD-L1 expression levels confirmed the original results. With the updated analysis, median PFS is reached for the favourable risk group.

**Figure 16: Kaplan-Meier curves of PFS (CA2099ER)**

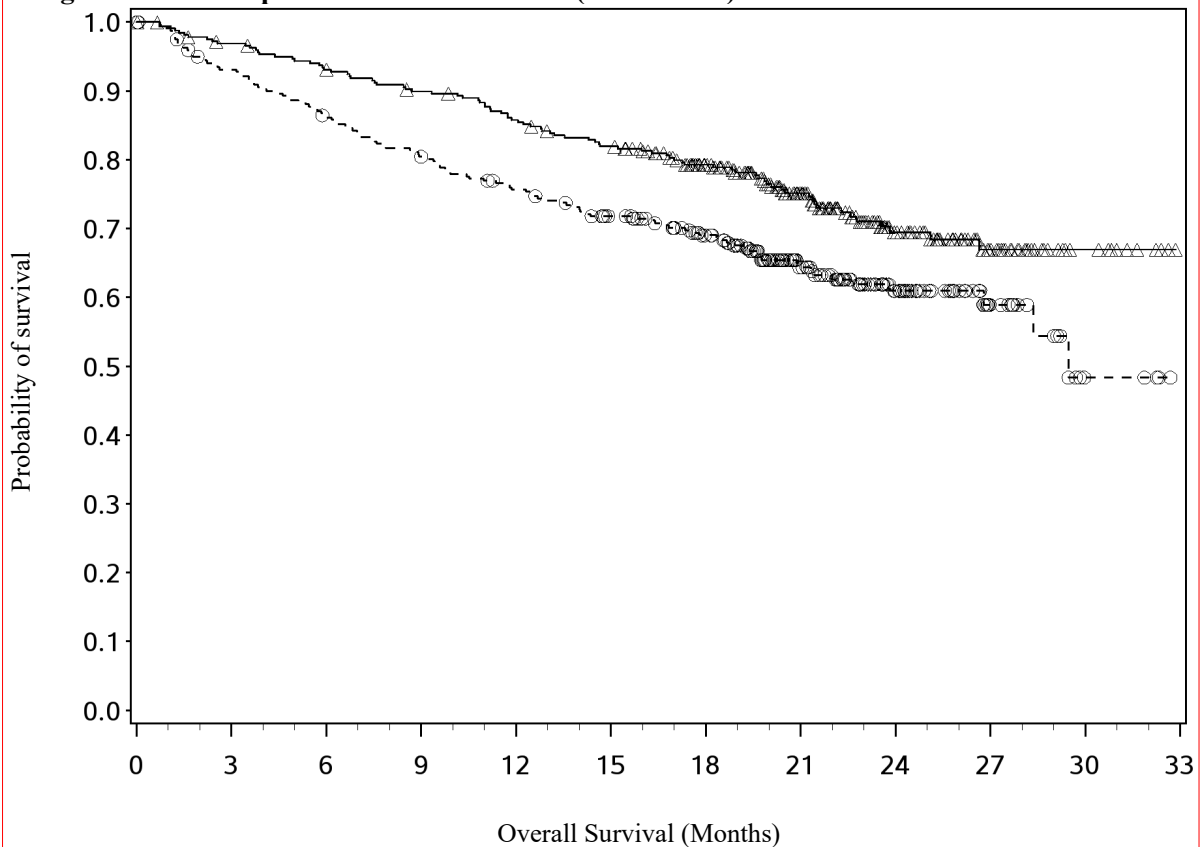


Number of subjects at risk

Nivolumab + cabozantinib	
323	280 236 201 166 145 102 56 26 5 2 0
Sunitinib	
328	230 160 122 87 61 37 17 7 2 1 0

—△— Nivolumab + cabozantinib (events: 175/323), median and 95.0% CI: 16.95 (12.58, 19.38)  
 ---○--- Sunitinib (events: 206/328), median and 95.0% CI: 8.31 (6.93, 9.69)

**Figure 17: Kaplan-Meier curves of OS (CA2099ER)**



Number of subjects at risk													
Nivolumab + cabozantinib													
323	308	295	283	269	255	220	147	84	40	10	0		
Sunitinib													
328	295	272	254	236	217	189	118	62	22	4	0		

—△— Nivolumab + cabozantinib (events: 86/323), median and 95% CI: NE  
 ---○--- Sunitinib (events: 116/328), median and 95% CI: 29.47 (28.35, NE)

**Classical Hodgkin lymphoma**

The safety and efficacy of nivolumab 3 mg/kg as a single agent for the treatment of relapsed or refractory cHL following ASCT was evaluated in two multi-centre, open-label, single-arm studies (CA209205 and CA209039).

CA209205 is a Phase 2, open-label, multi-cohort, single-arm study of nivolumab in cHL. It includes 243 patients who had ASCT; Cohort A included 63 (26%) patients who were brentuximab vedotin naïve; Cohort B included 80 (33%) patients who had received brentuximab vedotin after ASCT failure; and Cohort C included 100 (41%) patients who had received brentuximab vedotin before and/or after ASCT out of which 33 (14%) patients received brentuximab vedotin only prior to ASCT. All patients received nivolumab 3 mg/kg monotherapy intravenously over 60 minutes every 2 weeks. The first tumour assessments were conducted 9 weeks after the start of treatment and continued thereafter until disease progression or treatment discontinuation. The primary efficacy outcome measure was ORR as determined by an IRRC. Additional efficacy measures included duration of response, PFS and OS.

CA209039 is a Phase 1b open-label, multi-centre, dose-escalation, and multidose study of nivolumab in relapsed/refractory hematologic malignancies, including 23 patients with cHL treated with nivolumab 3 mg/kg monotherapy; amongst which, 15 patients received prior brentuximab vedotin treatment as a salvage therapy following ASCT, similar to Cohort B of study CA209205. The first tumour assessments were conducted 4 weeks after the start of treatment and continued thereafter until



disease progression or treatment discontinuation. Efficacy assessments included investigator-assessed ORR, retrospectively evaluated by an IRRC, and duration of response.

Data from the 80 patients from CA209205 Cohort B and from the 15 patients from CA209039 who received prior brentuximab vedotin treatment following ASCT were integrated. Additional data from 100 patients from CA209205 Cohort C who received brentuximab before and/or after ASCT are also presented. Baseline characteristics were similar across the two studies and cohorts (see Table 26 below).

**Table 26: Baseline patient characteristics in CA209205 Cohort B, Cohort C and CA209039**

	CA209205 Cohort B and CA209039 (n = 95)	CA209205 Cohort B <sup>a</sup> (n = 80)	CA209039 (n = 15)	CA209205 Cohort C <sup>b</sup> (n = 100)
Median age, years (range)	37.0 (18–72)	37.0 (18–72)	40.0 (24–54)	32.0 (19–69)
Gender	61 (64%) M 34 (36%) F	51 (64%) M 29 (36%) F	10 (67%) M 5 (33%) F	56 (56%) M 44 (44%) F
ECOG status				
0	49 (52%)	42 (52.5%)	7 (47%)	50 (50%)
1	46 (48%)	38 (47.5%)	8 (53%)	50 (50%)
≥ 5 prior lines of systemic therapy	49 (52%)	39 (49%)	10 (67%)	30 (30%)
Prior radiation therapy	72 (76%)	59 (74%)	13 (87%)	69 (69%)
Prior ASCT				
1	87 (92%)	74 (92.5%)	13 (87%)	100 (100%)
≥ 2	8 (8%)	6 (7.5%)	2 (13%)	0 (0%)
Years from most recent transplant to first dose of study therapy, median (min-max)	3.5 (0.2–19.0)	3.4 (0.2–19.0)	5.6 (0.5–15.0)	1.7 (0.2–17.0)

<sup>a</sup> 18/80 (22.5%) of the patients in CA209205 Cohort B presented B-Symptoms at baseline.

<sup>b</sup> 25/100 (25%) of the patients in CA209205 Cohort C presented B-Symptoms at baseline.

Efficacy from both studies was evaluated by the same IRRC. Results are shown in Table 27.

**Table 27: Efficacy results in patients with relapsed/refractory classical Hodgkin lymphoma**

	CA209205 Cohort B <sup>a</sup> and CA209039 (n = 95/12.0)	CA209205 Cohort B <sup>a</sup> (n = 80/12.0)	CA209039 (n = 15/12.0)
Number (n)/ minimum follow-up (months)			
Objective response, n (%); (95% CI)	63 (66%); (56, 76)	54 (68%); (56, 78)	9 (60%); (32, 84)
Complete remission (CR), n (%); (95% CI)	6 (6%); (2, 13)	6 (8%); (3, 16)	0 (0%); (0, 22)
Partial remission (PR), n (%); (95% CI)	57 (60%); (49, 70)	48 (60%); (48, 71)	9 (60%); (32, 84)
Stable disease, n (%)	22 (23)	17 (21)	5 (33)
Duration of response (months) <sup>b</sup>			
Median (95% CI)	13.1 (9.5, NE)	13.1 (8.7, NE)	12.0 (1.8, NE)
Range	0.0 <sup>+</sup> -23.1 <sup>+</sup>	0.0 <sup>+</sup> -14.2 <sup>+</sup>	1.8-23.1 <sup>+</sup>
Median time to response			
Months (range)	2.0 (0.7-11.1)	2.1 (1.6-11.1)	0.8 (0.7-4.1)
Median duration of follow-up			
Months (range)	15.8 (1.9-27.6)	15.4 (1.9-18.5)	21.9 (11.2-27.6)
Progression-free survival			
Rate (95% CI) at 12 months	57 (45, 68)	55 (41, 66)	69 (37, 88)

<sup>+,+</sup> denotes a censored observation.

<sup>a</sup> Follow-up was ongoing at the time of data submission.

<sup>b</sup> Data unstable due to the limited duration of response for Cohort B resulting from censoring.

NE = non-estimable

Updated efficacy results from longer follow-up data of Cohort B (minimum 68.7 months) and Cohort C (minimum 61.9 months) from CA209205 are presented below in Table 28.

**Table 28: Updated efficacy results in patients with relapsed/refractory classical Hodgkin lymphoma from longer follow-up of study CA209205**

Number (n)/ minimum follow-up (months)	CA209205 Cohort B (n = 80/68.7)	CA209205 Cohort C (n = 100/61.9) <sup>a</sup>
<b>Objective response, n (%); (95% CI)</b>	57 (71%); (60, 81)	75 (75%); (65, 83)
Complete remission (CR), n (%); (95% CI)	11 (14%); (7, 23)	21 (21%); (14, 30)
Partial remission (PR), n (%); (95% CI)	46 (58%); (46, 69)	54 (54%); (44, 64)
<b>Stable disease, n (%)</b>	14 (18%)	12 (12%)
<b>Duration of response in all responders (months)<sup>b</sup></b>		
Median (95% CI)	16.6 (9.3, 25.7)	18.2 (11.6, 30.9)
Range	0.0 <sup>+</sup> -71.0 <sup>+</sup>	0.0 <sup>+</sup> -59.8 <sup>+</sup>
<b>Duration of response in CR (months)</b>		
Median (95% CI)	30.3 (2.4, NE)	26.4 (7.1, NE)
Range	0.7 <sup>+</sup> -50.0 <sup>+</sup>	0.0 <sup>+</sup> -55.7 <sup>+</sup>
<b>Duration of response in PR (months)</b>		
Median (95% CI)	10.6 (7.5, 25.3)	14.7 (9.4, 30.4)
Range	0.0 <sup>+</sup> -67.9 <sup>+</sup>	0.0 <sup>+</sup> -55.9 <sup>+</sup>
<b>Median time to response</b>		
Months (range)	2.2 (1.6-11.1)	2.1 (0.8, 17.9)
<b>Median duration of follow-up</b>		
Months (range)	58.5 (1.9-74.3)	53.5 (1.4-70.4)
<b>Progression-free survival</b>		
Median (95% CI)	14.8 (11.0, 19.8)	15.1 (11.1, 19.1)
Rate (95% CI) at 12 months	52 (39, 63)	53 (42, 64)
Rate (95% CI) at 24 months	36 (24, 48)	37 (25, 48)
Rate (95% CI) at 60 months	16 (6, 29)	15 (6, 28)
<b>Overall survival</b>		
Median	Not reached	Not reached
Rate (95% CI) at 12 months	95 (87, 98)	90 (82, 94)
Rate (95% CI) at 24 months	87 (77, 93)	86 (77, 91)
Rate (95% CI) at 60 months	72 (60, 81)	67 (56, 75)

<sup>++</sup> denotes a censored observation.

<sup>a</sup> Patients in Cohort C (n = 33) who have received brentuximab vedotin only prior to ASCT had ORR of 73% (95% CI: 55, 87), CR of 21% (95% CI: 9, 39), PR of 52% (95% CI: 34, 69). Median duration of response was 13.5 months (95% CI: 9.4, 30.9).

<sup>b</sup> Determined for subjects with CR or PR.

NE = non-estimable

B-symptoms were present in 22% (53/243) of the patients in CA209205 at baseline. Nivolumab treatment resulted in rapid resolution of B-symptoms in 88.7% (47/53) of the patients, with a median time to resolution of 1.9 months.

In a post-hoc analysis of the 80 patients in CA209205 Cohort B, 37 had no response to prior brentuximab vedotin treatment. Among these 37 patients, treatment with nivolumab resulted in an ORR of 62.2% (23/37). The median duration of response is 25.6 months (10.6, 56.5) for the 23 responders to nivolumab who had failed to achieve response with prior brentuximab vedotin treatment.

### *Squamous cell cancer of the head and neck*

The safety and efficacy of nivolumab 3 mg/kg as a single agent for the treatment of metastatic or recurrent SCCHN were evaluated in a phase 3, randomised, open-label study (CA209141). The study included patients (18 years or older), with histologically confirmed recurrent or metastatic SCCHN (oral cavity, pharynx, larynx), stage III/IV and not amenable to local therapy with curative intent (surgery or radiation therapy with or without chemotherapy) and who have experienced disease progression during or within 6 months of receiving platinum-based therapy regimen and had an ECOG performance status score of 0 or 1. Prior platinum-based therapy was administered in either the adjuvant, neo-adjuvant, primary, recurrent, or metastatic setting. Patients were enrolled regardless of their tumour PD-L1 or human papilloma virus (HPV) status. Patients with active autoimmune disease, medical conditions requiring immunosuppression, recurrent or metastatic carcinoma of the nasopharynx, squamous cell carcinoma of unknown primary, salivary gland or non-squamous histologies (e.g., mucosal melanoma), or active brain or leptomeningeal metastases were excluded from the study. Patients with treated brain metastases were eligible if neurologically returned to baseline at least 2 weeks prior to enrolment, and either off corticosteroids, or on a stable or decreasing dose of < 10 mg daily prednisone equivalents.

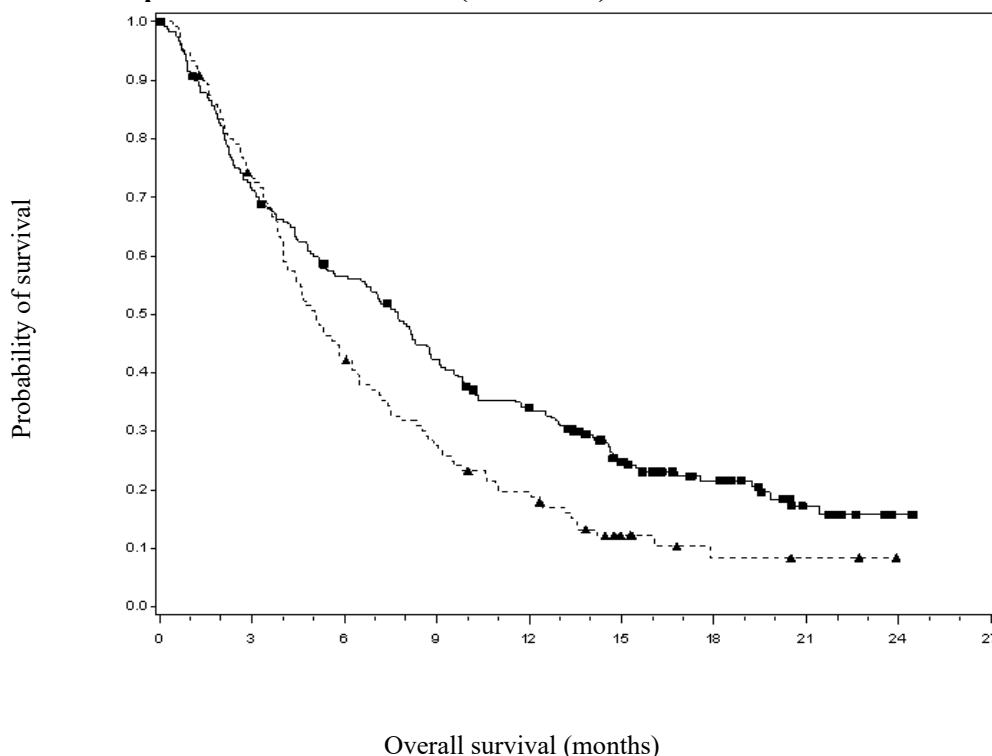
A total of 361 patients were randomised to receive either nivolumab 3 mg/kg (n = 240) administered intravenously over 60 minutes every 2 weeks or investigator's choice of either cetuximab (n = 15), 400 mg/m<sup>2</sup> loading dose followed by 250 mg/m<sup>2</sup> weekly or methotrexate (n = 52) 40 to 60 mg/m<sup>2</sup> weekly, or docetaxel (n = 54) 30 to 40 mg/m<sup>2</sup> weekly. Randomisation was stratified by prior cetuximab treatment. Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. Tumour assessments, according to RECIST version 1.1, were conducted 9 weeks after randomisation and continued every 6 weeks thereafter. Treatment beyond initial investigator-assessed RECIST version 1.1-defined progression was permitted in patients receiving nivolumab, if the patient had a clinical benefit and was tolerating study drug, as determined by the investigator. The primary efficacy outcome measure was OS. Key secondary efficacy outcome measures were investigator-assessed PFS and ORR. Additional prespecified subgroup analyses were conducted to evaluate the efficacy by tumour PD-L1 expression at predefined levels of 1%, 5%, and 10%.

Pre-study tumour tissue specimens were systematically collected prior to randomisation in order to conduct pre-planned analyses of efficacy according to tumour PD-L1 expression. Tumour PD-L1 expression was determined using the PD-L1 IHC 28-8 pharmDx assay.

Baseline characteristics were generally balanced between the two groups. The median age was 60 years (range: 28-83) with 31% ≥ 65 years of age and 5% ≥ 75 years of age, 83% were male, and 83% were white. Baseline ECOG performance status score was 0 (20%) or 1 (78%), 77% were former/current smokers, 90% had Stage IV disease, 66% had two or more lesions, 45%, 34% and 20% received 1, 2, or 3 or more prior lines of systemic therapy, respectively, and 25% were HPV-16 status positive.

With a minimum follow-up of 11.4 months, the trial demonstrated a statistically significant improvement in OS for patients randomised to nivolumab as compared with investigator's choice. The Kaplan-Meier curves for OS are shown in Figure 18. Efficacy results are shown in Table 29.

**Figure 18: Kaplan-Meier curves of OS (CA209141)**



**Number of subjects at risk**

	0	3	6	9	12	15	18	21	24	27
Nivolumab	240	169	132	98	76	45	27	12	3	
Investigator's choice	121	88	51	32	22	9	4	3	0	

■—— Nivolumab 3 mg/kg (events: 184/240), median and 95% CI: 7.72 (5.68, 8.77)  
 - - - ▲ - - - Investigator's choice (events: 105/121), median and 95% CI: 5.06 (4.04, 6.24)

**Table 29: Efficacy results (CA209141)**

	nivolumab (n = 240)	investigator's choice (n = 121)
<b>Overall survival</b>		
Events	184 (76.7%)	105 (86.8%)
Hazard ratio <sup>a</sup>		0.71
(95% CI)		(0.55, 0.90)
p-value <sup>b</sup>		0.0048
Median (95% CI) (months)	7.72 (5.68, 8.77)	5.06 (4.04, 6.24)
Rate (95% CI) at 6 months	56.5 (49.9, 62.5)	43.0 (34.0, 51.7)
Rate (95% CI) at 12 months	34.0 (28.0, 40.1)	19.7 (13.0, 27.3)
Rate (95% CI) at 18 months	21.5 (16.2, 27.4)	8.3 (3.6, 15.7)
<b>Progression-free survival</b>		
Events	204 (85.0%)	104 (86.0%)
Hazard ratio		0.87
95% CI		(0.69, 1.11)
p-value		0.2597
Median (95% CI) (months)	2.04 (1.91, 2.14)	2.33 (1.97, 3.12)
Rate (95% CI) at 6 months	21.0 (15.9, 26.6)	11.1 (5.9, 18.3)
Rate (95% CI) at 12 months	9.5 (6.0, 13.9)	2.5 (0.5, 7.8)

	nivolumab (n = 240)	investigator's choice (n = 121)
<b>Confirmed objective response<sup>c</sup></b>	32 (13.3%)	7 (5.8%)
(95% CI)	(9.3, 18.3)	(2.4, 11.6)
Odds ratio (95% CI)		2.49 (1.07, 5.82)
Complete response (CR)	6 (2.5%)	1 (0.8%)
Partial response (PR)	26 (10.8%)	6 (5.0%)
Stable disease (SD)	55 (22.9%)	43 (35.5%)
<b>Median time to response</b>		
Months (range)	2.1 (1.8-7.4)	2.0 (1.9-4.6)
<b>Median duration of response</b>		
Months (range)	9.7 (2.8-20.3+)	4.0 (1.5+-8.5+)

<sup>a</sup> Derived from a stratified proportional hazards model.

<sup>b</sup> P-value is derived from a log-rank test stratified by prior cetuximab; the corresponding O'Brien-Fleming efficacy boundary significance level is 0.0227.

<sup>c</sup> In the nivolumab group there were two patients with CRs and seven patients with PRs who had tumour PD-L1 expression < 1%.

Quantifiable tumour PD-L1 expression was measured in 67% of patients in the nivolumab group and 82% of patients in the investigator's choice group. Tumour PD-L1 expression levels were balanced between the two treatment groups (nivolumab vs. investigator's choice) at each of the predefined tumour PD-L1 expression levels of  $\geq 1\%$  (55% vs. 62%),  $\geq 5\%$  (34% vs. 43%), or  $\geq 10\%$  (27% vs. 34%).

Patients with tumour PD-L1 expression by all predefined expression levels in the nivolumab group demonstrated greater likelihood of improved survival compared to investigator's choice. The magnitude of OS benefit was consistent for  $\geq 1\%$ ,  $\geq 5\%$  or  $\geq 10\%$  tumour PD-L1 expression levels (see Table 30).

**Table 30: OS by tumour PD-L1 expression (CA209141)**

PD-L1 Expression	nivolumab	investigator's choice	
OS by tumour PD-L1 expression			Unstratified hazard ratio (95% CI)
Number of events (number of patients)			
< 1%	56 (73)	32 (38)	0.83 (0.54, 1.29)
$\geq 1\%$	66 (88)	55 (61)	0.53 (0.37, 0.77)
$\geq 5\%$	39 (54)	40 (43)	0.51 (0.32, 0.80)
$\geq 10\%$	30 (43)	31 (34)	0.57 (0.34, 0.95)

In an exploratory post-hoc analysis using a non-validated assay, both tumour cell PD-L1 expression and tumour-associated immune cell (TAIC) PD-L1 expression were analysed in relation to the magnitude of treatment effect of nivolumab compared to investigator's choice. This analysis showed that not only tumour cell PD-L1 expression but also TAIC PD-L1 expression appeared to be associated with benefit from nivolumab relative to investigator's choice (see Table 31). Due to the small numbers of patients in the subgroups, and exploratory nature of the analysis, no definitive conclusions can be drawn from these data.

**Table 31: Efficacy by tumour cell and TAIC PD-L1 expression (CA209141)**

	Median OS <sup>a</sup> (months)		Median PFS <sup>a</sup> (months)		ORR (%)	
	HR <sup>b</sup> (95% CI)		HR <sup>b</sup> (95% CI)		(95% CI) <sup>c</sup>	
	nivolumab	investigator's choice	nivolumab	investigator's choice	nivolumab	investigator's choice
<b>PD-L1 ≥ 1%, PD-L1+ TAIC abundant<sup>d</sup></b> (61 nivolumab, 47 investigator's choice)	9.10	4.60	3.19	1.97	19.7	0
	0.43	(0.28, 0.67)	0.48	(0.31, 0.75)	(10.6, 31.8)	(0, 7.5)
<b>PD-L1 ≥ 1%, PD-L1+ TAIC rare<sup>d</sup></b> (27 nivolumab, 14 investigator's choice)	6.67	4.93	1.99	2.04	11.1	7.1
	0.89	(0.44, 1.80)	0.93	(0.46, 1.88)	(2.4, 29.2)	(0.2, 33.9)
<b>PD-L1 &lt; 1%, PD-L1+ TAIC abundant<sup>d</sup></b> (43 nivolumab, 25 investigator's choice)	11.73	6.51	2.10	2.73	18.6	12.0
	0.67	(0.38, 1.18)	0.96	(0.55, 1.67)	(8.4, 33.4)	(2.5, 31.2)
<b>PD-L1 &lt; 1%, PD-L1+ TAIC rare<sup>d</sup></b> (27 nivolumab, 10 investigator's choice)	3.71	4.85	1.84	2.12	3.7	10.0
	1.09	(0.50, 2.36)	1.91	(0.84, 4.36)	(< 0.1, 19.0)	(0.3, 44.5)

<sup>a</sup> OS and PFS were estimated using Kaplan-Meier method.

<sup>b</sup> Hazard ratio in each subgroup derived from a Cox proportional hazards model with treatment as the only covariate.

<sup>c</sup> Confidence interval for ORR calculated using the Clopper-Pearson method.

<sup>d</sup> PD-L1+ TAIC in the tumour microenvironment were qualitatively assessed, and characterised as “numerous”, “intermediate”, and “rare” based on pathologist assessments. “Numerous” and “intermediate” groups were combined to define the “abundant” group.

Patients with investigator-assessed primary site of oropharyngeal cancer were tested for HPV (determined by p16 immunohistochemistry [IHC]). OS benefit was observed regardless of HPV status (HPV-positive: HR = 0.63; 95% CI: 0.38, 1.04, HPV-negative: HR = 0.64; 95% CI: 0.40, 1.03, and HPV-unknown: HR = 0.78; 95% CI: 0.55, 1.10).

Patient-reported outcomes (PROs) were assessed using the EORTC QLQ-C30, EORTC QLQ-H&N35, and 3-level EQ-5D. Over 15 weeks of follow-up, patients treated with nivolumab exhibited stable PROs, while those assigned to investigator's choice therapy exhibited significant declines in functioning (e.g., physical, role, social) and health status as well as increased symptomatology (e.g., fatigue, dyspnoea, appetite loss, pain, sensory problems, social contact problems). The PRO data should be interpreted in the context of the open-label study design and therefore taken cautiously.

### Urothelial carcinoma

#### Treatment of advanced urothelial carcinoma

##### Open-label phase 2 study (CA209275)

The safety and efficacy of nivolumab 3 mg/kg as a single agent for the treatment of patients with locally advanced or metastatic urothelial carcinoma was evaluated in a phase 2, multicentre, open-label, single-arm study (CA209275).

The study included patients (18 years or older) who had disease progression during or following platinum-containing chemotherapy for advanced or metastatic disease or had disease progression within 12 months of neoadjuvant or adjuvant treatment with platinum-containing chemotherapy.

Patients had an ECOG performance status score of 0 or 1 and were enrolled regardless of their tumour PD-L1 status. Patients with active brain metastases or leptomeningeal metastases, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the study. Patients that received more than 2 prior lines of chemotherapy with liver metastases were excluded.

A total of 270 patients who received nivolumab 3 mg/kg administered intravenously over 60 minutes every 2 weeks with a minimum follow-up of 8.3 months were evaluable for efficacy. Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. The first tumour assessments were conducted 8 weeks after the start of treatment and continued every 8 weeks thereafter up to 48 weeks, then every 12 weeks until disease progression or treatment discontinuation, whichever occurred later. Tumour assessments were continued after treatment discontinuation in patients who discontinued treatment for reasons other than progression. Treatment beyond initial investigator-assessed RECIST, version 1.1-defined progression was permitted if the patient had a clinical benefit, did not have rapid disease progression, and was tolerating study drug as determined by the investigator. The primary efficacy outcome measure was ORR as determined by BICR. Additional efficacy measures included duration of response, PFS and OS.

The median age was 66 years (range: 38 to 90) with 55%  $\geq$  65 years of age and 14%  $\geq$  75 years of age. The majority of patients were white (86%) and male (78%). Baseline ECOG performance status was 0 (54%) or 1 (46%).

**Table 32: Efficacy results (CA209275)<sup>a</sup>**

		<b>nivolumab</b> <b>(n = 270)</b>
<b>Confirmed objective response</b>		54 (20.0%)
(95% CI)		(15.4, 25.3)
Complete response (CR)		8 (3.0%)
Partial response (PR)		46 (17.0%)
Stable disease (SD)		60 (22.2%)
<b>Median duration of response<sup>b</sup></b>		
Months (range)		10.4 (1.9 <sup>+</sup> -12.0 <sup>+</sup> )
<b>Median time to response</b>		
Months (range)		1.9 (1.6, 7.2)
<b>Progression-free survival</b>		
Events (%)		216 (80)
Median (95% CI) months		2.0 (1.9, 2.6)
Rate (95% CI) at 6 months		26.1 (20.9, 31.5)
<b>Overall survival<sup>c</sup></b>		
Events (%)		154 (57)
Median (95% CI) months		8.6 (6.05, 11.27)
Rate (95% CI) at 12 months		41.0 (34.8, 47.1)
<b>Tumour PD-L1 expression level</b>		
<b>&lt; 1%</b>		<b><math>\geq</math> 1%</b>
<b>Confirmed objective response</b>		
(95% CI)		
	16% (10.3, 22.7) n = 146	25% (17.7, 33.6) n = 124

	<b>nivolumab</b> <b>(n = 270)</b>	
<b>Median duration of response</b>		
<b>Months (range)</b>	10.4 (3.7, 12.0 <sup>a</sup> )	Not Reached (1.9 <sup>a</sup> , 12.0 <sup>a</sup> )
<b>Progression-free survival</b>		
Median (95% CI) months	1.9 (1.8, 2.0)	3.6 (1.9, 3.7)
Rate (95% CI) at 6 months	22.0 (15.6, 29.2)	30.8 (22.7, 39.3)
<b>Overall survival</b>		
Median (95% CI) months	5.9 (4.37, 8.08)	11.6 (9.10, NE)
Rate (95% CI) at 12 months	34.0 (26.1, 42.1)	49.2 (39.6, 58.1)

<sup>a</sup> denotes a censored observation.

<sup>a</sup> median follow-up 11.5 months.

<sup>b</sup> Data unstable due to the limited duration of response.

<sup>c</sup> included 4 drug-related deaths: 1 pneumonitis, 1 acute respiratory failure, 1 respiratory failure, and 1 cardiovascular failure.

NE: non-estimable

Results from post-hoc, exploratory analyses indicate that in patients with low (e.g. <1%) to no tumour PD-L1 expression, other patient characteristics (e.g. liver metastases, visceral metastases, baseline haemoglobin <10g/dL and ECOG performance status = 1) might contribute to the clinical outcome.

#### Open-label phase 1/2 study (CA209032)

CA209032 was a Phase 1/2 open-label multi-cohort study which included a cohort of 78 patients (including 18 subjects who received planned crossover treatment with nivolumab 3 mg/kg plus ipilimumab 1 mg/kg combination) with similar inclusion criteria to study CA209275 treated with nivolumab monotherapy 3 mg/kg for urothelial carcinoma. At a minimum follow-up of 9 months, investigator-assessed confirmed ORR was 24.4% (95% CI: 15.3, 35.4). The median duration of response was not reached (range: 4.4-16.6<sup>a</sup> months). The median OS was 9.7 months (95% CI: 7.26, 16.16) and the estimated OS rates were 69.2% (CI: 57.7, 78.2) at 6 months and 45.6% (CI: 34.2, 56.3) at 12 months.

#### Adjuvant treatment of urothelial carcinoma

##### Randomised phase 3 study of adjuvant nivolumab vs. placebo (CA209274)

The safety and efficacy of nivolumab monotherapy for the adjuvant treatment of urothelial carcinoma was evaluated in a phase 3 multicentre, randomised, placebo-controlled, double-blinded study (CA209274). The study included patients (18 years or older) who have undergone radical resection of muscle invasive urothelial carcinoma (MIUC) originating in the bladder or upper urinary tract (renal pelvis or ureter) and are at high risk of recurrence. The MIUC pathologic staging criteria that defines high risk patients was ypT2-ypT4a or ypN<sup>+</sup> for adult patients who received neoadjuvant cisplatin chemotherapy, and pT3-pT4a or pN<sup>+</sup> for adult patients who did not receive neoadjuvant cisplatin chemotherapy and were not eligible or refused adjuvant cisplatin chemotherapy. The study included patients regardless of their PD-L1 status, who had an ECOG performance status score of 0 or 1 (an ECOG PS of 2 was allowed for patients ineligible for neoadjuvant cisplatin chemotherapy). Tumour cell PD-L1 expression was determined using the PD-L1 IHC 28-8 pharmDx assay. The study excluded patients with active, known or suspected autoimmune disease, patients who had treatment with any chemotherapy, radiation therapy, biologics for cancer, intravesical therapy, or investigational therapy within 28 days of first administration of study treatment.

A total of 709 patients were randomised to receive either nivolumab 240 mg (n = 353) every 2 weeks or placebo (n = 356) every 2 weeks until recurrence or unacceptable toxicity for a maximum treatment duration of 1 year. Of these, 282 patients had tumour cell PD-L1 expression ≥ 1%; 140 in the nivolumab arm and 142 in the placebo arm. Randomisation was stratified by pathologic nodal status (N+ vs. N0/x with < 10 nodes removed vs. N0 with ≥ 10 nodes removed), tumour cell PD-L1 expression (≥ 1% vs. < 1%/indeterminate), and use of cisplatin neoadjuvant chemotherapy. Tumour imaging assessments were to be performed every 12 weeks from the date of first dose to week 96, then



every 16 weeks from week 96 to week 160, then every 24 weeks until non-urothelial tract recurrence or treatment was discontinued (whichever occurred later) for a maximum of 5 years. The primary efficacy outcome measures were disease-free survival (DFS) in all randomised patients and DFS in randomised patients with tumour cell PD-L1 expression  $\geq 1\%$ . DFS was defined as the time between the date of randomisation and the date of the first documented recurrence assessed by investigator (local urothelial tract, local non-urothelial tract or distant), or death (from any cause), whichever occurred first. Secondary efficacy outcome measures included overall survival (OS).

Baseline characteristics were generally balanced across treatment groups. In patients with tumour cell PD-L1 expression  $\geq 1\%$ , the median age was 66 years (range: 34 - 92 years), 76% were male and 76% were white. Eighty two percent had muscle invasive bladder cancer (MIBC), 18% had upper tract urothelial carcinoma (UTUC) (renal pelvis and ureter), 42% of patients received prior cisplatin in the neoadjuvant setting, 45% of patients were N+ at radical resection, patients had ECOG performance status of 0 (61%), 1 (37%), or 2 (2%), and 7% of patients had a haemoglobin  $< 10$  g/dL.

At the primary pre-specified interim analysis in patients with tumour cell PD-L1 expression  $\geq 1\%$  (minimum follow-up of 6.3 months and median follow-up of 22.1 months for the nivolumab arm), the study demonstrated a statistically significant improvement in DFS for patients randomised to nivolumab as compared to placebo. Median DFS as determined by the investigator was not reached (95% CI: 21.19, N.R.) for nivolumab versus 8.41 months (95% CI: 5.59, 21.19) for placebo, HR 0.55 (98.72% CI: 0.35, 0.85), p-value = 0.0005. The primary analysis of DFS included censoring for new anti-cancer treatment. Results for DFS with and without censoring for new anti-cancer treatment were consistent.

In an updated descriptive DFS analysis in patients with tumour cell PD-L1 expression  $\geq 1\%$  (minimum follow-up of 11.4 months and median follow-up of 25.5 months for the nivolumab arm), DFS improvement was confirmed.

Efficacy results from this descriptive updated analysis are shown in Table 33 and Figure 19.

**Table 33: Efficacy results in patients with tumour cell PD-L1  $\geq 1\%$  (CA209274)**

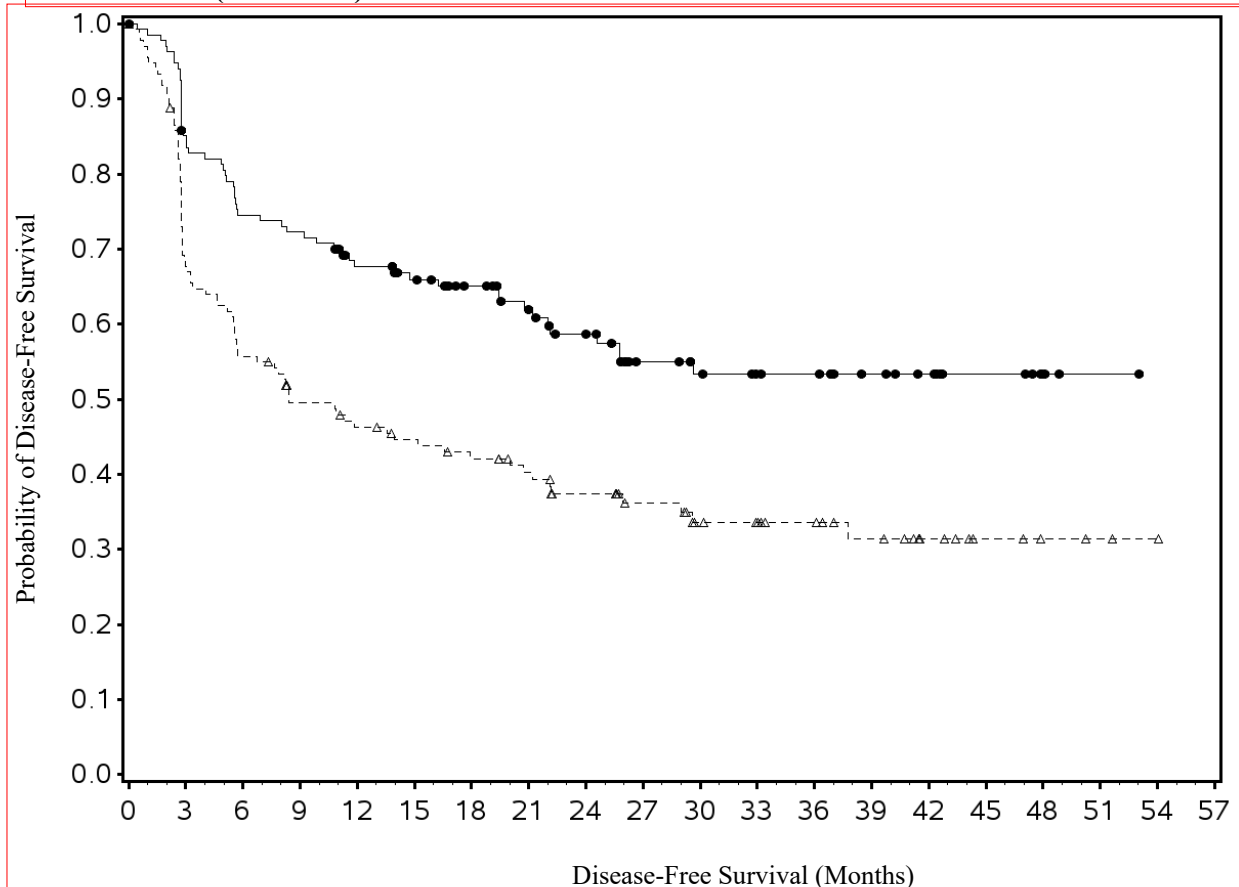
	nivolumab (n = 140)	placebo (n = 142)
<b>Disease-Free Survival</b>	Minimum follow-up 11.4 months	
Events (%)	56 (40.0)	85 (59.9)
Hazard ratio (95% CI) <sup>a</sup>	0.53 (0.38, 0.75)	
Median (95% CI) (months) <sup>b</sup>	NR (22.11, NE)	8.41 (5.59, 20.04)
Rate (95% CI) at 6 months	74.5 (66.2, 81.1)	55.7 (46.8, 63.6)
Rate (95% CI) at 12 months	67.6 (59.0, 74.9)	46.3 (37.6, 54.5)
Rate (95% CI) at 24 months	58.6 (49.3, 66.9)	37.4 (29.0, 45.8)

NR: not reached, NE: non-estimable.

<sup>a</sup> Stratified Cox proportional hazard model. Hazard Ratio is nivolumab over placebo.

<sup>b</sup> Based on Kaplan-Meier estimates.

**Figure 19: Kaplan-Meier curves of DFS in patients with tumour cell PD-L1 expression  $\geq 1\%$  (CA209274)**



**Number of subjects at risk**

Placebo	142	90	74	62	57	53	49	44	36	29	23	21	18	14	9	5	3	2	1	0
Nivolumab	140	113	99	96	85	75	67	58	50	38	33	30	29	22	19	8	3	1	0	0

---△--- Placebo (events: 85/142), median and 95% CI: 8.41 (5.59, 20.04)

—●— Nivolumab (events: 56/140), median and 95% CI: N.A. (22.11, N.A.)

Minimum follow-up of 11.4 months

Exploratory pre-specified subgroup descriptive analyses were performed in patients based on prior cisplatin treatment in the neoadjuvant setting.

In the subgroup of patients with tumour cell PD-L1 expression  $\geq 1\%$  who received prior cisplatin in the neoadjuvant setting (n = 118), the DFS HR was 0.37 (95% CI: 0.22, 0.64) with median DFS not reached and 8.41 months for the nivolumab and placebo arms, respectively. In the subgroup of patients with tumour cell PD-L1 expression  $\geq 1\%$  who did not receive prior cisplatin in the neoadjuvant setting (n = 164), the DFS HR was 0.69 (95% CI: 0.44, 1.08) with median DFS of 29.67 and 11.37 months for the nivolumab and placebo arms, respectively.

**dMMR or MSI-H colorectal cancer**

The safety and efficacy of nivolumab 3 mg/kg in combination with ipilimumab 1 mg/kg for the treatment of dMMR or MSI-H metastatic CRC was evaluated in a Phase 2, multi-centre, open-label, single-arm study (CA209142).

The study included patients (18 years or older) with locally determined dMMR or MSI-H status, who had disease progression during, after, or were intolerant to, prior therapy with fluoropyrimidine and oxaliplatin or irinotecan. Patients who had their most recent prior treatment in the adjuvant setting should have progressed on or within 6 months of completion of adjuvant chemotherapy. Patients had an ECOG performance status score of 0 or 1 and were enrolled regardless of their tumour PD-L1

status. Patients with active brain metastases, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the study.

A total of 119 patients were treated with nivolumab 3 mg/kg administered intravenously over 60 minutes in combination with ipilimumab 1 mg/kg administered intravenously over 90 minutes every 3 weeks for 4 doses followed by nivolumab monotherapy 3 mg/kg every 2 weeks. Treatment was continued as long as clinical benefit was observed or until treatment was no longer tolerated. Tumour assessments according to RECIST version 1.1 were conducted every 6 weeks for the first 24 weeks and every 12 weeks thereafter. The primary outcome measure was investigator-assessed ORR. Secondary outcome measures were BICR-assessed ORR and disease control rate. Analysis of ORR included duration of and time to response. Exploratory outcome measures included PFS and OS.

The median age was 58 years (range: 21-88) with 32%  $\geq$  65 years of age and 9%  $\geq$  75 years of age, 59% were male and 92% were white. Baseline ECOG performance status was 0 (45%) or 1 (55%), 25% of patients had BRAF mutations, 37% had KRAS mutations, and 12% were unknown. Of the 119 treated patients, 109 had received prior fluoropyrimidine based chemotherapy in the metastatic setting and 9 in the adjuvant setting. Before study enrolment, of the 119 treated patients, 118 (99%) had received fluorouracil, 111 (93%) had received oxaliplatin, 87 (73%) had received irinotecan as part of prior therapies; 82 (69%) had received prior treatment with fluoropyrimidine, oxaliplatin, and irinotecan. Twenty three percent, 36%, 24%, and 16% received 1, 2, 3, or 4 or more prior therapies respectively, and 29% of patients had received an EGFR inhibitor.

Efficacy results (minimum follow-up 46.9 months; median follow-up 51.1 months) are shown in Table 34.

**Table 34: Efficacy results (CA209142)\***

	nivolumab + ipilimumab (n = 119)
<b>Confirmed objective response, n (%)</b>	77 (64.7)
(95% CI)	(55.4, 73.2)
Complete response (CR), n (%)	15 (12.6)
Partial response (PR), n (%)	62 (52.1)
Stable disease (SD), n (%)	25 (21.0)
<b>Duration of response</b>	
Median (range) months	NR (1.4, 58.0+)
<b>Median time to response</b>	
Months (range)	2.8 (1.1, 37.1)

\* per investigator assessment

“+” denotes a censored observation.

NR = not reached

The BICR-assessed ORR was 61.3% (95% CI: 52.0, 70.1), including CR rate of 20.2% (95% CI: 13.4, 28.5), PR rate of 41.2% (95% CI: 32.2, 50.6) and stable disease reported in 22.7%. BICR assessments were generally consistent with the investigator assessment. Confirmed responses were observed regardless of BRAF or KRAS mutation status, and tumour PD-L1 expression levels.

Of 119 patients 11 (9.2%) patients were  $\geq$  75 years. The investigator assessed ORR in patients  $\geq$  75 years was 45.5% (95% CI: 16.7, 76.6).

### *Oesophageal squamous cell carcinoma*

#### *Randomised phase 3 study of nivolumab monotherapy in previously treated patients (ONO-4538-24/CA209473)*

The safety and efficacy of nivolumab 240 mg monotherapy for the treatment of unresectable advanced, recurrent or metastatic oesophageal squamous cell carcinoma (OSCC) was evaluated in a phase 3 randomised active-controlled, open-label study (ONO-4538-24/CA209473). The study

included adult patients (20 years or older) who were refractory or intolerant to at least one fluoropyrimidine- and platinum-based combination regimen, and patients were enrolled regardless of tumour PD-L1 expression level. Patients who were refractory or intolerant to taxane therapy, had brain metastases that were symptomatic or required treatment, had active autoimmune disease, medical conditions requiring systemic immunosuppression, and patients with apparent tumour invasion in organs located adjacent to the oesophagus (e.g. the aorta or respiratory tract), were excluded from the study.

A total of 419 patients were randomised 1:1 to receive either nivolumab 240 mg administered intravenously over 30 minutes every 2 weeks (n = 210) or investigator's choice of taxane chemotherapy: either docetaxel (n = 65) 75 mg/m<sup>2</sup> intravenously every 3 weeks, or paclitaxel (n = 144) 100 mg/m<sup>2</sup> intravenously once a week for 6 weeks followed by 1 week off. Randomisation was stratified by location (Japan vs. rest of world), number of organs with metastases ( $\leq 1$  vs.  $\geq 2$ ) and tumour PD-L1 expression ( $\geq 1\%$  vs.  $<1\%$  or indeterminate). Treatment continued until disease progression, assessed by the investigator per RECIST version 1.1, or unacceptable toxicity. Tumour assessments were conducted every 6 weeks for 1 year, and every 12 weeks thereafter. Treatment beyond initial investigator-assessed progression was permitted in patients receiving nivolumab with no rapid progression, investigator-assessed benefit, tolerance to treatment, stable performance status, and for whom treatment beyond progression would not delay an imminent intervention to prevent serious complications associated with disease progression (e.g. brain metastasis). The primary efficacy outcome measure was OS. Key secondary efficacy outcome measures were investigator-assessed ORR and PFS. Additional prespecified subgroup analyses were conducted to evaluate the efficacy by tumour PD-L1 expression at a predefined level of 1%. Tumour PD-L1 expression was determined using the PD-L1 IHC 28-8 pharmDx assay.

Baseline characteristics were generally balanced between the two groups. The median age was 65 years (range: 33-87), 53% were  $\geq 65$  years of age, 10% were aged  $\geq 75$  years, 87% were male, 96% were Asian and 4% were white. Baseline ECOG performance status was 0 (50%) or 1 (50%).

With a minimum follow-up of 17.6 months, the study demonstrated a statistically significant improvement in OS for patients randomised to nivolumab as compared with investigator's choice taxane chemotherapy. Efficacy results are shown in Table 35 and Figure 20.

A higher proportion of patients experienced death within the first 2.5 months in the nivolumab arm (32/210, 15.2%) as compared to the chemotherapy arm (15/209, 7.2%). No specific factor(s) associated with early deaths could be identified.

**Table 35: Efficacy results (ONO-4538-24/CA209473)**

	nivolumab (n = 210)	investigator's choice (n = 209)
<b>Overall Survival<sup>a</sup></b>		
Events	160 (76%)	173 (83%)
Hazard ratio (95% CI) <sup>b</sup>		0.77 (0.62, 0.96)
p-value <sup>c</sup>		0.0189
Median (95% CI) (months)	10.9 (9.2, 13.3)	8.4 (7.2, 9.9)

	nivolumab (n = 210)	investigator's choice (n = 209)
<b>Objective Response Rate<sup>d,e</sup></b>	33 (19.3%)	34 (21.5%)
(95% CI)	(13.7, 26.0)	(15.4, 28.8)
Complete response	1 (0.6%)	2 (1.3%)
Partial response	32 (18.7%)	32 (20.3%)
Stable disease	31 (18.1%)	65 (41.1%)
Median duration of response (95% CI) (months)	6.9 (5.4, 11.1)	3.9 (2.8, 4.2)
<b>Progression-Free Survival<sup>a</sup></b>		
Events	187 (89%)	176 (84%)
Median (95% CI) (months)	1.7 (1.5, 2.7)	3.4 (3.0, 4.2)
Hazard ratio (95% CI) <sup>b</sup>		1.1 (0.9, 1.3)

<sup>a</sup> Based on ITT analysis.

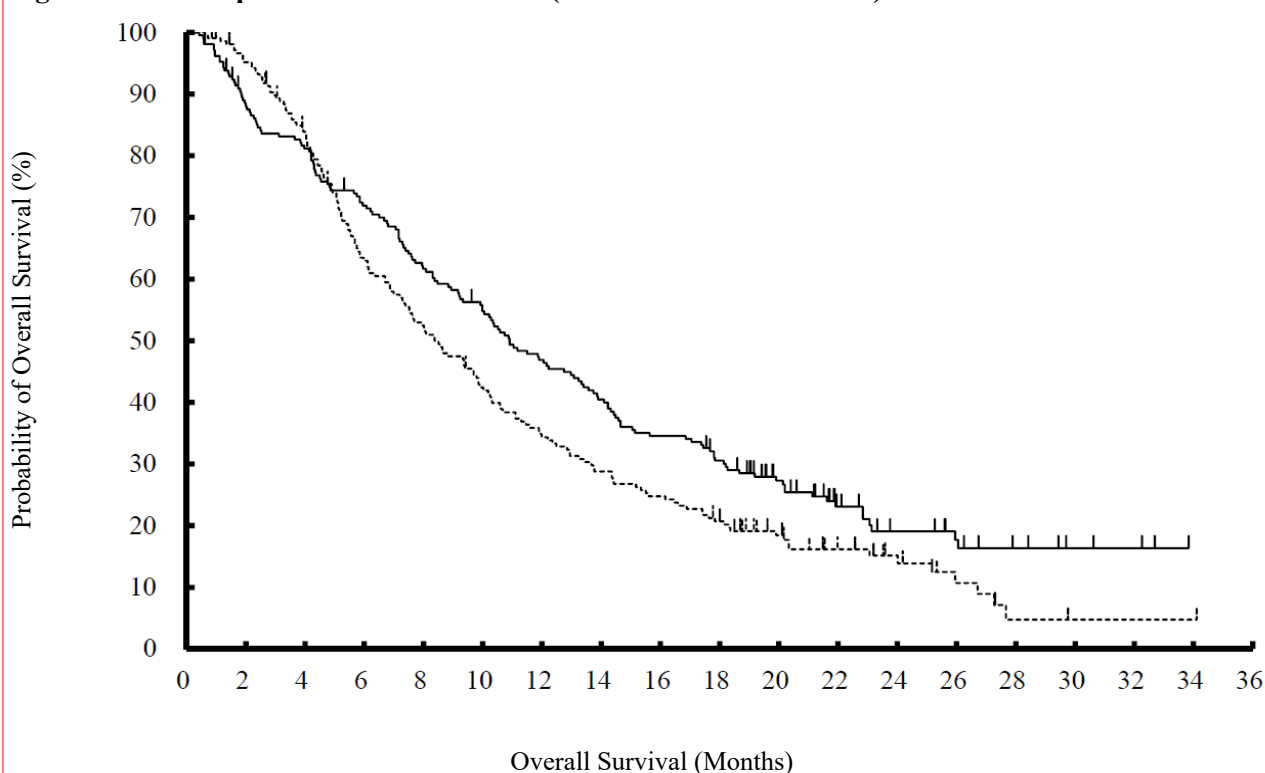
<sup>b</sup> Based on a stratified proportional hazards model.

<sup>c</sup> Based on a stratified log-rank test.

<sup>d</sup> Based on Response Evaluable Set (RES) analysis, n=171 in nivolumab group and n=158 in investigator's choice group.

<sup>e</sup> Not significant, p-value 0.6323.

**Figure 20: Kaplan-Meier curves of OS (ONO-4538-24/CA209473)**



Number of subjects at risk																				
Nivolumab																				
	210	182	167	147	126	11	95	82	70	60	43	25	17	13	7	4	3	0	0	
Investigator's choice		209	196	169	126	105	84	68	57	49	40	27	17	12	6	2	1	1	1	0
Legend		<span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Nivolumab <span style="border-bottom: 1px dashed black; width: 20px; display: inline-block;"></span> Investigator's choice																		

Of the 419 patients, 48% had tumour PD-L1 expression  $\geq 1\%$ . The remaining 52% of patients had tumour PD-L1 expression  $<1\%$ . The hazard ratio (HR) for OS was 0.69 (95% CI: 0.51, 0.94) with median survivals of 10.9 and 8.1 months for the nivolumab and investigator's choice taxane chemotherapy arms, respectively, in the tumour PD-L1 positive subgroup. In the tumour PD-L1 negative OSCC subgroup, the HR for OS was 0.84 (95% CI: 0.62, 1.14) with median survivals of 10.9 and 9.3 months for the nivolumab and chemotherapy arms, respectively.

*Randomised phase 3 study of nivolumab in combination with ipilimumab vs. chemotherapy and nivolumab in combination with chemotherapy vs. chemotherapy as first-line treatment (CA209648)*

The safety and efficacy of nivolumab in combination with ipilimumab and nivolumab in combination with chemotherapy were evaluated in a randomised, active-controlled, open-label study (CA209648). The study included adult patients (18 years or older) with previously untreated, unresectable advanced, recurrent or metastatic OSCC. Patients were enrolled regardless of their tumour PD-L1 status, and tumour cell PD-L1 expression was determined using the PD-L1 IHC 28-8 pharmDx assay. Patients were required to have squamous cell carcinoma or adenosquamous cell carcinoma of oesophagus, not amenable to chemoradiation and/or surgery. Prior adjuvant, neoadjuvant, or definitive chemotherapy, radiotherapy or chemoradiotherapy was permitted if given as part of curative intent regimen prior to trial enrollment. Patients who had a baseline performance score  $\geq 2$ , had brain metastases that were symptomatic, had active autoimmune disease, used systemic corticosteroids or immunosuppressants, or patients at high risk of bleeding or fistula due to apparent invasion of tumour to organs adjacent to the oesophageal tumour were excluded from the study. Randomisation was stratified by tumour cell PD-L1 status ( $\geq 1\%$  vs.  $< 1\%$  or indeterminate), region (East Asia vs. rest of Asia vs. rest of world), ECOG performance status (0 vs. 1), and number of organs with metastases ( $\leq 1$  vs.  $\geq 2$ ).

A total of 970 patients were randomised to receive either nivolumab in combination with ipilimumab, (n = 325), nivolumab in combination with chemotherapy (n = 321), or chemotherapy (n = 324). Of these, 473 patients had tumour cell PD-L1 expression  $\geq 1\%$ , 158 in the nivolumab plus ipilimumab arm, 158 in the nivolumab plus chemotherapy arm, and 157 in the chemotherapy arm. Patients in the nivolumab plus ipilimumab arm received nivolumab 3 mg/kg every 2 weeks in combination with ipilimumab 1 mg/kg every 6 weeks, and patients in the nivolumab plus chemotherapy arm received nivolumab 240 mg every 2 weeks on days 1 and 15, fluorouracil 800 mg/m<sup>2</sup>/day intravenously on days 1 through 5 (for 5 days), and cisplatin 80 mg/m<sup>2</sup> intravenously on day 1 (of a 4-week cycle). Patients in the chemotherapy arm received fluorouracil 800 mg/m<sup>2</sup>/day intravenously on days 1 through 5 (for 5 days), and cisplatin 80 mg/m<sup>2</sup> intravenously on day 1 (of a 4-week cycle). Treatment continued until disease progression, unacceptable toxicity, or up to 24 months. Patients in the nivolumab plus ipilimumab arm who discontinued combination therapy because of an adverse reaction attributed to ipilimumab were permitted to continue nivolumab as a single agent. Patients in the nivolumab plus chemotherapy arm in whom either fluorouracil and/or cisplatin were discontinued, other components of the treatment regimen were allowed to be continued.

Baseline characteristics were generally balanced across treatment groups. In patients with tumour cell PD-L1 expression  $\geq 1\%$ , the median age was 63 years (range: 26-85), 8.2% were  $\geq 75$  years of age, 81.8% were male, 73.1% were Asian, and 23.3% were white. Patients had histological confirmation of squamous cell carcinoma (98.9%) or adenosquamous cell carcinoma (1.1%) in the oesophagus. Baseline ECOG performance status was 0 (45.2%) or 1 (54.8%).

*Nivolumab in combination with ipilimumab vs. chemotherapy*

The primary efficacy outcome measures were PFS (by BICR) and OS assessed in patients with tumour cell PD-L1 expression  $\geq 1\%$ . Secondary endpoints per the pre-specified hierarchical testing included OS, PFS (by BICR), and ORR (by BICR) in all randomised patients. The tumour assessments per RECIST v1.1 were conducted every 6 weeks up to and including week 48, then every 12 weeks thereafter.

At the primary pre-specified analysis, with a minimum follow-up of 13.1 months, the study demonstrated a statistically significant improvement in OS in patients with tumour cell PD-L1 expression  $\geq 1\%$ . Efficacy results are shown in Table 36.

**Table 36: Efficacy results in patients with tumour cell PD-L1 ≥ 1% (CA209648)**

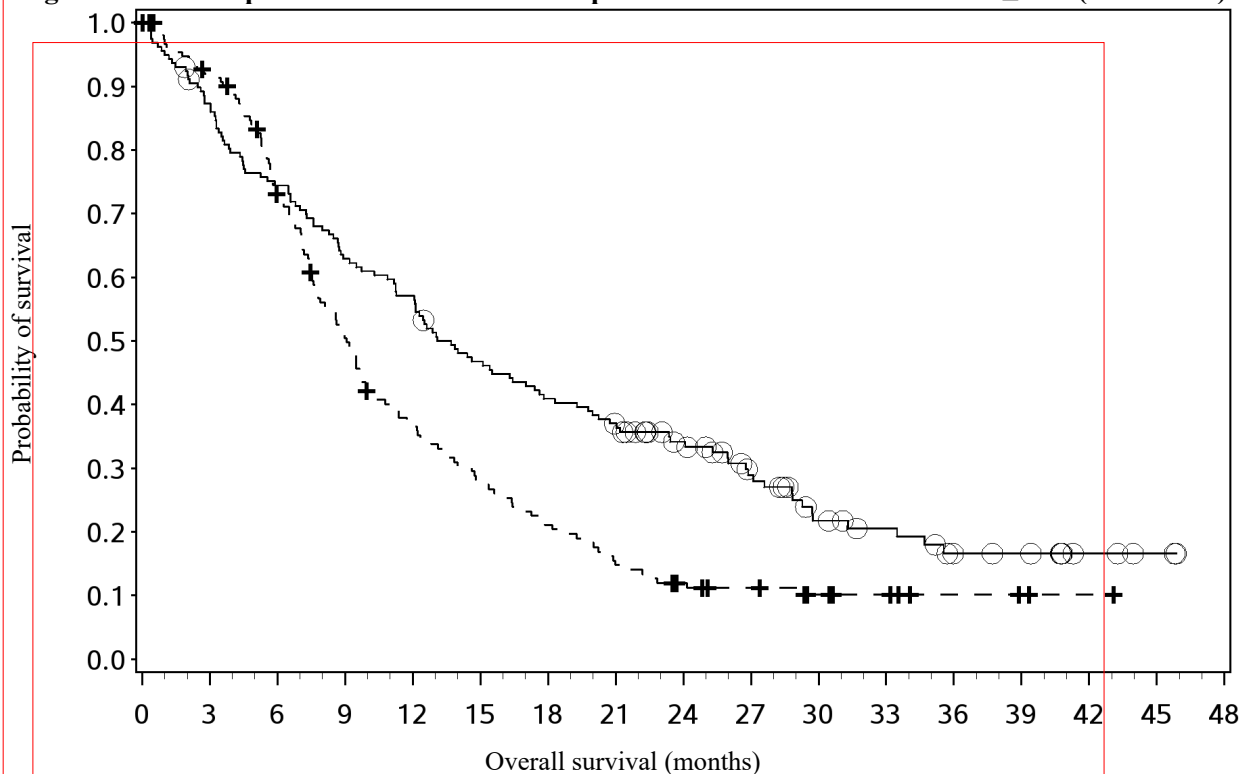
	nivolumab + ipilimumab (n = 158)	chemotherapy <sup>a</sup> (n = 157)
<b>Overall survival</b>		
Events	106 (67.1%)	121 (77.1%)
Hazard ratio (98.6% CI) <sup>b</sup>		0.64 (0.46, 0.90)
p-value <sup>c</sup>		0.0010
Median (95% CI) (months) <sup>d</sup>	13.70 (11.24, 17.02)	9.07 (7.69, 9.95)
Rate (95% CI) at 12 months <sup>d</sup>	57.1 (49.0, 64.4)	37.1 (29.2, 44.9)
<b>Progression-free survival<sup>e</sup></b>		
Events	123 (77.8%)	100 (63.7%)
Hazard ratio (98.5% CI) <sup>b</sup>		1.02 (0.73, 1.43)
p-value <sup>c</sup>		0.8958
Median (95% CI) (months) <sup>d</sup>	4.04 (2.40, 4.93)	4.44 (2.89, 5.82)
Rate (95% CI) at 12 months <sup>d</sup>	26.4 (19.5, 33.9)	10.5 (4.7, 18.8)
<b>Overall response rate, n (%)<sup>e</sup></b>		
(95% CI)	56 (35.4) (28.0, 43.4)	31 (19.7) (13.8, 26.8)
Complete response	28 (17.7)	8 (5.1)
Partial response	28 (17.7)	23 (14.6)
<b>Duration of response<sup>e</sup></b>		
Median (95% CI) (months) <sup>d</sup>	11.83 (7.10, 27.43)	5.68 (4.40, 8.67)
Range	1.4 <sup>+</sup> , 34.5 <sup>+</sup>	1.4 <sup>+</sup> , 31.8 <sup>+</sup>

<sup>a</sup> Fluorouracil and cisplatin.<sup>b</sup> Based on stratified Cox proportional hazard model.<sup>c</sup> Based on stratified 2-sided log-rank test.<sup>d</sup> Based on Kaplan-Meier estimates.<sup>e</sup> Assessed by BICR.

At an updated descriptive analysis with a minimum follow-up of 20 months, OS improvements were consistent with the primary analysis. Median OS was 13.70 months (95% CI: 11.24, 17.41) for nivolumab plus ipilimumab vs. 9.07 months (95% CI: 7.69, 10.02) for chemotherapy (HR = 0.63; 95% CI: 0.49, 0.82). Median PFS was 4.04 months (95% CI: 2.40, 4.93) for nivolumab plus ipilimumab vs. 4.44 months (95% CI: 2.89, 5.82) for chemotherapy (HR = 1.02; 95% CI: 0.77, 1.34). The ORR was 35.4% (95% CI: 28.0, 43.4) for nivolumab plus ipilimumab vs. 19.7% (95% CI: 13.8, 26.8) for chemotherapy.

The Kaplan-Meier curves for OS with a minimum follow-up of 20 months are shown in Figure 21.

**Figure 21: Kaplan-Meier curves of OS in patients with tumour cell PD-L1  $\geq$  1% (CA209648)**



Number of subjects at risk

Nivolumab + ipilimumab

158 136 116 98 89 72 63 55 43 31 20 16 10 9 4 2 0

Chemotherapy

157 137 107 73 53 40 30 21 15 12 8 6 3 2 1 0 0

—○— Nivolumab + ipilimumab (events: 119/158), median and 95% CI: 13.70 (11.24, 17.41)

---+--- Chemotherapy (events: 130/157), median and 95% CI: 9.07 (7.69, 10.02)

Based on data cut-off: 23-Aug-2021, minimum follow-up of 20 months

*Nivolumab in combination with chemotherapy vs. chemotherapy*

The primary efficacy outcome measures were PFS (by BICR) and OS in patients with tumour cell PD-L1 expression  $\geq$  1%. Secondary endpoints per the pre-specified hierarchical testing included OS, PFS (by BICR), and ORR (by BICR) in all randomised patients. The tumour assessments per RECIST v1.1 were conducted every 6 weeks up to and including week 48, then every 12 weeks thereafter.

At the primary pre-specified analysis, with a minimum follow-up of 12.9 months the study demonstrated a statistically significant improvement in OS and PFS in patients with tumour cell PD-L1 expression  $\geq$  1%. Efficacy results are shown in Table 37.

**Table 37: Efficacy results in patients with tumour cell PD-L1  $\geq$  1% (CA209648)**

	nivolumab + chemotherapy (n = 158)	chemotherapy <sup>a</sup> (n = 157)
<b>Overall survival</b>		
Events	98 (62.0%)	121 (77.1%)
Hazard ratio (99.5% CI) <sup>b</sup>		0.54 (0.37, 0.80)
p-value <sup>c</sup>		<0.0001
Median (95% CI) (months) <sup>d</sup>	15.44 (11.93, 19.52)	9.07 (7.69, 9.95)
Rate (95% CI) at 12 months <sup>d</sup>	58.0 (49.8, 65.3)	37.1 (29.2, 44.9)

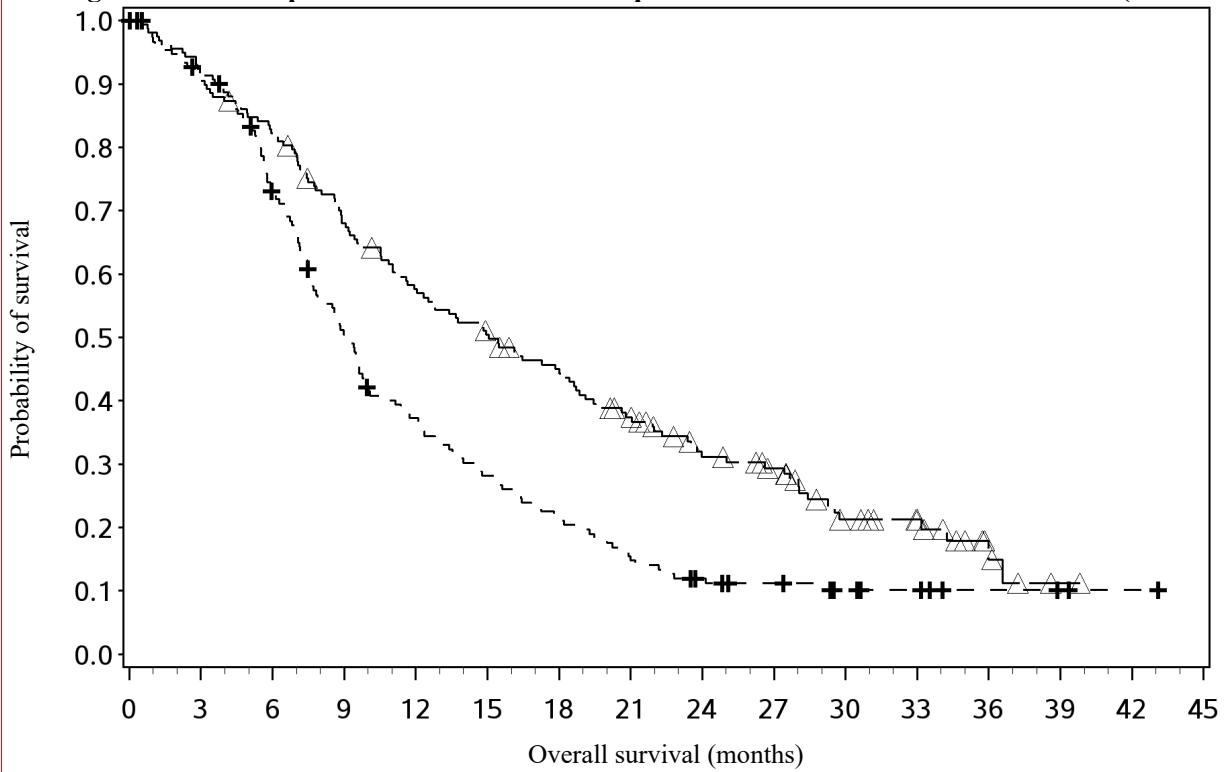


	nivolumab + chemotherapy (n = 158)	chemotherapy <sup>a</sup> (n = 157)
<b>Progression-free survival<sup>e</sup></b>		
Events	117 (74.1%)	100 (63.7%)
Hazard ratio (98.5% CI) <sup>b</sup>		0.65 (0.46, 0.92)
p-value <sup>c</sup>		0.0023
Median (95% CI) (months) <sup>d</sup>	6.93 (5.68, 8.34)	4.44 (2.89, 5.82)
Rate (95% CI) at 12 months <sup>d</sup>	25.4 (18.2, 33.2)	10.5 (4.7, 18.8)
<b>Overall response rate, n (%)<sup>e</sup></b>		
	84 (53.2)	31 (19.7)
(95% CI)	(45.1, 61.1)	(13.8, 26.8)
Complete response	26 (16.5)	8 (5.1)
Partial response	58 (36.7)	23 (14.6)
<b>Duration of response<sup>e</sup></b>		
Median (95% CI) (months) <sup>d</sup>	8.38 (6.90, 12.35)	5.68 (4.40, 8.67)
Range	1.4 <sup>+</sup> , 34.6	1.4 <sup>+</sup> , 31.8 <sup>+</sup>
<sup>a</sup>	Fluorouracil and cisplatin.	
<sup>b</sup>	Based on stratified Cox proportional hazard model.	
<sup>c</sup>	Based on stratified 2-sided log-rank test.	
<sup>d</sup>	Based on Kaplan-Meier estimates.	
<sup>e</sup>	Assessed by BICR.	

At an updated descriptive analysis with a minimum follow-up of 20 months, OS improvements were consistent with the primary analysis. Median OS was 15.05 months (95% CI: 11.93, 18.63) for nivolumab plus chemotherapy vs. 9.07 months (95% CI: 7.69, 10.02) for chemotherapy (HR = 0.59; 95% CI: 0.46, 0.76). Median PFS was 6.93 months (95% CI: 5.68, 8.35) for nivolumab plus chemotherapy vs. 4.44 months (95% CI: 2.89, 5.82) for chemotherapy (HR = 0.66; 95% CI: 0.50, 0.87). The ORR was 53.2% (95% CI: 45.1, 61.1) for nivolumab plus chemotherapy vs. 19.7% (95% CI: 13.8, 26.8) for chemotherapy.

The Kaplan-Meier curves for OS and PFS with a minimum follow-up of 20 months are shown in Figures 22 and 23.

**Figure 22: Kaplan-Meier curves of OS in patients with tumour cell PD-L1  $\geq$  1% (CA209648)**



Number of subjects at risk

Nivolumab + chemotherapy

158 143 129 105 88 76 66 52 38 32 19 15 5 1 0 0

Chemotherapy

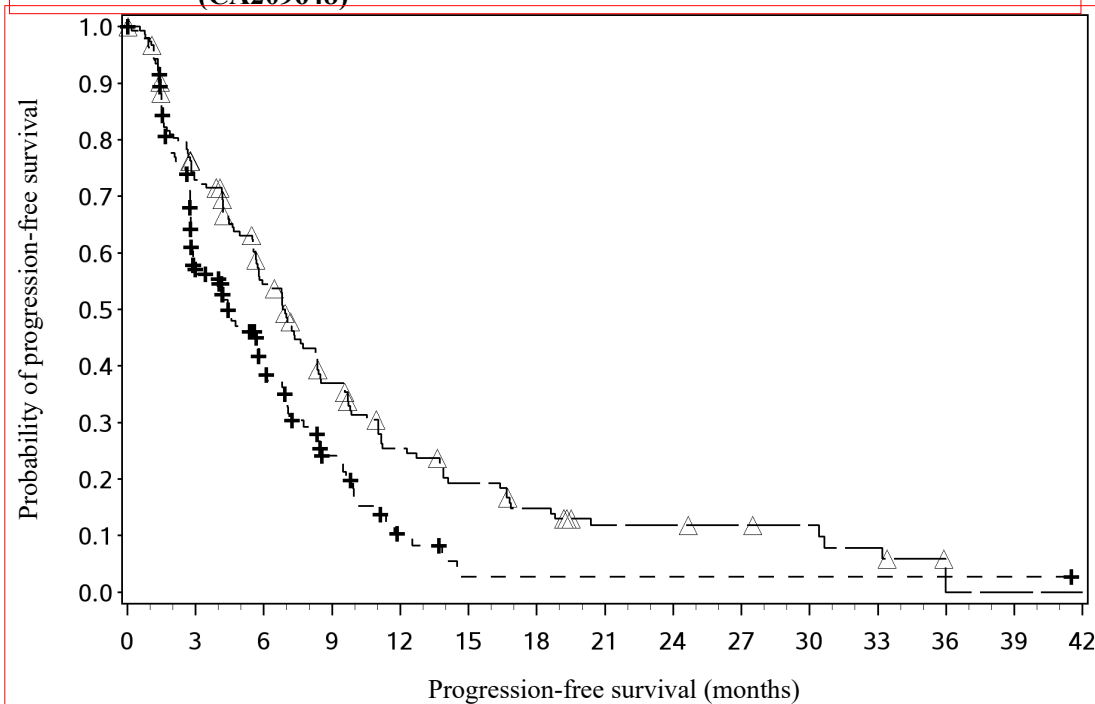
157 137 107 73 53 40 30 21 15 12 8 6 3 2 1 0

---△--- Nivolumab + chemotherapy (events: 118/158), median and 95% CI: 15.05 (11.93, 18.63)

---+--- Chemotherapy (events: 130/157), median and 95% CI: 9.07 (7.69, 10.02)

Based on data cut-off: 23-Aug-2021, minimum follow-up of 20 months

**Figure 23: Kaplan-Meier curves of PFS in patients with tumour cell PD-L1  $\geq 1\%$  (CA209648)**



Number of subjects at risk

Nivolumab + chemotherapy														
158	107	75	47	30	22	16	10	10	7	6	4	0	0	0
Chemotherapy														
157	68	36	17	5	1	1	1	1	1	1	1	1	1	0

---△--- Nivolumab + chemotherapy (events: 123/158), median and 95% CI: 6.93 (5.65, 8.35)

---+--- Chemotherapy (events: 101/157), median and 95% CI: 4.44 (2.89, 5.82)

Based on data cut-off: 23-Aug-2021, minimum follow-up of 20 months

### *Adjuvant treatment of oesophageal or gastro-oesophageal junction cancer*

The safety and efficacy of nivolumab monotherapy for the adjuvant treatment of oesophageal or gastro-oesophageal junction cancer was evaluated in a phase 3 multicentre, randomised, placebo-controlled, double-blinded study (CA209577). The study included adult patients who had received CRT, followed by complete surgical resection of carcinoma within 16 weeks prior to randomisation, and who had residual pathologic disease as confirmed by the investigator, with at least ypN1 or ypT1. Patients with a baseline performance score  $\geq 2$ , who did not receive concurrent CRT prior to surgery, with stage IV resectable disease, active autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the study. Patients were enrolled regardless of tumour PD-L1 expression level.

A total of 794 patients were randomised 2:1 to receive either nivolumab 240 mg (n = 532) or placebo (n = 262). Patients were administered nivolumab intravenously over 30 minutes every 2 weeks for 16 weeks followed by 480 mg infused over 30 minutes every 4 weeks beginning at week 17. Patients were administered placebo over 30 minutes with the same dosing schedule as nivolumab. Randomisation was stratified by tumour PD-L1 status ( $\geq 1\%$  vs.  $<1\%$  or indeterminate or non-evaluable), pathologic lymph node status (positive  $\geq$  ypN1 vs. negative ypN0), and histology (squamous vs. adenocarcinoma). Treatment continued until disease recurrence, unacceptable toxicity, or for up to 1 year in total duration. The primary efficacy outcome measure was disease-free survival (DFS), as assessed by the investigator, defined as the time between the date of randomisation and the date of first recurrence (local, regional, or distant from the primary resected site) or death from any cause, whichever occurred first. Patients on treatment underwent imaging for tumour recurrence every 12 weeks for 2 years, and a minimum of one scan every 6 to 12 months for years 3 to 5.

Baseline characteristics were generally balanced between the two groups. The median age was 62 years (range: 26-86) with 36% ≥ 65 years of age and 5% ≥ 75 years of years. The majority of patients were white (82%) and male (85 %). Baseline ECOG performance status was 0 (58%) or 1 (42%).

At the primary pre-specified interim analysis (minimum of 6.2 months and a median of 24.4 months follow-up), the study demonstrated a statistically significant improvement in DFS for patients randomised to nivolumab compared with placebo. Median DFS as determined by the investigator was 22.41 months (95% CI: 16.62, 34.00) for nivolumab versus 11.04 months (95% CI: 8.34, 14.32) for placebo, HR 0.69 (96.4% CI: 0.56, 0.86), p-value < 0.0003. The primary analysis of DFS included censoring for new anti-cancer treatment. Results for DFS with and without censoring for new anti-cancer treatment were consistent. In an updated descriptive DFS analysis with minimum of 14 months and median of 32.2 months follow-up, DFS improvement was confirmed. Efficacy results from this descriptive secondary analysis are shown in Table 38 and Figure 24.

**Table 38: Efficacy results (CA209577)**

	<b>nivolumab (n = 532)</b>	<b>placebo (n = 262)</b>
<b>Disease-free Survival<sup>a</sup> with minimum follow-up 14 months<sup>c</sup></b>		
Events (%)	268 (50)	171 (65)
Hazard ratio (95% CI) <sup>b</sup>	0.67 (0.55, 0.81)	
Median (95% CI) (months)	22.4 (17.0, 33.6)	10.4 (8.3, 13.9)
Rate (95% CI) at 6 months	72.6 (68.5, 76.3)	61.5 (55.3, 67.1)
Rate (95% CI) at 12 months	61.8 (57.4, 65.8)	45.5 (39.3, 51.4)
Rate (95% CI) at 24 months	48.3 (43.7, 52.8)	36.0 (29.9, 42.0)

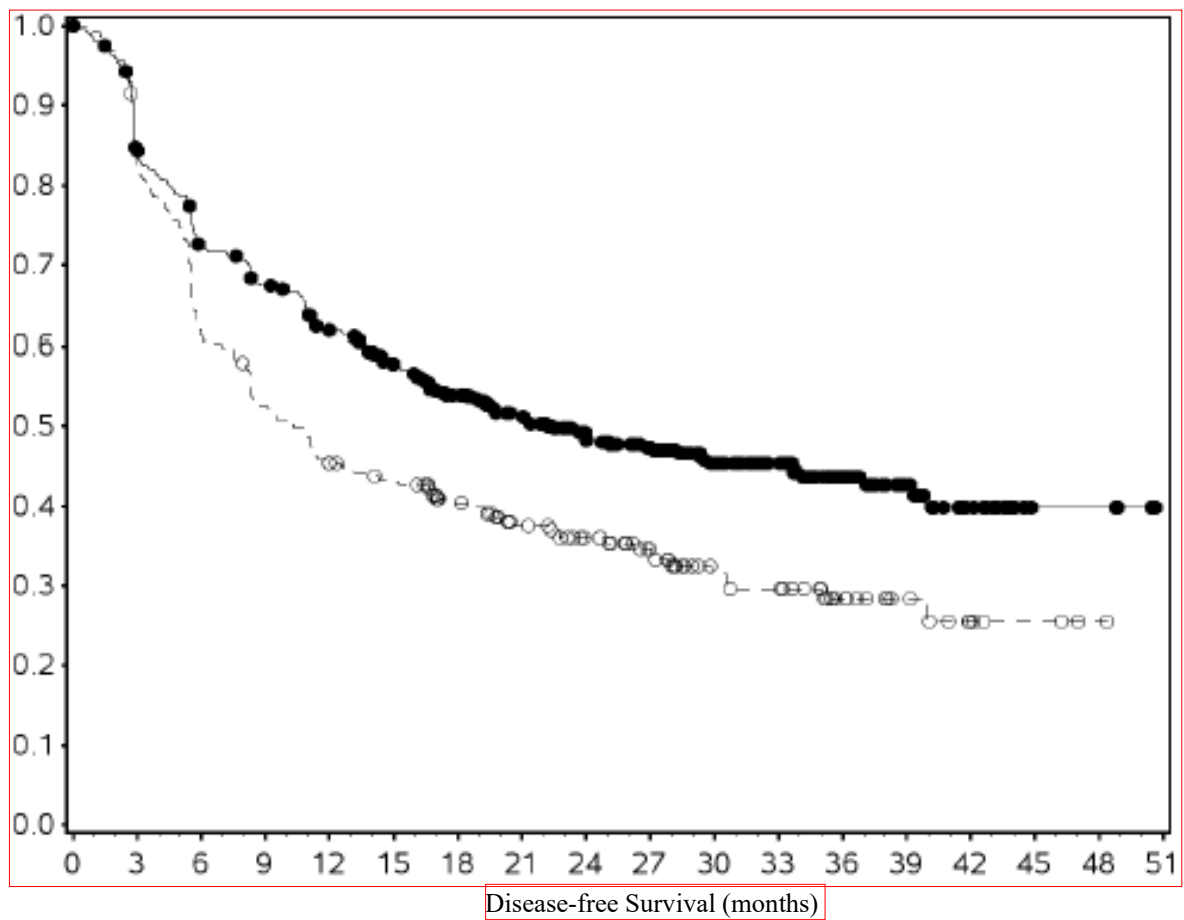
<sup>a</sup> Based on all randomised patients.

<sup>b</sup> Based on a stratified cox proportional hazards model.

<sup>c</sup> Descriptive analysis based on data cut-off: 18-Feb-2021.

**Figure 24: Kaplan-Meier curves of DFS (CA209577)**

Probability of Disease-Free Survival



Number of subjects at risk

Nivolumab																	
532	433	371	342	307	272	228	194	160	137	106	84	57	34	19	4	4	0
Placebo																	
262	211	158	134	114	107	88	73	62	50	33	30	18	11	5	3	1	0

● — Nivolumab (events: 268/532), median and 95% CI: 22.41 (16.95, 33.64)  
 ---○--- Placebo (events: 171/262), median and 95% CI: 10.35 (8.31, 13.93)

Based on data cut-off: 18-Feb-2021, minimum follow-up of 14 months

DFS benefit was observed regardless of histology and PD-L1 expression.

### *Gastric, gastro-oesophageal junction or oesophageal adenocarcinoma*

The safety and efficacy of nivolumab 240 mg every 2 weeks or 360 mg every 3 weeks in combination with chemotherapy (dose and schedule of nivolumab selected depending on the chemotherapy regimen used, see below) was evaluated in a phase 3, randomised, open-label study (CA209649). The study included adult patients (18 years or older) with previously untreated advanced or metastatic gastric, gastro-oesophageal junction (GEJ) or oesophageal adenocarcinoma, no prior systemic treatment (including HER2 inhibitors), and ECOG performance status score 0 or 1. Patients were enrolled regardless of their tumour cell PD-L1 status, and tumour cell PD-L1 expression was determined using the PD-L1 IHC 28-8 pharmDx assay. A retrospective re-scoring of a patient's tumour PD-L1 status using CPS was conducted using the PD-L1-stained tumour specimens used for randomisation. Patients with known HER2-positive tumours, who had baseline ECOG performance score  $\geq 2$ , untreated central nervous system metastases, or who had active, known, or suspected autoimmune disease, or medical conditions requiring systemic immunosuppression were excluded from the study. A total of 643 patients with HER2-undetermined status (40.3% of the study population) were included in the study. Randomisation was stratified by tumour cell PD-L1 status ( $\geq 1\%$  vs.  $< 1\%$  or indeterminate), region (Asia vs. US vs. rest of world), ECOG performance status (0 vs. 1), and chemotherapy regimen. Chemotherapy consisted of FOLFOX (fluorouracil, leucovorin and oxaliplatin) or CapeOX (capecitabine and oxaliplatin).

A total of 1581 patients were randomised to receive either nivolumab in combination with chemotherapy or chemotherapy. Of these, 955 patients had PD-L1 CPS  $\geq 5$ ; 473 in the nivolumab plus chemotherapy arm and 482 in the chemotherapy arm. Patients in the nivolumab plus chemotherapy arm received either nivolumab 240 mg by intravenous infusion over 30 minutes in combination with FOLFOX (oxaliplatin 85 mg/m<sup>2</sup>, leucovorin 400 mg/m<sup>2</sup> and fluorouracil 400 mg/m<sup>2</sup> intravenously on day 1 and fluorouracil 1200 mg/m<sup>2</sup> intravenously by continuous infusion over 24 hours daily or per local standard on days 1 and 2) every 2 weeks, or nivolumab 360 mg by intravenous infusion over 30 minutes in combination with CapeOX (oxaliplatin 130 mg/m<sup>2</sup> intravenously on day 1 and capecitabine 1000 mg/m<sup>2</sup> orally twice daily on days 1-14) every 3 weeks. Treatment continued until disease progression, unacceptable toxicity, or for up to 24 months for nivolumab only. In patients who received nivolumab plus chemotherapy and in whom chemotherapy was discontinued, nivolumab monotherapy was allowed to be given at 240 mg every 2 weeks, 360 mg every 3 weeks or 480 mg every 4 weeks up to 24 months after treatment initiation. Tumour assessments were performed every 6 weeks up to and including week 48, then every 12 weeks thereafter.

Baseline characteristics were generally balanced across treatment groups. In patients with PD-L1 CPS  $\geq 5$ , the median age was 62 years (range: 18-90), 11% were  $\geq 75$  years of age, 71% were male, 25% were Asian and 69% were white. Baseline ECOG performance status was 0 (42%) or 1 (58%). Tumour locations were distributed as gastric (70%), GEJ (18%) and oesophagus (12%).

Primary efficacy outcome measures were PFS (by BICR) and OS assessed in patients with PD-L1 CPS  $\geq 5$  based on the PD-L1 IHC 28-8 pharmDX. Secondary endpoints per the pre-specified hierarchical testing were OS in patients with PD-L1 CPS  $\geq 1$  and in all randomised patients; further endpoints included ORR (BICR) in PD-L1 CPS  $\geq 5$  and all randomised patients. At the primary pre-specified analysis, with a minimum follow-up of 12.1 months, the study demonstrated a statistically significant improvement in OS and PFS in patients with PD-L1 CPS  $\geq 5$ . Median OS was 14.4 months (95% CI: 13.1, 16.2) for nivolumab in combination with chemotherapy vs. 11.1 months (95% CI: 10.0,

12.1) for chemotherapy (HR = 0.71; 98.4% CI: 0.59, 0.86; p-value <0.0001). Median PFS was 7.69 months (95% CI: 7.03, 9.17) for nivolumab in combination with chemotherapy vs. 6.05 months (95% CI: 5.55, 6.90) for chemotherapy (HR = 0.68; 98% CI: 0.56, 0.81; p-value <0.0001). The ORR was 60% (95% CI: 55, 65) for nivolumab in combination with chemotherapy vs. 45% (95% CI: 40, 50) for chemotherapy.

At an updated descriptive analysis with a minimum follow-up of 19.4 months, OS improvements were consistent with the primary analysis. Efficacy results are shown in Table 39, and Figures 25, and 26.

**Table 39: Efficacy results in patients with PD-L1 CPS ≥ 5 (CA209649)**

	nivolumab + chemotherapy (n = 473)	chemotherapy (n = 482)
Minimum follow-up 19.4 months <sup>a</sup>		
<b>Overall survival</b>		
Events	344 (73%)	397 (82%)
Hazard ratio (95% CI) <sup>b</sup>	0.69 (0.60, 0.81)	
Median (95% CI) (months) <sup>c</sup>	14.4 (13.1, 16.3)	11.1 (10.0, 12.1)
Rate (95% CI) at 12 months	57.3 (52.6, 61.6)	46.4 (41.8, 50.8)
<b>Progression-free survival<sup>d</sup></b>		
Events	342 (72.3%)	366 (75.9%)
Hazard ratio (95% CI) <sup>b</sup>	0.68 (0.59, 0.79)	
Median (95% CI) (months) <sup>c</sup>	8.31 (7.03, 9.26)	6.05 (5.55, 6.90)
Rate (95% CI) at 12 months	36.3 (31.7, 41.0)	21.9 (17.8, 26.1)
<b>Objective response rate, n<sup>d,e</sup></b>		
(95% CI)	227/378 (60%) (54.9, 65.0)	176/390 (45%) (40.1, 50.2)
Complete response	12.2%	6.7%
Partial response	47.9%	38.5%
<b>Duration of response<sup>d,e</sup></b>		
Median (95% CI) (months) <sup>c</sup>	9.69 (8.25, 12.22)	6.97 (5.62, 7.85)

<sup>a</sup> Descriptive analysis based on data cut-off: 04-Jan-2021.

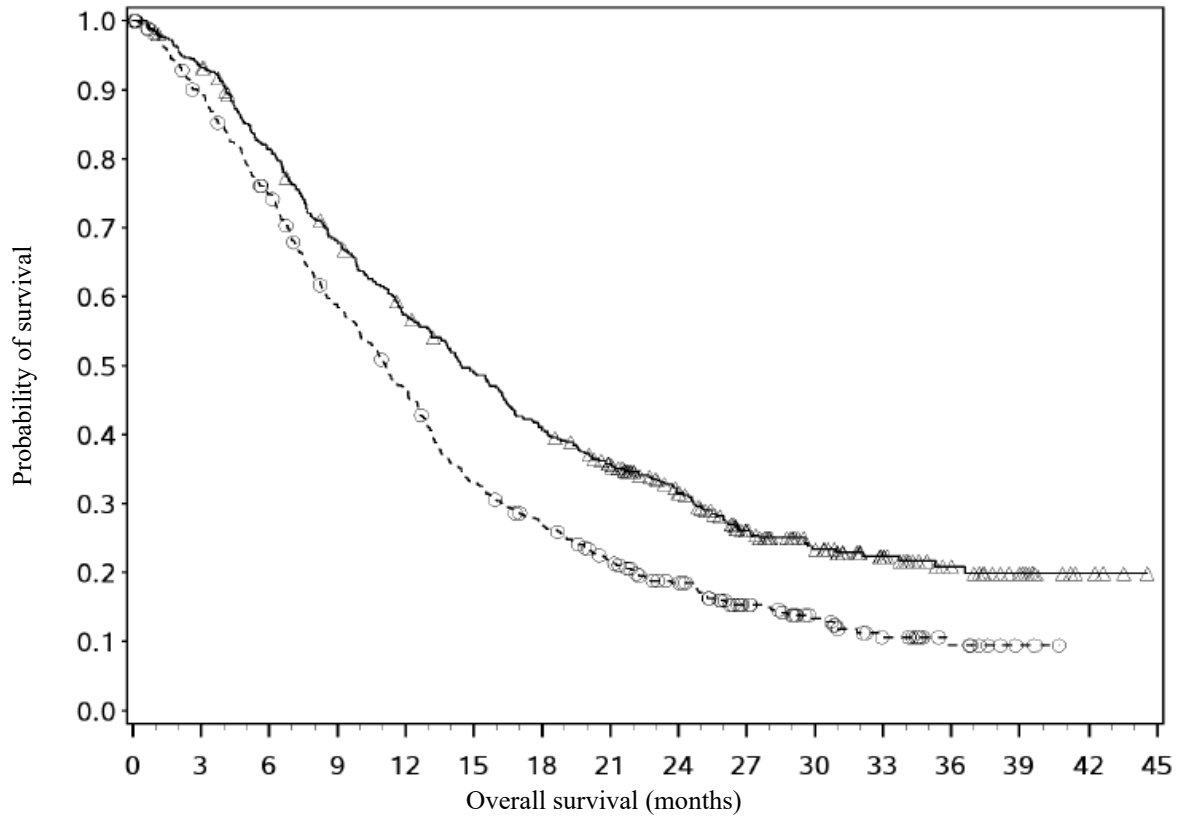
<sup>b</sup> Based on stratified long Cox proportional hazard model.

<sup>c</sup> Kaplan-Meier estimate.

<sup>d</sup> Confirmed by BICR.

<sup>e</sup> Based on patients with measurable disease at baseline.

**Figure 25: Kaplan-Meier curves of OS in patients with PD-L1 CPS  $\geq 5$  (CA209649)**



Number of subjects at risk

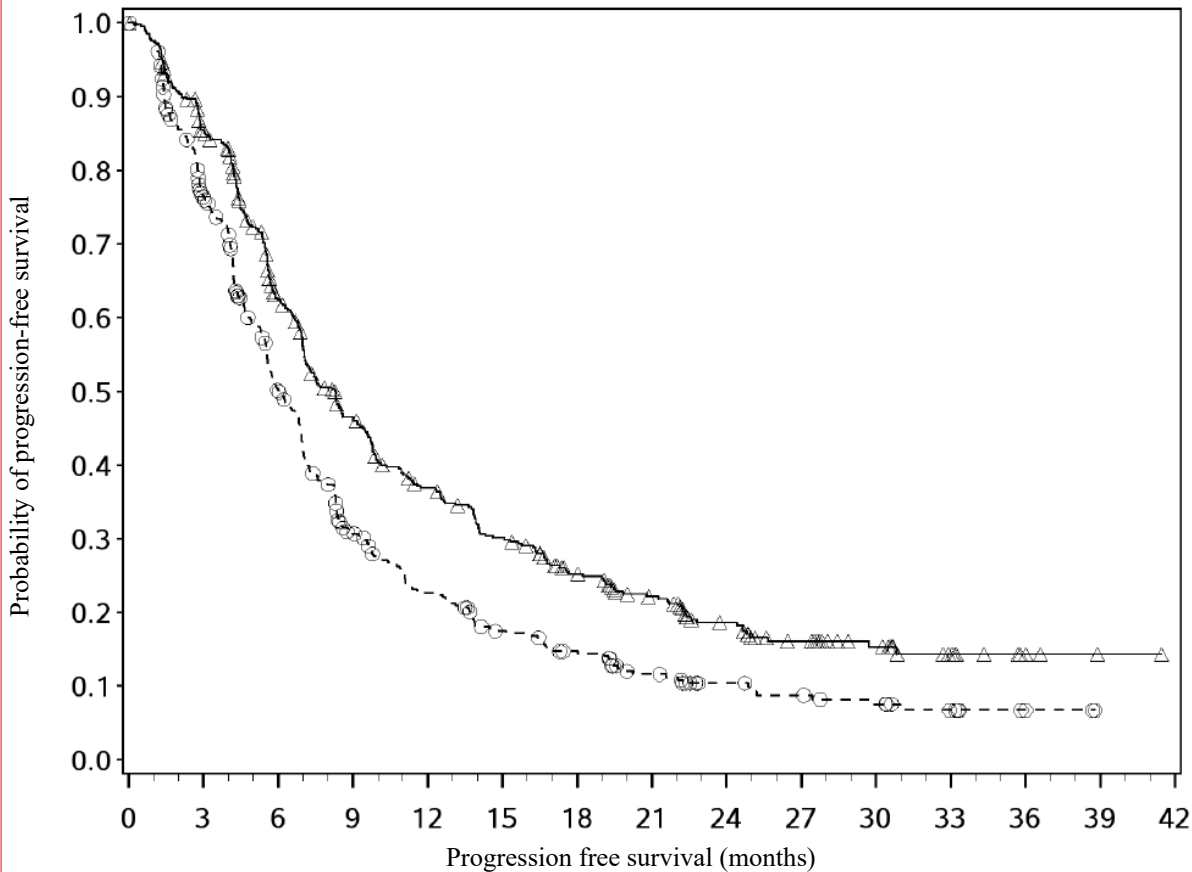
Nivolumab + chemotherapy															
473	439	378	314	263	223	187	155	118	78	56	37	23	13	4	0
Chemotherapy															
482	421	350	272	213	152	122	92	68	44	28	16	8	2	0	0

—△— Nivolumab + chemotherapy (events: 344/473), median and 95% CI: 14.42 (13.14, 16.26)  
 ---○--- Chemotherapy (events: 397/482), median and 95% CI: 11.10 (10.02, 12.09)

Minimum follow-up of 19.4 months



**Figure 26: Kaplan-Meier curves of PFS in patients with PD-L1 CPS  $\geq 5$  (CA209649)**



**Number of subjects at risk**

**Nivolumab + chemotherapy**

473	386	259	186	143	115	88	67	47	31	20	11	4	1	0
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**Chemotherapy**

482	328	202	114	81	58	46	30	20	16	12	7	3	0	0
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—△— Nivolumab + chemotherapy (events: 342/473), median and 95% CI: 8.31 (7.03, 9.26)

- -○- - Chemotherapy (events: 397/482), median and 95% CI: 6.05 (5.55, 6.90)

Minimum follow-up of 19.4 months

**Paediatric population**

Study CA209908 was an open-label, sequential-arm, phase 1b/2 clinical study of nivolumab monotherapy and nivolumab in combination with ipilimumab in paediatric and young adult patients with high-grade primary CNS malignancies, including diffuse intrinsic pontine glioma (DIPG), high-grade glioma, medulloblastoma, ependymoma and other recurrent subtypes of high-grade CNS malignancy (e.g., pineoblastoma, atypical teratoid/rhabdoid tumour, and embryonal CNS tumours). Of the 151 paediatric patients (from  $\geq 6$  months to  $< 18$  years old) enrolled in the study, 77 were treated with nivolumab monotherapy (3 mg/kg every 2 weeks) and 74 were treated with nivolumab in combination with ipilimumab (3 mg/kg nivolumab followed by 1 mg/kg ipilimumab, every 3 weeks for 4 doses, followed by nivolumab monotherapy 3 mg/kg every 2 weeks). The primary efficacy outcome measures were OS in the DIPG cohort and investigator-assessed PFS, based on RANO criteria, for all other tumour types. The median OS in the DIPG cohort was 10.97 months (80% CI: 9.92, 12.16) in patients treated with nivolumab monotherapy and 10.50 months (80% CI: 9.10, 12.32) in patients treated with nivolumab in combination with ipilimumab. For all other studied CNS paediatric tumour types, the median PFS ranged from 1.23 to 2.35 months in patients treated with nivolumab monotherapy and from 1.45 to 3.09 months in patients treated with nivolumab in combination with ipilimumab. There were no objective responses observed in the study with the exception of one ependymoma patient treated with nivolumab monotherapy who had a partial

response. Results for OS, PFS, and ORR observed in study CA209908 do not suggest clinically meaningful benefit over what may be expected in these patient populations.

The European Medicines Agency has deferred the obligation to submit the results of studies with nivolumab in all subsets of the paediatric population in the treatment of malignant solid tumours and malignant neoplasms of lymphoid tissue (see section 4.2 for information on paediatric use).

#### Safety and efficacy in elderly patients

No overall differences in safety or efficacy were reported between elderly ( $\geq 65$  years) and younger patients ( $< 65$  years). Data from SCCHN, adjuvant melanoma, and adjuvant OC or GEJC patients 75 years of age or older are too limited to draw conclusions on this population. Data from cHL patients 65 years of age or older are too limited to draw conclusions on this population. Data from MPM patients showed a higher rate of serious adverse reactions and discontinuation rate due to adverse reactions in patients 75 years of age or older (68% and 35%, respectively) relative to all patients who received nivolumab in combination with ipilimumab (54% and 28%, respectively).

## **5.2 Pharmacokinetic properties**

#### Nivolumab monotherapy

The pharmacokinetics (PK) of nivolumab is linear in the dose range of 0.1 to 10 mg/kg. The geometric mean clearance (CL), terminal half-life, and average exposure at steady state at 3 mg/kg every 2 weeks of nivolumab were 7.9 mL/h, 25.0 days, and 86.6  $\mu\text{g/mL}$ , respectively, based on a population PK analysis.

Nivolumab CL in cHL patients was approximately 32% lower relative to NSCLC. Nivolumab baseline CL in adjuvant melanoma patients was approximately 40% lower and steady state CL approximately 20% lower relative to advanced melanoma. With available safety data, these decreases in CL were not clinically meaningful.

The metabolic pathway of nivolumab has not been characterised. Nivolumab is expected to be degraded into small peptides and amino acids via catabolic pathways in the same manner as endogenous IgG.

#### Nivolumab in combination with ipilimumab

When nivolumab 1 mg/kg was administered in combination with ipilimumab 3 mg/kg, the CL of nivolumab was increased by 29% and the CL of ipilimumab was increased by 9%, which was not considered clinically relevant. When nivolumab 3 mg/kg was administered in combination with ipilimumab 1 mg/kg, the CL of nivolumab was increased by 1% and the CL of ipilimumab was decreased by 1.5%, which were not considered clinically relevant.

When administered in combination with ipilimumab, the CL of nivolumab increased by 20% in the presence of anti-nivolumab antibodies and the CL of ipilimumab increased by 5.7% in the presence of anti-ipilimumab antibodies. These changes were not considered clinically relevant.

#### Nivolumab in combination with ipilimumab and chemotherapy

When nivolumab 360 mg every 3 weeks was administered in combination with ipilimumab 1 mg/kg every 6 weeks and with 2 cycles of chemotherapy, the CL of nivolumab decreased approximately 10% and the CL of ipilimumab increased approximately 22%, which were not considered clinically relevant.

#### Special populations

A population PK analysis suggested no difference in CL of nivolumab based on age, gender, race, solid tumour type, tumour size, and hepatic impairment. Although ECOG status, baseline glomerular filtration rate (GFR), albumin, body weight, and mild hepatic impairment had an effect on nivolumab CL, the effect was not clinically meaningful.

### Renal impairment

The effect of renal impairment on the CL of nivolumab was evaluated in patients with mild (GFR < 90 and  $\geq 60$  mL/min/1.73 m<sup>2</sup>; n = 379), moderate (GFR < 60 and  $\geq 30$  mL/min/1.73 m<sup>2</sup>; n = 179), or severe (GFR < 30 and  $\geq 15$  mL/min/1.73 m<sup>2</sup>; n = 2) renal impairment compared to patients with normal renal function (GFR  $\geq 90$  mL/min/1.73 m<sup>2</sup>; n = 342) in population PK analyses. No clinically important differences in the CL of nivolumab were found between patients with mild or moderate renal impairment and patients with normal renal function. Data from patients with severe renal impairment are too limited to draw conclusions on this population (see section 4.2).

### Hepatic impairment

The effect of hepatic impairment on the CL of nivolumab was evaluated in patients with mild hepatic impairment (total bilirubin  $1.0 \times$  to  $1.5 \times$  ULN or AST > ULN as defined using the National Cancer Institute criteria of hepatic dysfunction; n = 92) compared to patients with normal hepatic function (total bilirubin and AST  $\leq$  ULN; n = 804) in the population PK analyses. No clinically important differences in the CL of nivolumab were found between patients with mild hepatic impairment and normal hepatic function. Nivolumab has not been studied in patients with moderate (total bilirubin >  $1.5 \times$  to  $3 \times$  ULN and any AST) or severe hepatic impairment (total bilirubin >  $3 \times$  ULN and any AST) (see section 4.2).

## **5.3 Preclinical safety data**

Blockade of PD-L1 signalling has been shown in murine models of pregnancy to disrupt tolerance to the foetus and to increase foetal loss. The effects of nivolumab on prenatal and postnatal development were evaluated in monkeys that received nivolumab twice weekly from the onset of organogenesis in the first trimester through delivery, at exposure levels either 8 or 35 times higher than those observed at the clinical dose of 3 mg/kg of nivolumab (based on AUC). There was a dose-dependent increase in foetal losses and increased neonatal mortality beginning in the third trimester.

The remaining offspring of nivolumab-treated females survived to scheduled termination, with no treatment-related clinical signs, alterations to normal development, organ-weight effects, or gross and microscopic pathology changes. Results for growth indices, as well as teratogenic, neurobehavioral, immunological, and clinical pathology parameters throughout the 6-month postnatal period were comparable to the control group. However, based on its mechanism of action, foetal exposure to nivolumab may increase the risk of developing immune-related disorders or altering the normal immune response and immune-related disorders have been reported in PD-1 knockout mice.

Fertility studies have not been performed with nivolumab.

## **6. PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

Sodium citrate dihydrate

Sodium chloride

Mannitol (E421)

Pentetic acid (diethylenetriaminepentaacetic acid)

Polysorbate 80 (E433)

Sodium hydroxide (for pH adjustment)

Hydrochloric acid (for pH adjustment)

Water for injections

## 6.2 Incompatibilities

In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products. OPDIVO should not be infused concomitantly in the same intravenous line with other medicinal products.

## 6.3 Shelf life

Unopened vial

3 years

After preparation of infusion

Chemical and physical in-use stability from the time of preparation has been demonstrated as follows (times are inclusive of the administration period):

Infusion preparation	Chemical and physical in-use stability	
	Storage at 2°C to 8°C protected from light	Storage at room temperature (≤ 25°C) and room light
Undiluted or diluted with sodium chloride 9 mg/mL (0.9%) solution for injection	30 days	24 hours (of total 30 days storage)
Diluted with 50 mg/mL (5%) glucose solution for injection	7 days	8 hours (of total 7 days storage)

From a microbiological point of view the prepared solution for infusion, regardless of the diluent, should be used immediately. If not used immediately, in-use storage times and conditions prior to use are the responsibility of the user and would normally not be longer than 7 days at 2°C to 8°C or 8 hours (of the total 7 days of storage) at room temperature (≤ 25°C). Aseptic handling should be ensured during the preparation of infusion (see section 6.6).

## 6.4 Special precautions for storage

Store in a refrigerator (2°C-8°C).

Do not freeze.

Store in the original package in order to protect from light.

The unopened vial can be stored at controlled room temperature up to 25°C with room light for up to 48 hours.

For storage conditions after preparation of the infusion, see section 6.3.

## 6.5 Nature and contents of container

4 mL of concentrate in a 10 mL vial (Type I glass) with a stopper (coated butyl rubber) and a dark blue flip-off seal (aluminium). Pack size of 1 vial.

10 mL of concentrate in a 10 mL vial (Type I glass) with a stopper (coated butyl rubber) and a grey flip-off seal (aluminium). Pack size of 1 vial.

12 mL of concentrate in a 25 mL vial (Type I glass) with a stopper (coated butyl rubber) and a blue flip-off seal (aluminium). Pack size of 1 vial.

24 mL of concentrate in a 25 mL vial (Type I glass) with a stopper (coated butyl rubber) and a red matte flip-off seal (aluminium). Pack size of 1 vial.

Not all pack sizes may be marketed.

## 6.6 Special precautions for disposal and other handling

Preparation should be performed by trained personnel in accordance with good practices rules, especially with respect to asepsis.

### Preparation and administration

#### Calculating the dose

More than one vial of OPDIVO concentrate may be needed to give the total dose for the patient.

#### *Nivolumab monotherapy*

The prescribed dose for the patient is 240 mg or 480 mg given regardless of body weight depending on indication (see section 4.2).

#### *Nivolumab in combination with ipilimumab*

The prescribed dose for the patient is given in mg/kg. Based on this prescribed dose, calculate the total dose to be given.

- The total nivolumab dose in mg = the patient's weight in kg × the prescribed dose in mg/kg.
- The volume of OPDIVO concentrate to prepare the dose (mL) = the total dose in mg, divided by 10 (the OPDIVO concentrate strength is 10 mg/mL).

#### *Nivolumab in combination with ipilimumab in MPM*

The prescribed dose for the patient is 360 mg given regardless of body weight.

#### *Nivolumab in combination with ipilimumab in OSCC*

The prescribed dose for the patient can be based on body weight (3 mg/kg) or 360 mg given regardless of body weight.

#### *Nivolumab in combination with chemotherapy in OSCC*

The prescribed dose for the patient is 240 mg or 480 mg given regardless of body weight.

#### *Nivolumab in combination with chemotherapy in gastric, GEJ or oesophageal adenocarcinoma*

The prescribed dose for the patient is 360 mg or 240 mg given regardless of body weight.

#### *Nivolumab in combination with ipilimumab and chemotherapy*

The prescribed dose for the patient is 360 mg given regardless of body weight.

#### *Nivolumab in combination with cabozantinib*

The prescribed dose for the patient is nivolumab 240 mg or 480 mg given regardless of body weight.

#### Preparing the infusion

Take care to ensure aseptic handling when you prepare the infusion.

OPDIVO can be used for intravenous administration either:

- without dilution, after transfer to an infusion container using an appropriate sterile syringe; or
- after diluting according to the following instructions:
  - the final infusion concentration should range between 1 and 10 mg/mL.
  - the total volume of infusion must not exceed 160 mL. For patients weighing less than 40 kg, the total volume of infusion must not exceed 4 mL per kilogram of patient weight.

OPDIVO concentrate may be diluted with either:

- sodium chloride 9 mg/mL (0.9%) solution for injection; or
- 50 mg/mL (5%) glucose solution for injection.

#### STEP 1

- Inspect the OPDIVO concentrate for particulate matter or discoloration. Do not shake the vial. OPDIVO concentrate is a clear to opalescent, colourless to pale yellow liquid. Discard the vial if the solution is cloudy, is discoloured, or contains particulate matter other than a few translucent-to-white particles.
- Withdraw the required volume of OPDIVO concentrate using an appropriate sterile syringe.

#### STEP 2

- Transfer the concentrate into a sterile, evacuated glass bottle or intravenous container (PVC or polyolefin).
- If applicable, dilute with the required volume of sodium chloride 9 mg/mL (0.9%) solution for injection or 50 mg/mL (5%) glucose solution for injection. For ease of preparation, the concentrate can also be transferred directly into a pre-filled bag containing the appropriate volume of sodium chloride 9 mg/mL (0.9%) solution for injection or 50 mg/mL (5%) glucose solution for injection.
- Gently mix the infusion by manual rotation. Do not shake.

#### Administration

OPDIVO infusion must not be administered as an intravenous push or bolus injection.

Administer the OPDIVO infusion intravenously over a period of 30 or 60 minutes depending on the dose.

OPDIVO infusion should not be infused at the same time in the same intravenous line with other agents. Use a separate infusion line for the infusion.

Use an infusion set and an in-line, sterile, non-pyrogenic, low protein binding filter (pore size of 0.2 µm to 1.2 µm).

OPDIVO infusion is compatible with PVC and polyolefin containers, glass bottles, PVC infusion sets and in-line filters with polyethersulfone membranes with pore sizes of 0.2 µm to 1.2 µm.

After administration of the nivolumab dose, flush the line with sodium chloride 9 mg/mL (0.9%) solution for injection or 50 mg/mL (5%) glucose solution for injection.

#### Disposal

Do not store any unused portion of the infusion solution for reuse. Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

## 7. MARKETING AUTHORISATION HOLDER

Bristol-Myers Squibb Pharma EEIG  
Plaza 254  
Blanchardstown Corporate Park 2  
Dublin 15, D15 T867  
Ireland

## 8. MARKETING AUTHORISATION NUMBER(S)

EU/1/15/1014/001  
EU/1/15/1014/002  
EU/1/15/1014/003  
EU/1/15/1014/004

**9. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION**

Date of first authorisation: 19 June 2015

Date of latest renewal: 23 April 2020

**10. DATE OF REVISION OF THE TEXT**

27 October 2022

Detailed information on this medicinal product is available on the website of the European Medicines Agency <http://www.ema.europa.eu>