

## FULL PRESCRIBING INFORMATION

### 1 NAME OF THE MEDICINAL PRODUCT

IMBRUVICA 140mg Capsules  
IMBRUVICA 140mg TABLETS  
IMBRUVICA 280mg TABLETS  
IMBRUVICA 420mg TABLETS  
IMBRUVICA 560mg TABLETS

### 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each capsule contains 140 mg of ibrutinib

#### *Tablets:*

IMBRUVICA 140mg TABLETS	IMBRUVICA 280mg TABLETS	IMBRUVICA 420mg TABLETS	IMBRUVICA 560mg TABLETS
Ibrutinib 140mg	Ibrutinib 280 mg	Ibrutinib 420mg	Ibrutinib 560mg

### 3 PHARMACEUTICAL FORM

Capsules; size 0, white opaque hard gelatin capsule with black printing "ibr 140 mg", containing off-white to white powder.

#### Tablets:

140 mg tablets: Yellow green to green round tablets debossed with "ibr" on one side and "140" on the other side.

280 mg tablets: Purple oblong tablets debossed with "ibr" on one side and "280" on the other side.

420 mg tablets: Yellow green to green oblong tablets debossed with "ibr" on one side and "420" on the other side.

560 mg tablets: Yellow to orange oblong tablets debossed with "ibr" on one side and "560" on the other side.

## 4 INDICATIONS AND USAGE

### 4.1 Mantle Cell Lymphoma

IMBRUVICA is indicated for the treatment of adult patients with mantle cell lymphoma (MCL) who have received at least one prior therapy.

### 4.2 *Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma*

IMBRUVICA is indicated for the first line treatment of adult patients, 65 years of age or older, with chronic lymphocytic leukemia (CLL)/small lymphocytic lymphoma (SLL).

IMBRUVICA is indicated for the treatment of adult patients with chronic lymphocytic leukemia (CLL)/small lymphocytic lymphoma (SLL) who have received at list one prior treatment).

### 4.3 Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma with 17p deletion

IMBRUVICA is indicated for the treatment of adult patients with chronic lymphocytic leukemia (CLL)/small lymphocytic lymphoma (SLL) with 17p deletion.

### 4.4 Waldenström's Macroglobulinemia

IMBRUVICA is indicated for the treatment of adult patients with Waldenström's macroglobulinemia (WM).

### 4.5 Marginal Zone Lymphoma

IMBRUVICA is indicated for the treatment of adult patients with marginal zone lymphoma (MZL) who require systemic therapy and have received at least one prior anti-CD20-based therapy.

### 4.6 Chronic Graft versus Host Disease

IMBRUVICA is indicated for the treatment of adult patients with chronic graft-versus-host disease (cGVHD) after failure of one or more lines of systemic therapy.

## 5 DOSAGE AND ADMINISTRATION

### 5.1 Recommended Dosage

#### Mantle Cell Lymphoma and Marginal Zone Lymphoma

The recommended dosage of IMBRUVICA for MCL and MZL is 560 mg orally once daily until disease progression or unacceptable toxicity.

#### Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma and Waldenström's Macroglobulinemia

The recommended dosage of IMBRUVICA for CLL/SLL and WM is 420 mg orally once daily until disease progression or unacceptable toxicity.

For CLL/SLL, IMBRUVICA can be administered as a single agent or in combination with rituximab or in combination with Obinutuzumab (BR).

For patients with relapsed/refractory chronic lymphocytic leukemia/small lymphocytic lymphoma, without del(17p), who have received at least one prior therapy , the recommended dose of IMBRUVICA when used in combination with bendamustine and rituximab (administered every

28 days for up to 6 cycles) is 420 mg orally once daily until disease progression or unacceptable toxicity.

For WM, IMBRUVICA can be administered as a single agent or in combination with rituximab. When administering IMBRUVICA in combination with rituximab or obinutuzumab, consider administering IMBRUVICA prior to rituximab or obinutuzumab when given on the same day.

### Chronic Graft versus Host Disease

The recommended dosage of IMBRUVICA for cGVHD is 420 mg orally once daily until cGVHD progression, recurrence of an underlying malignancy, or unacceptable toxicity. When a patient no longer requires therapy for the treatment of cGVHD, IMBRUVICA should be discontinued considering the medical assessment of the individual patient.

### Administration

Administer IMBRUVICA at approximately the same time each day with a glass of water.

Swallow tablets or capsule whole. Do not open, break, or chew the capsules. Do not cut, crush, or chew the tablets.

If a dose of IMBRUVICA is not taken at the scheduled time, it can be taken as soon as possible on the same day with a return to the normal schedule the following day. Do not take extra doses of IMBRUVICA to make up for the missed dose.

## **5.2 Dosage Modifications for Adverse Reactions**

Interrupt IMBRUVICA therapy for any Grade 3 or greater non-hematological toxicities, Grade 3 or greater neutropenia with infection or fever, or Grade 4 hematological toxicities. Once the adverse reaction has improved to Grade 1 or baseline (recovery), IMBRUVICA may be reinitiated at the starting dose. If the adverse reaction reoccurs, reduce dose by 140 mg per day. Consider a second reduction of dose by 140 mg as needed. If these adverse reactions persist or recur following two dose reductions, discontinue IMBRUVICA.

Recommended dose modifications are described below:

<b>Toxicity Occurrence</b>	<b>Dose Modification for MCL and MZL After Recovery Starting Dose = 560 mg</b>	<b>Dose Modification for CLL/SLL, WM, and cGVHD After Recovery Starting Dose = 420 mg</b>
First	Restart at 560 mg daily	Restart at 420 mg daily
Second	Restart at 420 mg daily	Restart at 280 mg daily
Third	Restart at 280 mg daily	Restart at 140 mg daily
Fourth	Discontinue IMBRUVICA	Discontinue IMBRUVICA

### 5.3 Dosage Modifications for Use with CYP3A Inhibitors

Avoid co-administration with strong or moderate CYP3A inhibitors and consider alternative agents with less CYP3A inhibition.

Concomitant use of strong CYP3A inhibitors which would be taken chronically (e.g., ritonavir, indinavir, nelfinavir, saquinavir, boceprevir, telaprevir, nefazodone) is not recommended. For short-term use (treatment for 7 days or less) of strong CYP3A inhibitors (e.g., antifungals and antibiotics) consider interrupting IMBRUVICA therapy until the CYP3A inhibitor is no longer needed [*see Drug Interactions (10.1)*].

Reduce IMBRUVICA dose to 140 mg if a moderate CYP3A inhibitor must be used (e.g., fluconazole, darunavir, erythromycin, diltiazem, atazanavir, aprepitant, amprenavir, fosamprevir, crizotinib, imatinib, verapamil and ciprofloxacin) [*see Drug Interactions (10.1)*].

Patients taking concomitant strong or moderate CYP3A inhibitors should be monitored more closely for signs of IMBRUVICA toxicity.

### 5.4 Dosage Modifications for Use in Hepatic Impairment

For patients with mild hepatic impairment (Child Pugh class A), the recommended dosage is 140 mg daily.

Avoid the use of IMBRUVICA in patients with moderate or severe hepatic impairment (Child-Pugh classes B and C) [*see Use in Specific Populations (8.6) and Clinical Pharmacology (12.3)*].

## 6 DOSAGE FORMS AND STRENGTHS

[See Pharmaceutical form (3)].

## 7 CONTRAINDICATIONS

Hypersensitivity to the active substance or to any of the excipients (listed in section 16.1).

## 8 WARNINGS AND PRECAUTIONS

### 8.1 Hemorrhage

Fatal bleeding events have occurred in patients who received IMBRUVICA. Major hemorrhage ( $\geq$  Grade 3, serious, or any central nervous system events; e.g., intracranial hemorrhage [including subdural hematoma], gastrointestinal bleeding, hematuria, and post procedural hemorrhage) occurred in 4% of patients, with fatalities occurring in 0.4% of 2,838 patients who received IMBRUVICA in 27 clinical trials. Bleeding events, including bruising and petechiae, occurred in 39% of patients who received IMBRUVICA.

The mechanism for the bleeding events is not well understood.

Use of either anticoagulant or antiplatelet agents concomitantly with IMBRUVICA increases the risk of major hemorrhage. Across clinical trials, 3.1% of 2,838 patients who received IMBRUVICA without antiplatelet or anticoagulant therapy experienced major hemorrhage. The addition of antiplatelet therapy with or without anticoagulant therapy increased this percentage to 4.4%, and the addition of anticoagulant therapy with or without antiplatelet therapy increased this percentage to 6.1%. Consider the risks and benefits of anticoagulant or antiplatelet therapy when co-administered with IMBRUVICA. Monitor for signs and symptoms of bleeding.

Consider the benefit-risk of withholding IMBRUVICA for at least 3 to 7 days pre- and post surgery depending upon the type of surgery and the risk of bleeding [see *Clinical Studies (14)*].

## 8.2 Infections

Fatal and non-fatal infections (including bacterial, viral, or fungal) have occurred with IMBRUVICA therapy. Grade 3 or greater infections occurred in 21% of 1,476 patients who received IMBRUVICA in clinical trials [see *Adverse Reactions (9.1, 9.2)*]. Cases of progressive multifocal leukoencephalopathy (PML) and *Pneumocystis jirovecii* pneumonia (PJP) have occurred in patients treated with IMBRUVICA. Consider prophylaxis according to standard of care in patients who are at increased risk for opportunistic infections. Monitor and evaluate patients for fever and infections and treat appropriately.

## 8.3 Cytopenias

In 645 patients with B-cell malignancies who received IMBRUVICA as a single agent, grade 3 or 4 neutropenia occurred in 23% of patients, grade 3 or 4 thrombocytopenia in 8% and grade 3 or 4 anemia in 3%, based on laboratory measurements.

Monitor complete blood counts monthly.

## 8.4 Cardiac Arrhythmias

Fatal and serious cardiac arrhythmias have occurred with IMBRUVICA. Grade 3 or greater ventricular tachyarrhythmias occurred in 0.2% of patients and Grade 3 or greater atrial fibrillation and atrial flutter occurred in 4% of 1,476 patients who received IMBRUVICA in clinical trials. These events have occurred particularly in patients with cardiac risk factors, hypertension, acute infections, and a previous history of cardiac arrhythmias [see *Adverse Reactions (9.1)*]. Periodically monitor patients clinically for cardiac arrhythmias. Obtain an ECG for patients who develop arrhythmic symptoms (e.g., palpitations, lightheadedness, syncope, chest pain) or new onset dyspnea. Manage cardiac arrhythmias appropriately, and if it persists, consider the risks and benefits of IMBRUVICA treatment and follow dose modification guidelines [see *Dosage and Administration (5.2)*].

## 8.5 Hypertension

Hypertension occurred in 19% of 1,476 patients who received IMBRUVICA in clinical trials. Grade 3 or greater hypertension occurred in 8% of patients. Based on data from 1,124 of these patients, the median time to onset was 5.9 months (range, 0.03 to 24 months).

Monitor blood pressure in patients treated with IMBRUVICA and initiate or adjust antihypertensive medication throughout treatment with IMBRUVICA as appropriate.

## 8.6 Second Primary Malignancies

Other malignancies (10%), including non-skin carcinomas (4%), occurred among the 1,476 patients who received IMBRUVICA in clinical trials. The most frequent second primary malignancy was non-melanoma skin cancer (6%).

## 8.7 Tumor Lysis Syndrome

Tumor lysis syndrome has been infrequently reported with IMBRUVICA. Assess the baseline risk (e.g., high tumor burden) and take appropriate precautions. Monitor patients closely and treat as appropriate.

## 8.8 Embryo-Fetal Toxicity

Based on findings in animals, IMBRUVICA can cause fetal harm when administered to a pregnant woman. Administration of ibrutinib to pregnant rats and rabbits during the period of organogenesis caused embryo-fetal toxicity including malformations at exposures that were 2-20 times higher than those reported in patients with hematologic malignancies. Advise women to avoid becoming pregnant while taking IMBRUVICA and for 3 months after cessation of therapy. If this drug is used during pregnancy or if the patient becomes pregnant while taking this drug, the patient should be apprised of the potential hazard to a fetus [*see Use in Specific Populations (8.1)*].

## 9 ADVERSE REACTIONS

The following clinically significant adverse reactions are described elsewhere in the labeling:

- Hemorrhage [*see Warnings and Precautions (8.1)*]
- Infections [*see Warnings and Precautions (8.2)*]
- Cytopenias [*see Warnings and Precautions (8.3)*]
- Cardiac Arrhythmias [*see Warnings and Precautions (8.4)*]
- Hypertension [*see Warnings and Precautions (8.5)*]
- Second Primary Malignancies [*see Warnings and Precautions (8.6)*]
- Tumor Lysis Syndrome [*see Warnings and Precautions (8.7)*]

### 9.1 Clinical Trials Experience

Because clinical trials are conducted under widely variable conditions, adverse event rates observed in clinical trials of a drug cannot be directly compared with rates of clinical trials of another drug and may not reflect the rates observed in practice.

The data in the WARNINGS AND PRECAUTIONS reflect exposure to IMBRUVICA in 6 trials as a single agent at 420 mg orally once daily in 475 patients and at 560 mg orally once daily in 174 patients and in 4 trials administered in combination with other drugs at 420 mg orally once daily in 827 patients. Among these 1,476 patients with B-cell malignancies who received IMBRUVICA, 87% were exposed for 6 months or longer and 68% were exposed for greater than one year. In this pooled safety population of 1,476 patients with B-cell malignancies, the most common adverse reactions ( $\geq 30\%$ ) were thrombocytopenia, diarrhea, fatigue, musculoskeletal pain, neutropenia, rash, anemia, and bruising.

#### Mantle Cell Lymphoma

The data described below reflect exposure to IMBRUVICA in a clinical trial (Study 1104) that included 111 patients with previously treated MCL treated with 560 mg daily with a median treatment duration of 8.3 months.

The most common adverse reactions ( $\geq 20\%$ ) were thrombocytopenia, diarrhea, neutropenia, anemia,

fatigue, musculoskeletal pain, peripheral edema, upper respiratory tract infection, nausea, bruising, dyspnea, constipation, rash, abdominal pain, vomiting and decreased appetite (see [Tables 1 and 2](#)).

The most common Grade 3 or 4 non-hematological adverse reactions ( $\geq 5\%$ ) were pneumonia, abdominal pain, atrial fibrillation, diarrhea, fatigue, and skin infections.

Fatal and serious cases of renal failure have occurred with IMBRUVICA therapy. Increases in creatinine 1.5 to 3 times the upper limit of normal (ULN) occurred in 9% of patients.

Adverse reactions from the MCL trial (N=111) using single agent IMBRUVICA 560 mg daily occurring at a rate of  $\geq 10\%$  are presented in [Table 1](#).

**Table 1: Non-Hematologic Adverse Reactions in  $\geq 10\%$  of Patients with MCL (N=111)**

Body System	Adverse Reaction	All Grades (%)	Grade 3 or Higher (%)
<b>Gastrointestinal disorders</b>	Diarrhea	51	5 0
	Nausea	31	0
	Constipation	25	5
	Abdominal pain	24	0
	Vomiting	23	1 0
	Stomatitis	17	
	Dyspepsia	11	
<b>General disorders and administration site conditions</b>	Fatigue	41	5
	Peripheral edema	35	3
	Pyrexia	18	1
	Asthenia	14	3
<b>Musculoskeletal and connective tissue disorders</b>	Musculoskeletal pain	37	1 0
	Muscle spasms	14	0
	Arthralgia	11	
Body System	Adverse Reaction	All Grades (%)	Grade 3 or Higher (%)
<b>Infections and infestations</b>	Upper respiratory tract infection	34	0 3
	Urinary tract infection	14	8 <sup>†</sup>
	Pneumonia	14	5 1
	Skin infections	14	
	Sinusitis	13	
<b>Skin and subcutaneous tissue disorders</b>	Bruising	30	0 3
	Rash	25	0
	Petechiae	11	
<b>Respiratory, thoracic and mediastinal disorders</b>	Dyspnea	27	5 <sup>†</sup>
	Cough	19	0
	Epistaxis	11	0
<b>Metabolism and nutrition disorders</b>	Decreased appetite	21	2
	Dehydration	12	4
<b>Nervous system disorders</b>	Dizziness	14	0
	Headache	13	0

† Includes one event with a fatal outcome.

**Table 2: Treatment-Emergent\* Hematologic Laboratory Abnormalities in Patients with MCL (N=111)**

	Percent of Patients (N=111)	
	All Grades (%)	Grade 3 or 4 (%)
Platelets decreased	57	17
Neutrophils decreased	47	29
Hemoglobin decreased	41	9

\* Based on laboratory measurements and adverse reactions  
Treatment-emergent Grade 4 thrombocytopenia (6%) and neutropenia (13%) occurred in patients.

Ten patients (9%) discontinued treatment due to adverse reactions in the trial (N=111). The most frequent adverse reaction leading to treatment discontinuation was subdural hematoma (1.8%). Adverse reactions leading to dose reduction occurred in 14% of patients.

Patients with MCL who develop lymphocytosis greater than 400,000/mcL have developed intracranial hemorrhage, lethargy, gait instability, and headache. However, some of these cases were in the setting of disease progression.

Forty percent of patients had elevated uric acid levels on study including 13% with values above 10 mg/dL. Adverse reaction of hyperuricemia was reported for 15% of patients.

#### Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma

The data described below reflect exposure to IMBRUVICA in one single-arm, open-label clinical trial (Study 1102) and five randomized controlled clinical trials in patients with CLL/SLL (n=2,016 total, including n=1,133 patients exposed to IMBRUVICA). In general, patients with creatinine clearance (CLcr)  $\leq$  30 mL/min, AST or ALT  $\geq$  2.5 x ULN, or total bilirubin  $\geq$  1.5x ULN (unless of non-hepatic origin) were excluded from these trials. Study 1102 included 51 patients with previously treated CLL/SLL. RESONATE included 386 randomized patients with previously treated CLL or SLL who received single agent IMBRUVICA or ofatumumab. RESONATE-2 included 267 randomized patients with treatment naïve CLL or SLL who were 65 years or older and received single agent IMBRUVICA or chlorambucil. HELIOS included 574 randomized patients with previously treated CLL or SLL who received IMBRUVICA in combination with BR or placebo in combination with BR. iLLUMINATE included 228 randomized patients with treatment naïve CLL/SLL who were 65 years or older or with coexisting medical conditions and received IMBRUVICA in combination with obinutuzumab or chlorambucil in combination with obinutuzumab.

The most common adverse reactions in patients with CLL/SLL receiving IMBRUVICA ( $\geq$  30%) were thrombocytopenia, diarrhea, fatigue, musculoskeletal pain, neutropenia, rash, anemia, bruising, and nausea.

Four to 10 percent of patients with CLL/SLL receiving IMBRUVICA discontinued treatment due to adverse reactions. These included pneumonia, hemorrhage, atrial fibrillation, neutropenia, arthralgia, rash, and thrombocytopenia. Adverse reactions leading to dose reduction occurred in



approximately 9% of patients.

*Study 1102*

Adverse reactions and laboratory abnormalities from Study 1102 (N=51) using single agent IMBRUVICA 420 mg daily in patients with previously treated CLL/SLL occurring at a rate of  $\geq$  10% with a median duration of treatment of 15.6 months are presented in [Tables 3](#) and [4](#).

**Table 3: Non-Hematologic Adverse Reactions in  $\geq$  10% of Patients with CLL/SLL (N=51) in Study 1102**

<b>Body System</b>	<b>Adverse Reaction</b>	<b>All Grades (%)</b>	<b>Grade 3 or Higher (%)</b>
<b>Gastrointestinal disorders</b>	Diarrhea	59	4
	Constipation	22	2
	Nausea	20	2
	Stomatitis	20	0
	Vomiting	18	2
	Abdominal pain	14	0
	Dyspepsia	12	0
<b>Skin and subcutaneous tissue disorders</b>	Bruising	51	2
	Rash	25	0
	Petechiae	16	0
<b>Infections and infestations</b>	Upper respiratory tract infection	47	2
	Sinusitis	22	6
	Skin infection	16	6
	Pneumonia	12	10
	Urinary tract infection	12	2
<b>General disorders and administration site conditions</b>	Fatigue	33	6
	Pyrexia	24	2
	Peripheral edema	22	0
	Asthenia	14	6
	Chills	12	0
<b>Musculoskeletal and connective tissue disorders</b>	Musculoskeletal pain	25	6
	Arthralgia	24	0
	Muscle spasms	18	2
<b>Respiratory, thoracic and mediastinal disorders</b>	Cough	22	0
	Oropharyngeal pain	14	0
	Dyspnea	12	0
<b>Nervous system disorders</b>	Dizziness	20	0
	Headache	18	2
<b>Vascular disorders</b>	Hypertension	16	8

<b>Metabolism and nutrition disorders</b>	Decreased appetite	16	2
<b>Neoplasms benign, malignant, unspecified</b>	Second malignancies	10	2 <sup>†</sup>

<sup>†</sup> One patient death due to histiocytic sarcoma.

**Table 4: Treatment-Emergent\* Hematologic Laboratory Abnormalities in Patients with CLL/SLL (N=51) in Study 1102**

	Percent of Patients (N=51)	
	All Grades (%)	Grade 3 or 4 (%)
Platelets decreased	69	12
Neutrophils decreased	53	26
Hemoglobin decreased	43	0

\* Based on laboratory measurements per IWCLL criteria and adverse reactions. Treatment-emergent Grade 4 thrombocytopenia (8%) and neutropenia (12%) occurred in patients.

### RESONATE

Adverse reactions and laboratory abnormalities described below in [Tables 5 and 6](#) reflect exposure to IMBRUVICA with a median duration of 8.6 months and exposure to ofatumumab with a median of 5.3 months in RESONATE in patients with previously treated CLL/SLL.

**Table 5: Adverse Reactions Reported in ≥ 10% of Patients in the IMBRUVICA Treated Arm in Patients with CLL/SLL in RESONATE**

Body System Adverse Reaction	IMBRUVICA (N=195)		Ofatumumab (N=191)	
	All Grades (%)	Grade 3 or Higher (%)	All Grades (%)	Grade 3 or Higher (%)
<b>Gastrointestinal disorders</b>				
Diarrhea	48	4	18	2
Nausea	26	2	18	0
Stomatitis*	17	1	6	1
Constipation	15	0	9	0
Vomiting	14	0	6	1
<b>Musculoskeletal and connective tissue disorders</b>				

Musculoskeletal pain*	28	2	18	1
Arthralgia	17	1	7	0
Muscle spasms	13	0	8	0
<b>Skin and subcutaneous tissue disorders</b>				
Rash*	24	3	13	0
Petechiae	14	0	1	0
Bruising*	12	0	1	0
<b>General disorders and administration site conditions</b>				
Pyrexia	24	2	15	2†
<b>Respiratory, thoracic and mediastinal disorders</b>				
Cough	19	0	23	1
Dyspnea	12	2	10	1
<b>Infections and infestations</b>				
Upper respiratory tract infection	16	1	11	2†
Pneumonia*	15	12†	13	10†
Sinusitis*	11	1	6	0
Urinary tract infection	10	4	5	1
	<b>IMBRUVICA (N=195)</b>		<b>Ofatumumab (N=191)</b>	
<b>Body System Adverse Reaction</b>	<b>All Grades (%)</b>	<b>Grade 3 or Higher (%)</b>	<b>All Grades (%)</b>	<b>Grade 3 or Higher (%)</b>
<b>Nervous system disorders</b>				
Headache	14	1	6	0
Dizziness	11	0	5	0
<b>Injury, poisoning and procedural complications</b>				
Contusion	11	0	3	0

<b>Eye disorders</b>				
Vision blurred	10	0	3	0

The body system and individual ADR terms are sorted in descending frequency order in the IMBRUVICA arm.

\* Includes multiple ADR terms

† Includes 3 events of pneumonia with fatal outcome in each arm, and 1 event of pyrexia and upper respiratory tract infection with a fatal outcome in the ofatumumab arm.

**Table 6: Treatment-Emergent Hematologic Laboratory Abnormalities in Patients with CLL/SLL in RESONATE**

	<b>IMBRUVICA (N=195)</b>		<b>Ofatumumab (N=191)</b>	
	<b>All Grades (%)</b>	<b>Grade 3 or 4 (%)</b>	<b>All Grades (%)</b>	<b>Grade 3 or 4 (%)</b>
Neutrophils decreased	51	23	57	26
Platelets decreased	52	5	45	10
Hemoglobin decreased	36	0	21	0

Treatment-emergent Grade 4 thrombocytopenia (2% in the IMBRUVICA arm vs 3% in the ofatumumab arm) and neutropenia (8% in the IMBRUVICA arm vs 8% in the ofatumumab arm) occurred in patients.

### RESONATE-2

Adverse reactions and laboratory abnormalities described below in [Tables 7](#) and [8](#) reflect exposure to IMBRUVICA with a median duration of 17.4 months. The median exposure to chlorambucil was 7.1 months in RESONATE-2.

**Table 7: Adverse Reactions Reported in  $\geq$  10% of Patients in the IMBRUVICA Treated Arm in Patients with CLL/SLL in RESONATE-2**

<b>Body System Adverse Reaction</b>	<b>IMBRUVICA (N=135)</b>		<b>Chlorambucil (N=132)</b>	
	<b>All Grades (%)</b>	<b>Grade 3 or Higher (%)</b>	<b>All Grades (%)</b>	<b>Grade 3 or Higher (%)</b>
<b>Gastrointestinal disorders</b>				
Diarrhea	42	4	17	0
Nausea	22	1	39	1
Constipation	16	1	16	0
Stomatitis*	14	1	4	1
Vomiting	13	0	20	1
Abdominal pain	13	3	11	1

Dyspepsia	11	0	2	0
<b>Musculoskeletal and connective tissue disorders</b>				
Musculoskeletal pain*	36	4	20	0
Arthralgia	16	1	7	1
Muscle spasms	11	0	5	0
<b>General disorders and administration site conditions</b>				
Fatigue	30	1	38	5
Peripheral edema	19	1	9	0
Pyrexia	17	0	14	2
<b>Respiratory, thoracic and mediastinal disorders</b>				
Cough	22	0	15	0
Dyspnea	10	1	10	0
<b>Skin and subcutaneous tissue disorders</b>				
Rash*	21	4	12	2
Bruising*	19	0	7	0
<b>Eye disorders</b>				
Dry eye	17	0	5	0
Lacrimation increased	13	0	6	0
Vision blurred	13	0	8	0
Visual acuity reduced	11	0	2	0
<b>Infections and infestations</b>				
Upper respiratory tract infection	17	2	17	2
Skin infection*	15	2	3	1
Pneumonia*	14	8	7	4
Urinary tract infections	10	1	8	1
<b>Body System Adverse Reaction</b>	<b>IMBRUVICA (N=135)</b>		<b>Chlorambucil (N=132)</b>	

	All Grades (%)	Grade 3 or Higher (%)	All Grades (%)	Grade 3 or Higher (%)
<b>Vascular disorders</b>				
Hypertension*	14	4	1	0
<b>Nervous system disorders</b>				
Headache	12	1	10	2
Dizziness	11	0	12	1
<b>Investigations</b>				
Weight decreased	10	0	12	0

Subjects with multiple events for a given ADR term are counted once only for each ADR term.

The body system and individual ADR terms are sorted in descending frequency order in the IMBRUVICA arm. \*

Includes multiple ADR terms

**Table 8: Treatment-Emergent Hematologic Laboratory Abnormalities in Patients with CLL/SLL in RESONATE-2**

	IMBRUVICA (N=135)		Chlorambucil (N=132)	
	All Grades (%)	Grade 3 or 4 (%)	All Grades (%)	Grade 3 or 4 (%)
Neutrophils Decreased	55	28	67	31
Platelets Decreased	47	7	58	14
Hemoglobin Decreased	36	0	39	2

Treatment-emergent Grade 4 thrombocytopenia (1% in the IMBRUVICA arm vs 3% in the chlorambucil arm) and neutropenia (11% in the IMBRUVICA arm vs 12% in the chlorambucil arm) occurred in patients.

## HELIOS

Adverse reactions described below in [Table 9](#) reflect exposure to IMBRUVICA + BR with a median duration of 14.7 months and exposure to placebo + BR with a median of 12.8 months in HELIOS in patients with previously treated CLL/SLL.

**Table 9: Adverse Reactions Reported in at Least 10% of Patients and at Least 2% Greater in the IMBRUVICA Arm in Patients with CLL/SLL in HELIOS**

Body System Adverse Reaction	IMBRUVICA + BR (N=287)		Placebo + BR (N=287)	
	All Grades (%)	Grade 3 or Higher (%)	All Grades (%)	Grade 3 or Higher (%)
<b>Blood and lymphatic system disorders</b>				
Neutropenia*	66	61	60	56 <sup>†</sup>

Thrombocytopenia*	34	16	26	16
<b>Gastrointestinal disorders</b>				
Diarrhea	36	2	23	1
Abdominal pain	12	1	8	<1
<b>Skin and subcutaneous tissue disorders</b>				
Rash *	32	4	25	1
Bruising *	20	<1	8	<1
<b>Musculoskeletal and connective tissue disorders</b>				
Musculoskeletal pain*	29	2	20	0
Muscle spasms	12	<1	5	0
<b>General disorders and administration site conditions</b>				
Pyrexia	25	4	22	2
<b>Vascular disorders</b>				
Hemorrhage*	19	2†	9	1
Hypertension *	11	5	5	2
<b>Infections and infestations</b>				
Bronchitis	13	2	10	3
Skin infection*	10	3	6	2
<b>Metabolism and nutrition disorders</b>				
Hyperuricemia	10	2	6	0

The body system and individual ADR terms are sorted in descending frequency order in the IMBRUVICA arm.

\* Includes multiple ADR terms

<1 used for frequency above 0 and below 0.5%

† Includes 2 events of hemorrhage with fatal outcome in the IMBRUVICA arm and 1 event of neutropenia with a fatal outcome in the placebo + BR arm.

Atrial fibrillation of any grade occurred in 7% of patients treated with IMBRUVICA + BR and 2% of patients treated with placebo + BR. The frequency of Grade 3 and 4 atrial fibrillation was 3% in patients treated with IMBRUVICA + BR and 1% in patients treated with placebo + BR.

### *iLLUMINATE*

Adverse reactions described below in [Table 10](#) reflect exposure to IMBRUVICA + obinutuzumab with a median duration of 29.3 months and exposure to chlorambucil + obinutuzumab with a median of 5.1 months in *iLLUMINATE* in patients with previously untreated CLL/SLL.

**Table 10: Adverse Reactions Reported in at Least 10% of Patients in the IMBRUVICA Arm in Patients with CLL/SLL in iLLUMINATE**

Body System Adverse Reaction	IMBRUVICA + Obinutuzumab (N=113)		Chlorambucil + Obinutuzumab (N=115)	
	All Grades (%)	Grade 3 or Higher (%)	All Grades (%)	Grade 3 or Higher (%)
<b>Blood and lymphatic system disorders</b>				
Neutropenia*	48	39	64	48
Thrombocytopenia*	36	19	28	11
Anemia	17	4	25	8
<b>Skin and subcutaneous tissue disorders</b>				
Rash*	36	3	11	0
Bruising*	32	3	3	0
<b>Gastrointestinal disorders</b>				
Diarrhea	34	3	10	0
Constipation	16	0	12	1
Nausea	12	0	30	0
<b>Musculoskeletal and connective tissue disorders</b>				
Musculoskeletal pain*	33	1	23	3
Arthralgia	22	1	10	0
Muscle spasms	13	0	6	0
<b>Respiratory, thoracic and mediastinal disorders</b>				
Cough	27	1	12	0
<b>Injury, poisoning and procedural complications</b>				
Infusion related reaction	25	2	58	8
<b>Vascular disorders</b>				
Hemorrhage*	25	1	9	0
Hypertension*	17	4	4	3
<b>General disorders and administration site conditions</b>				
Pyrexia	19	2	26	1
Fatigue	18	0	17	2
Peripheral edema	12	0	7	0



<b>Infections and infestations</b>				
Pneumonia*	16	9	9	4 <sup>†</sup>
Upper respiratory tract infection	14	1	6	0
Skin infection*	13	1	3	0
Urinary tract infection	12	3	7	1
Nasopharyngitis	12	0	3	0
Conjunctivitis	11	0	2	0
<b>Metabolism and nutrition disorders</b>				
Hyperuricemia	13	1	0	0
<b>Cardiac disorders</b>				
Atrial fibrillation	12	5	0	0
<b>Psychiatric disorders</b>				
Insomnia	12	0	4	0

The body system and individual ADR terms are sorted in descending frequency order in the IMBRUVICA arm.

\* Includes multiple ADR terms

† Includes one event with a fatal outcome.

### Waldenström's Macroglobulinemia and Marginal Zone Lymphoma

The data described below reflect exposure to IMBRUVICA in three single-arm open-label clinical trials (Study 1118, Study 1121, and INNOVATE monotherapy arm) and one randomized controlled trial (INNOVATE) in patients with WM or MZL, including a total n=307 patients overall and n=232 patients exposed to IMBRUVICA. Study 1118 included 63 patients with previously treated WM who received single agent IMBRUVICA. Study 1121 included 63 patients with previously treated MZL who received single agent IMBRUVICA. INNOVATE included 150 patients with treatment naïve or previously treated WM who received IMBRUVICA or placebo in combination with rituximab. The INNOVATE monotherapy arm included 31 patients with previously treated WM who failed prior rituximab-containing therapy and received IMBRUVICA. The most common adverse reactions in Studies 1118, 1121, and INNOVATE ( $\geq 20\%$ ) were thrombocytopenia, diarrhea, bruising, neutropenia, musculoskeletal pain, hemorrhage, anemia, rash, fatigue, and nausea.

Seven percent of patients receiving IMBRUVICA across Studies 1118, 1121, and INNOVATE discontinued treatment due to adverse reactions. The most common adverse reactions leading to discontinuation were atrial fibrillation, interstitial lung disease, diarrhea and rash. Adverse reactions leading to dose reduction occurred in 13% of patients.

#### *Study 1118 and INNOVATE Monotherapy Arm*

Adverse reactions and laboratory abnormalities described below in [Tables 13](#) and [14](#) reflect exposure to IMBRUVICA with a median duration of 11.7 months in Study 1118 and 33 months in the INNOVATE Monotherapy Arm.

**Table 13: Non-Hematologic Adverse Reactions in  $\geq 10\%$  in Patients with WM in Study 1118 and the INNOVATE Monotherapy Arm (N=94)**

Body System	Adverse Reaction	All Grades (%)	Grade 3 or Higher (%)
Gastrointestinal disorders	Diarrhea	38	2
	Nausea	21	0
	Stomatitis*	15	0
	Constipation	12	10
	Gastroesophageal reflux disease	12	
Skin and subcutaneous tissue disorders	Bruising*	28	1
	Rash*	21	1
Vascular disorders	Hemorrhage*	28	0
	Hypertension*	14	4
General disorders and administrative site conditions	Fatigue	18	2
	Pyrexia	12	2
Musculoskeletal and connective tissue disorders	Musculoskeletal pain*	21	0
	Muscle spasms	19	0
Infections and infestations	Upper respiratory tract infection	19	0
	Skin infection*	18	3
	Sinusitis*	16	0
	Pneumonia*	13	5
Nervous system disorders	Headache	14	0
	Dizziness	13	0
Respiratory, thoracic and mediastinal disorders	Cough	13	0

The body system and individual ADR preferred terms are sorted in descending frequency order.

\* Includes multiple ADR terms.

**Table 14: Treatment-Emergent Hematologic Laboratory Abnormalities in Patients with WM in Study 1118 and the INNOVATE Monotherapy Arm (N=94)**

	Percent of Patients (N=94)	
	All Grades (%)	Grade 3 or 4 (%)
Platelets Decreased	38	11
Neutrophils Decreased	43	16
Hemoglobin Decreased	21	6

Treatment-emergent Grade 4 thrombocytopenia (4%) and neutropenia (7%) occurred in patients.

### INNOVATE

Adverse reactions described below in [Table 15](#) reflect exposure to IMBRUVICA + R with a median duration of 25.8 months and exposure to placebo + R with a median duration of 15.5 months in patients with treatment naïve or previously treated WM in INNOVATE.

**Table 15: Adverse Reactions Reported in at Least 10% of Patients and at Least 2% Greater in the IMBRUVICA Arm in Patients with WM in INNOVATE**

Body System Adverse Reaction	IMBRUVICA + R (N=75)		Placebo + R (N=75)	
	All Grades (%)	Grade 3 or Higher (%)	All Grades (%)	Grade 3 or Higher (%)
<b>Skin and subcutaneous tissue disorders</b>				
Bruising*	37	1	5	0
Rash*	24	1	11	0
<b>Musculoskeletal and connective tissue disorders</b>				
Musculoskeletal pain*	35	4	21	3
Arthralgia	24	3	11	1
Muscle spasms	17	0	12	1
<b>Vascular disorders</b>				
Hemorrhage*	32	3	17	4 <sup>†</sup>
Hypertension*	20	13	5	4
<b>Gastrointestinal disorders</b>				
Diarrhea	28	0	15	1
Nausea	21	0	12	0
Dyspepsia	16	0	1	0
Constipation	13	1	11	1
<b>Infections and infestations</b>				
Pneumonia*	19	13	5	3
Skin infection*	17	3	3	0
Urinary tract infection	13	0	0	0
Bronchitis	12	3	7	0
Influenza	12	0	7	1
Viral upper respiratory tract infection	11	0	7	0
<b>General disorders and administration site conditions</b>				
Peripheral edema	17	0	12	1

<b>Respiratory, thoracic, and mediastinal disorders</b>				
Cough	17	0	11	0
<b>Blood and lymphatic system disorders</b>				
Neutropenia*	16	12	11	4
<b>Cardiac disorders</b>				
Atrial fibrillation	15	12	3	1
<b>Nervous system disorders</b>				
Dizziness	11	0	7	0
<b>Psychiatric disorders</b>				
Insomnia	11	0	4	0
<b>Metabolism and nutrition disorders</b>				
Hypokalemia	11	0	1	1

The body system and individual ADR preferred terms are sorted in descending frequency order.

\* Includes multiple ADR terms.

† Includes one event with a fatal outcome.

Grade 3 or 4 infusion related reactions were observed in 1% of patients treated with IR.

### *Study 1121*

Adverse reactions and laboratory abnormalities described below in [Tables 16](#) and [17](#) reflect exposure to IMBRUVICA with a median duration of 11.6 months in Study 1121.

**Table 16: Non-Hematologic Adverse Reactions in  $\geq$  10% in Patients with MZL in Study 1121 (N=63)**

<b>Body System</b>	<b>Adverse Reaction</b>	<b>All Grades (%)</b>	<b>Grade 3 or Higher (%)</b>
<b>General disorders and administrative site conditions</b>	Fatigue	44	6
	Peripheral edema	24	2
	Pyrexia	17	2
<b>Gastrointestinal disorders</b>	Diarrhea	43	5
	Nausea	25	0
	Dyspepsia	19	0
	Stomatitis*	17	2
	Abdominal pain	16	2
	Constipation	14	0
	Abdominal pain upper	13	0
	Vomiting	11	2

<b>Skin and subcutaneous tissue disorders</b>	Bruising *	41	0
	Rash*	29	5
	Pruritus	14	0
<b>Musculoskeletal and connective tissue disorders</b>	Musculoskeletal pain*	40	3
	Arthralgia	24	2
	Muscle spasms	19	3
<b>Infections and infestations</b>	Upper respiratory tract infection	21	0
	Sinusitis*	19	0
	Bronchitis	11	0
	Pneumonia*	11	10
<b>Metabolism and nutrition disorders</b>	Decreased appetite	16	20
	Hyperuricemia	16	00
	Hypoalbuminemia	14	
	Hypokalemia	13	
<b>Vascular disorders</b>	Hemorrhage*	30	2 <sup>†</sup>
	Hypertension*	14	5
<b>Respiratory, thoracic and mediastinal disorders</b>	Cough	22	2
	Dyspnea	21	2
<b>Nervous system disorders</b>	Dizziness	19	0
	Headache	13	0
<b>Psychiatric disorders</b>	Anxiety	16	2

The body system and individual ADR preferred terms are sorted in descending frequency order.

\* Includes multiple ADR terms.

† Includes one event with a fatal outcome.

**Table 17: Treatment-Emergent Hematologic Laboratory Abnormalities in Patients with MZL in Study 1121 (N=63)**

	Percent of Patients (N=63)	
	All Grades (%)	Grade 3 or 4 (%)
Platelets decreased	49	6
Hemoglobin decreased	43	13
Neutrophils decreased	22	13

Treatment-emergent Grade 4 thrombocytopenia (3%) and neutropenia (6%) occurred in patients.

### Chronic Graft versus Host Disease

The data described below reflect exposure to IMBRUVICA in an open-label clinical trial (Study 1129) that included 42 patients with cGVHD after failure of first line corticosteroid therapy and required additional therapy.

The most common adverse reactions in the cGVHD trial ( $\geq 20\%$ ) were fatigue, bruising, diarrhea, thrombocytopenia, stomatitis, muscle spasms, nausea, hemorrhage, anemia, and pneumonia.

Atrial fibrillation occurred in one patient (2%) which was Grade 3.

Twenty-four percent of patients receiving IMBRUVICA in the cGVHD trial discontinued treatment due to adverse reactions. The most common adverse reactions leading to

discontinuation were fatigue and pneumonia. Adverse reactions leading to dose reduction occurred in 26% of patients.

Adverse reactions and laboratory abnormalities described below in Tables 18 and 19 reflect exposure to IMBRUVICA with a median duration of 4.4 months in the cGVHD trial.

**Table 18: Non-Hematologic Adverse Reactions in  $\geq$  10% of Patients with cGVHD (N=42)**

Body System	Adverse Reaction	All Grades (%)	Grade 3 or Higher (%)
General disorders and administration site conditions	Fatigue	57	12
	Pyrexia	17	5
	Edema peripheral	12	0
Skin and subcutaneous tissue disorders	Bruising*	40	0
	Rash*	12	0
Gastrointestinal disorders	Diarrhea	36	10
	Stomatitis*	29	2
	Nausea	26	0
	Constipation	12	0
Musculoskeletal and connective tissue disorders	Muscle spasms	29	2
	Musculoskeletal pain*	14	5
Vascular disorders	Hemorrhage*	26	0
Infections and infestations	Pneumonia*	21	14 <sup>†</sup>
	Upper respiratory tract infection	19	0
	Sepsis*	10	10
Nervous system disorders	Headache	17	5
Injury, poisoning and procedural complications	Fall	17	0
Respiratory, thoracic and mediastinal disorders	Cough	14	0
	Dyspnea	12	2
Metabolism and nutrition disorders	Hypokalemia	12	7

The system organ class and individual ADR preferred terms are sorted in descending frequency order. \*

Includes multiple ADR terms.

<sup>†</sup> Includes 2 events with a fatal outcome.

**Table 19: Treatment-Emergent Hematologic Laboratory Abnormalities in Patients with cGVHD (N=42)**

	Percent of Patients (N=42)	
	All Grades (%)	Grade 3 or 4 (%)
Platelets decreased	33	0
Neutrophils decreased	10	10
Hemoglobin decreased	24	2

Treatment-emergent Grade 4 neutropenia occurred in 2% of patients.

### Additional Important Adverse Reactions

#### *Cardiovascular Events*

Data on cardiovascular events are based on randomized controlled trials with IMBRUVICA (n=2,115; median treatment duration of 19.1 months for 1,157 patients treated with IMBRUVICA and 5.3 months for 958 patients in the control arm). The incidence of ventricular tachyarrhythmias (ventricular extrasystoles, ventricular arrhythmias, ventricular fibrillation, ventricular flutter, and ventricular tachycardia) of any grade was 1.0% versus 0.4% and of Grade 3 or greater was 0.3% versus 0% in patients treated with IMBRUVICA compared to patients in the control arm. In addition, the incidence of atrial fibrillation and atrial flutter of any grade was 8.4% versus 1.6% and for Grade 3 or greater was 4.0% versus 0.5% in patients treated with IMBRUVICA compared to patients in the control arm.

The incidence of ischemic cerebrovascular events (cerebrovascular accidents, ischemic stroke, cerebral ischemia, and transient ischemic attack) of any grade was 1% versus 0.4% and Grade 3 or greater was 0.5% versus 0.2% in patients treated with IMBRUVICA compared to patients in the control arm, respectively.

#### *Diarrhea*

In randomized controlled trials (n=2,115; median treatment duration of 19.1 months for 1,157 patients treated with IMBRUVICA and 5.3 months for 958 patients in the control arm), diarrhea of any grade occurred at a rate of 43% of patients treated with IMBRUVICA compared to 19% of patients in the control arm. Grade 3 diarrhea occurred in 3% versus 1% of IMBRUVICA-treated patients compared to the control arm, respectively. Less than 1% (0.3%) of subjects discontinued IMBRUVICA due to diarrhea compared with 0% in the control arm.

Based on data from 1,605 of these patients, the median time to first onset was 21 days (range, 0 to 708) versus 46 days (range, 0 to 492) for any grade diarrhea and 117 days (range, 3 to 414) versus 194 days (range, 11 to 325) for Grade 3 diarrhea in IMBRUVICA-treated patients compared to the control arm, respectively. Of the patients who reported diarrhea, 85% versus 89% had complete resolution, and 15% versus 11% had not reported resolution at time of analysis in IMBRUVICA-treated patients compared to the control arm, respectively. The median time from onset to resolution in IMBRUVICA-treated subjects was 7 days (range, 1 to 655) versus 4 days (range, 1 to 367) for any grade diarrhea and 7 days (range, 1 to 78) versus 19 days (range, 1 to 56) for Grade 3 diarrhea in IMBRUVICA-treated subjects compared to the control arm, respectively.

#### *Visual Disturbance*

In randomized controlled trials (n=2,115; median treatment duration of 19.1 months for 1,157 patients treated with IMBRUVICA and 5.3 months for 958 patients in the control arm), blurred vision and decreased visual acuity of any grade occurred in 11% of patients treated with IMBRUVICA (9% Grade 1, 2% Grade 2, no Grade 3 or higher) compared to 6% in the control arm (5% Grade 1 and <1% Grade 2 and 3).

Based on data from 1,605 of these patients, the median time to first onset was 91 days (range, 0 to 617) versus 100 days (range, 2 to 477) in IMBRUVICA-treated patients compared to the control arm, respectively. Of the patients who reported visual disturbances, 60% versus 71% had complete resolution and 40% versus 29% had not reported resolution at the time of analysis in IMBRUVICA-treated patients compared to the control arm, respectively. The median time from

onset to resolution was 37 days (range, 1 to 457) versus 26 days (range, 1 to 721) in IMBRUVICA-treated subjects compared to the control arm, respectively.

### Long-Term Safety

The safety data from long-term treatment with IMBRUVICA over 5 years of 1,284 patients (treatment-naïve CLL/SLL n=162, relapsed/refractory CLL/SLL n=646, relapsed/refractory MCL n=370, and WM n=106) were analyzed. The median treatment duration was 51 months (range, 0.2 to 98 months for CLL/SLL, 11 months (range, 0 to 87 months) for MCL, and 47 months (range, 0.3 to 61 months) for WM. The cumulative rate of hypertension increased over time. The prevalence for Grade 3 or greater hypertension was 4% (year 0-1), 7% (year 1-2), 9% (year 2-3), 9% (year 3-4), and 9% (year 4-5; the overall incidence for the 5-year period was 11%.

## **9.2 Postmarketing Experience**

The following adverse reactions have been identified during postapproval use of IMBRUVICA. Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

- Hepatobiliary disorders: hepatic failure including acute and/or fatal events, hepatic cirrhosis
- Respiratory disorders: interstitial lung disease
- Metabolic and nutrition disorders: tumor lysis syndrome
- Immune system disorders: anaphylactic shock, angioedema, urticaria
- Skin and subcutaneous tissue disorders: Stevens-Johnson Syndrome (SJS), onychoclasia, panniculitis, neutrophilic dermatoses
- Infections: hepatitis B reactivation
- Nervous system disorders: peripheral neuropathy

### 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. Any suspected adverse events should be reported to the Ministry of Health according to the National Regulation by using an online form <http://sideeffects.health.gov.il>

## **10 DRUG INTERACTIONS**

### **10.1 CYP3A Inhibitors Ibrutinib is primarily metabolized by cytochrome P450 enzyme 3A (CYP3A).**

In healthy volunteers, co-administration of ketoconazole, a strong CYP3A inhibitor, increased C<sub>max</sub> and AUC of ibrutinib by 29- and 24-fold, respectively. The highest ibrutinib dose evaluated in clinical trials was 12.5 mg/kg (actual doses of 840 – 1400 mg) given for 28 days with single dose AUC values of 1445 ± 869 ng·hr/mL which is approximately 50% greater than steady state exposures seen at the highest indicated dose (560 mg).

Avoid concomitant administration of IMBRUVICA with strong or moderate inhibitors of CYP3A. For strong CYP3A inhibitors used short-term (e.g., antifungals and antibiotics for 7 days or less, e.g., ketoconazole, itraconazole, voriconazole, posaconazole, clarithromycin, telithromycin) consider interrupting IMBRUVICA therapy during the duration of inhibitor use. Avoid strong CYP3A inhibitors that are needed chronically. If a



moderate CYP3A inhibitor must be used, reduce the IMBRUVICA dose. Patients taking concomitant strong or moderate CYP3A4 inhibitors should be monitored more closely for signs of IMBRUVICA toxicity [see *Dosage and Administration (2.4)*]. Avoid grapefruit and Seville oranges during IMBRUVICA treatment, as these contain moderate inhibitors of CYP3A.

## 10.2 Effect of CYP3A Inducers on Ibrutinib

The coadministration of IMBRUVICA with strong CYP3A inducers may decrease ibrutinib concentrations. Avoid coadministration with strong CYP3A inducers [see *Clinical Pharmacology (12.3)*].

## 11 USE IN SPECIFIC POPULATIONS

### 11.1 Pregnancy

#### Risk Summary

IMBRUVICA can cause fetal harm based on findings from animal studies. There are no available data on IMBRUVICA use in pregnant women to inform a drug-associated risk of major birth defects and miscarriage. In animal reproduction studies, administration of ibrutinib to pregnant rats and rabbits during the period of organogenesis at exposures up to 2-20 times the clinical doses of 420-560 mg daily produced embryofetal toxicity including structural abnormalities (*see Data*). Advise pregnant women of the potential risk to a fetus.

All pregnancies have a background risk of birth defect, loss, or other adverse outcomes. The estimated background risk of major birth defects and miscarriage for the indicated population is unknown. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2-4% and 15-20%, respectively.

#### Data

##### *Animal Data*

Ibrutinib was administered orally to pregnant rats during the period of organogenesis at doses of 10, 40 and 80 mg/kg/day. Ibrutinib at a dose of 80 mg/kg/day was associated with visceral malformations (heart and major vessels) and increased resorptions and post-implantation loss. The dose of 80 mg/kg/day in rats is approximately 14 times the exposure (AUC) in patients with MCL or MZL and 20 times the exposure in patients with CLL/SLL or WM administered the dose of 560 mg daily and 420 mg daily, respectively. Ibrutinib at doses of 40 mg/kg/day or greater was associated with decreased fetal weights. The dose of 40 mg/kg/day in rats is approximately 6 times the exposure (AUC) in patients with MCL administered the dose of 560 mg daily. Ibrutinib was also administered orally to pregnant rabbits during the period of organogenesis at doses of 5, 15, and 45 mg/kg/day. Ibrutinib at a dose of 15 mg/kg/day or greater was associated with skeletal variations (fused sternebrae) and ibrutinib at a dose of 45 mg/kg/day was associated with increased resorptions and post-implantation loss. The dose of 15 mg/kg/day in rabbits is approximately 2.0 times the exposure (AUC) in patients with MCL and 2.8 times the exposure in patients with CLL/SLL or WM administered the dose of 560 and 420 mg daily, respectively.

### 11.2 Lactation

#### Risk Summary

There is no information regarding the presence of ibrutinib or its metabolites in human milk, the

effects on the breastfed child, or the effects on milk production. Because of the potential for serious adverse reactions in the breastfed child, advise women not to breastfeed during treatment with IMBRUVICA and for 1 week after the last dose.

### **11.3 Females and Males of Reproductive Potential**

#### Pregnancy Testing

Verify pregnancy status in females of reproductive potential prior to initiating IMBRUVICA.

#### Contraception

##### *Females*

Advise females of reproductive potential to avoid pregnancy while taking IMBRUVICA and for up to 3 months after ending treatment. Therefore, women of child-bearing potential must use highly effective contraceptive measures while taking IMBRUVICA and for three months after stopping treatment. It is currently unknown whether ibrutinib may reduce the effectiveness of hormonal contraceptives, and therefore women using hormonal contraceptives should add a barrier method. If this drug is used during pregnancy or if the patient becomes pregnant while taking this drug, the patient should be informed of the potential hazard to a fetus.

*Males*  
Advise men to avoid fathering a child while receiving IMBRUVICA and for 3 month following the last dose of IMBRUVICA.

### **11.4 Pediatric Use**

The safety and effectiveness of IMBRUVICA in pediatric patients has not been established.

### **11.5 Geriatric Use**

Of the 1,124 patients in clinical studies of IMBRUVICA, 64% were  $\geq 65$  years of age, while 23% were  $\geq 75$  years of age. No overall differences in effectiveness were observed between younger and older patients. Anemia (all grades), pneumonia (Grade 3 or higher), thrombocytopenia, hypertension, and atrial fibrillation occurred more frequently among older patients treated with IMBRUVICA.

11.6 Ibrutinib is metabolized in the liver. In a hepatic impairment study, data showed an increase in ibrutinib exposure. Following single dose administration, the AUC of ibrutinib increased 2.7-, 8.2- and 9.8-fold in subjects with mild (Child-Pugh class A), moderate (Child-Pugh class B), and severe (Child-Pugh class C) hepatic impairment compared to subjects with normal liver function.

The safety of IMBRUVICA has not been evaluated in cancer patients with mild to severe hepatic impairment by Child-Pugh criteria.

Monitor patients for signs of IMBRUVICA toxicity and follow dose modification guidance as needed. It is not recommended to administer IMBRUVICA to patients with moderate or severe hepatic impairment (Child-Pugh classes B and C) [see Dosage and Administration (5) and Clinical Pharmacology (12.3)].

### **11.7 Plasmapheresis**

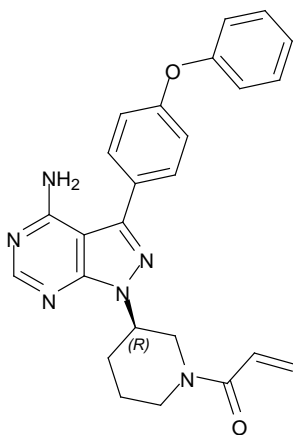
Management of hyperviscosity in WM patients may include plasmapheresis before and during treatment with IMBRUVICA. Modifications to IMBRUVICA dosing are not required.

## 12 OVERDOSAGE

There is no specific experience in the management of ibrutinib overdose in patients. One healthy subject experienced reversible Grade 4 hepatic enzyme increases (AST and ALT) after a dose of 1680 mg. Closely monitor patients who ingest more than the recommended dosage and provide appropriate supportive treatment.

## 13 DESCRIPTION

Ibrutinib is an inhibitor of Bruton's tyrosine kinase (BTK). It is a white to off-white solid with the empirical formula  $C_{25}H_{24}N_6O_2$  and a molecular weight 440.50. Ibrutinib is freely soluble in dimethyl sulfoxide, soluble in methanol and practically insoluble in water. The chemical name for ibrutinib is 1-[(3R)-3-[4-amino-3-(4-phenoxyphenyl)-1H-pyrazolo[3,4-d]pyrimidin-1-yl]-1-piperidinyl]-2-propen-1-one and has the following structure:



IMBRUVICA (ibrutinib) is available as immediate-release oral capsules and immediate-release oral tablets.

IMBRUVICA (ibrutinib) capsules for oral use are supplied as white opaque capsules that contain 140 mg ibrutinib as the active ingredient.

## 14 CLINICAL PHARMACOLOGY

### 14.1 Mechanism of Action

Ibrutinib is a small-molecule inhibitor of BTK. Ibrutinib forms a covalent bond with a cysteine residue in the BTK active site, leading to inhibition of BTK enzymatic activity. BTK is a signaling molecule of the B-cell antigen receptor (BCR) and cytokine receptor pathways. BTK's role in signaling through the B-cell surface receptors results in activation of pathways necessary for B-cell trafficking, chemotaxis, and adhesion. Nonclinical studies show that ibrutinib inhibits malignant B-cell proliferation and survival *in vivo* as well as cell migration and substrate adhesion *in vitro*.

### 14.2 Pharmacodynamics

In patients with recurrent B-cell lymphoma > 90% occupancy of the BTK active site in

peripheral blood mononuclear cells was observed up to 24 hours after ibrutinib doses of  $\geq 2.5$  mg/kg/day ( $\geq 175$  mg/day for average weight of 70 kg).

#### In vitro Platelet Aggregation

Ibrutinib demonstrated inhibition of collagen-induced platelet aggregation, with IC<sub>50</sub> values at 4.6  $\mu$ M (2026 ng/mL), 0.8  $\mu$ M (352 ng/mL), and 3  $\mu$ M (1321 ng/mL) in blood samples from healthy donors, donors taking warfarin, and donors with severe renal dysfunction, respectively. Ibrutinib did not show meaningful inhibition of platelet aggregation for ADP, arachidonic acid, ristocetin, and TRAP-6.

#### Cardiac Electrophysiology

At a single dose 3 times the maximum recommended dose (1680 mg), IMBRUVICA did not prolong the QT interval to any clinically relevant extent.

### **14.3 Pharmacokinetics**

Ibrutinib exposure increases with doses up to 840 mg (1.5 times the maximum approved recommended dosage) in patients with B-cell malignancies. The mean steady-state AUC (% coefficient of variation) observed in patients at 560 mg with MCL is 865 (69%) ng·h/mL and with MZL is 978 (82%) ng·h/mL, and in patients at 420 mg with CLL/SLL is 708 (71%) ng·h/mL, with WM is 707 (72%) ng·h/mL, and with cGVHD is 1159 (50%) ng·h/mL. Steady-state concentrations of ibrutinib without CYP3A inhibitors were achieved with an accumulation ratio of 1 to 1.6 after 1 week of multiple daily doses of 420 mg or 560 mg.

#### Absorption

Absolute bioavailability of ibrutinib in fasted condition was 2.9% (90% CI: 2.1, 3.9) in healthy subjects. Ibrutinib is absorbed after oral administration with a median T<sub>max</sub> of 1 hour to 2 hours.

#### *Effect of Food*

The administration of IMBRUVICA with a high-fat and high-calorie meal (800 calories to 1,000 calories with approximately 50% of total caloric content of the meal from fat) increased ibrutinib C<sub>max</sub> by 2- to 4-fold and AUC by approximately 2-fold, compared with administration of ibrutinib after overnight fasting.

In vitro studies suggest that ibrutinib is not a substrate of p-glycoprotein (P-gp) or breast cancer resistance protein (BCRP).

#### Distribution

Reversible binding of ibrutinib to human plasma protein *in vitro* was 97.3% with no concentration dependence in the range of 50 ng/mL to 1000 ng/mL. The volume of distribution (V<sub>d</sub>) was 683 L, and the apparent volume of distribution at steady state (V<sub>d,ss</sub>/F) was approximately 10,000 L.

#### Elimination

Intravenous clearance was 62 L/h in fasted conditions and 76 L/h in fed conditions. In line with the high first-pass effect, the apparent oral clearance is 2000 L/h in fasted conditions and 1000 L/h in fed conditions. The half-life of ibrutinib is 4 hours to 6 hours.

## *Metabolism*

Metabolism is the main route of elimination for ibrutinib. It is metabolized to several metabolites primarily by cytochrome P450 (CYP) 3A and to a minor extent by CYP2D6. The active metabolite, PCI-45227, is a dihydrodiol metabolite with inhibitory activity towards BTK approximately 15 times lower than that of ibrutinib. The range of the mean metabolite to parent ratio for PCI-45227 at steady-state is 1 to 2.8.

## *Excretion*

Ibrutinib, mainly in the form of metabolites, is eliminated primarily via feces. After a single oral administration of radiolabeled ibrutinib, 90% of radioactivity was excreted within 168 hours, with 80% excreted in the feces and less than 10% eliminated in urine. Unchanged ibrutinib accounted for 1% of the radiolabeled excreted dose in feces and none in urine, with the remainder of the excreted dose being metabolites.

## Specific Populations

### *Age and Sex*

Age and sex have no clinically meaningful effect on ibrutinib pharmacokinetics.

### *Patients with Renal Impairment*

Mild and moderate renal impairment (creatinine clearance [CL<sub>cr</sub>] > 25 mL/min as estimated by Cockcroft-Gault equation) had no influence on the exposure of ibrutinib. No data is available in patients with severe renal impairment (CL<sub>cr</sub> < 25 mL/min) or in patients on dialysis.

### *Patients with Hepatic Impairment*

The AUC of ibrutinib increased 2.7-fold in subjects with mild hepatic impairment (Child-Pugh class A), 8.2-fold in subjects with moderate hepatic impairment (Child-Pugh class B) and 9.8-fold in subjects with severe hepatic impairment (Child-Pugh class C) relative to subjects with normal liver function. The C<sub>max</sub> of ibrutinib increased 5.2-fold in mild hepatic impairment, 8.8-fold in moderate hepatic impairment and 7-fold in severe hepatic impairment relative to subjects with normal liver function [*see Use in Specific Populations (8.6)*].

## Drug Interaction Studies

### *Coadministration of Ibrutinib with CYP3A Inhibitors*

In a sequential design trial of 18 healthy, fasted volunteers, a single dose of 120 mg of IMBRUVICA was administered alone on Day 1 and a single dose of 40 mg of IMBRUVICA was administered on Day 7 in combination with 400 mg of ketoconazole (given daily on Days 4 - 9). Ketoconazole increased ibrutinib dose-normalized C<sub>max</sub> and AUC 29-fold and 24-fold, respectively.

Simulations using fasted conditions indicate that moderate CYP3A inhibitors diltiazem and erythromycin may increase AUC of ibrutinib by 5-to 8-fold.

*Effect of CYP3A Inducers on Ibrutinib:* The coadministration of rifampin (strong CYP3A inducer) decreased the C<sub>max</sub> of ibrutinib by more than 13-fold and AUC by more than 10-fold. Simulations suggest that efavirenz (moderate CYP3A inducer) may decrease the AUC of ibrutinib by 3-fold.

## *In Vitro Studies*

*Effect of Ibrutinib on CYP Substrates:* In vitro studies suggest that ibrutinib and PCI-45227 are unlikely to inhibit CYP1A2, 2B6, 2C8, 2C9, 2C19, 2D6 or 3A at clinical doses. Both ibrutinib and PCI-45227 are unlikely to induce CYP1A2, CYP2B6 or CYP3A at clinical doses.

*Effect of Ibrutinib on Substrates of Transporters:* In vitro studies suggest that ibrutinib may inhibit BCRP and P-gp transport at clinical doses. The coadministration of oral P-gp or BCRP substrates with a narrow therapeutic index (e.g., digoxin, methotrexate) with IMBRUVICA may increase their concentrations.

## **15 NONCLINICAL TOXICOLOGY**

### **15.1 Carcinogenesis, Mutagenesis, Impairment of Fertility**

Ibrutinib was not carcinogenic in a 6-month rasH2 mouse study at oral doses up to 2000 mg/kg/day resulting in exposures approximately 23 (males) to 37 (females) times higher than the exposure in humans at a dose of 560 mg daily [*see Warnings and Precautions (5.6)*].

Ibrutinib was not mutagenic in a bacterial mutagenicity (Ames) assay, was not clastogenic in a chromosome aberration assay in mammalian (CHO) cells, nor was it clastogenic in an *in vivo* bone marrow micronucleus assay in mice at doses up to 2000 mg/kg.

Rats were administered oral daily doses of ibrutinib for 4 weeks prior to pairing and during pairing in males and 2 weeks prior to pairing and during pairing in females. Treatment of female rats continued following pregnancy up to gestation day (GD) 7, and treatment of male rats continued until end of study. No effects on fertility or reproductive capacities were observed in male or female rats up to the maximum dose tested, 100 mg/kg/day (Human Equivalent Dose [HED] 16 mg/kg).

## **16 CLINICAL STUDIES**

### **16.1 Mantle Cell Lymphoma**

The safety and efficacy of IMBRUVICA in patients with MCL who have received at least one prior therapy were evaluated in Study 1104 (NCT01236391), an open-label, multi-center, single-arm trial of 111 previously treated patients. IMBRUVICA was administered orally at 560 mg once daily until disease progression or unacceptable toxicity. Tumor response was assessed according to the revised International Working Group (IWG) for non-Hodgkin's lymphoma (NHL) criteria. The primary endpoint in this study was investigator-assessed overall response rate (ORR). The median age was 68 years (range, 40 to 84 years), 77% were male, and 92% were White. At baseline, 89% of patients had a baseline ECOG performance status of 0 or 1. The median time since diagnosis was 42 months, and median number of prior treatments was 3 (range, 1 to 5 treatments), including 11% with prior stem cell transplantation. At baseline, 39% of subjects had at least one tumor  $\geq 5$  cm, 49% had bone marrow involvement, and 54% had extranodal involvement at screening.

Responses to IMBRUVICA are shown in [Table 20](#).

**Table 20: Overall Response Rate (ORR) and Duration of Response (DOR) Based on Investigator Assessment in Patients with MCL in Study 1104**

	<b>Total (N=111)</b>
ORR (%)	65.8
95% CI (%)	(56.2, 74.5)
CR (%)	17.1
PR (%)	48.6
Median DOR months (95% CI)	17.5 (15.8, NE)

CI = confidence interval; CR = complete response; PR = partial response; NE = not evaluable

An Independent Review Committee (IRC) performed independent reading and interpretation of imaging scans. The IRC review demonstrated an ORR of 69%.

The median time to response was 1.9 months.

### Lymphocytosis

Upon initiation of IMBRUVICA, a temporary increase in lymphocyte counts (i.e.,  $\geq 50\%$  increase from baseline and above absolute lymphocyte count of 5,000/mcL) occurred in 33% of patients in the MCL study. The onset of isolated lymphocytosis occurs during the first few weeks of IMBRUVICA therapy and resolves by a median of 8 weeks.

### **16.2 Chronic Lymphocytic Leukemia / Small Lymphocytic Lymphoma**

The safety and efficacy of IMBRUVICA in patients with CLL/SLL were demonstrated in one uncontrolled trial and five randomized, controlled trials.

#### Study 1102

Study 1102 (NCT01105247), an open-label, multi-center trial, was conducted in 48 previously treated CLL patients. IMBRUVICA was administered orally at 420 mg once daily until disease progression or unacceptable toxicity. The ORR and DOR were assessed using a modified version of the International Workshop on CLL Criteria by an Independent Review Committee.

The median age was 67 years (range, 37 to 82 years), 71% were male, and 94% were White. All patients had a baseline ECOG performance status of 0 or 1. The median time since diagnosis was 80 months and the median number of prior treatments was 4 (range, 1 to 12 treatments). At baseline, 46% of subjects had at least one tumor  $\geq 5$  cm.

The ORR was 58.3% (95% CI: 43.2%, 72.4%), all partial responses. None of the patients achieved a complete response. The DOR ranged from 5.6 to 24.2+ months. The median DOR was not reached.

#### RESONATE

The RESONATE study, a randomized, multicenter, open label, phase 3 study of IMBRUVICA versus ofatumumab (NCT01578707), was conducted in patients with previously treated CLL or SLL. Patients (n=391) were randomized 1:1 to receive either IMBRUVICA 420 mg daily until disease progression, or unacceptable toxicity or ofatumumab at an initial dose of 300 mg, followed one week later by a dose of 2000 mg weekly for 7 doses and then every 4 weeks for 4 additional doses. Fifty-seven patients randomized to ofatumumab crossed over following progression to receive IMBRUVICA.

The median age was 67 years (range, 30 to 88 years), 68% were male, and 90% were White. All patients had a baseline ECOG performance status of 0 or 1. The trial enrolled 373 patients with CLL and 18 patients with SLL. The median time since diagnosis was 91 months and the median number of prior treatments was 2 (range, 1 to 13 treatments). At baseline, 58% of patients had at least one tumor  $\geq 5$  cm. Thirty-two percent of patients had 17p deletion.

Efficacy results for RESONATE are shown in [Table 21](#) and the Kaplan-Meier curves for PFS, assessed by an IRC according to IWCLL criteria, and OS are shown in [Figures 1 and 2](#), respectively.

**Table 21: Efficacy Results in Patients with CLL/SLL in RESONATE**

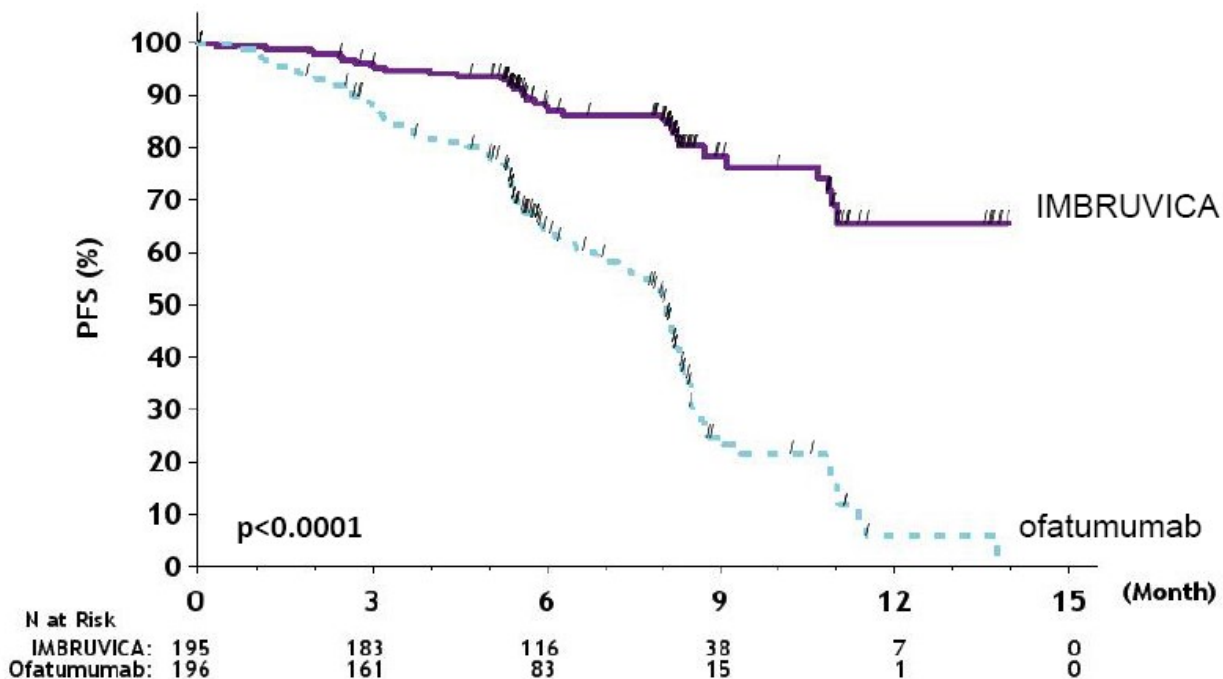
Endpoint	IMBRUVICA N=195	Ofatumumab N=196
<b>Progression Free Survival<sup>b</sup></b>		
Number of events (%)	35 (17.9)	111 (56.6)
Disease progression	26	93
Death events	9	18
Median (95% CI), months	NE	8.1 (7.2, 8.3)
HR (95% CI)	0.22 (0.15, 0.32)	
<b>Overall Survival<sup>a</sup></b>		
Number of deaths (%)	16 (8.2)	33 (16.8)
HR (95% CI)	0.43 (0.24, 0.79)	
Overall Response Rate <sup>b</sup>	42.6%	4.1%

<sup>a</sup> Median OS not evaluable for either arm

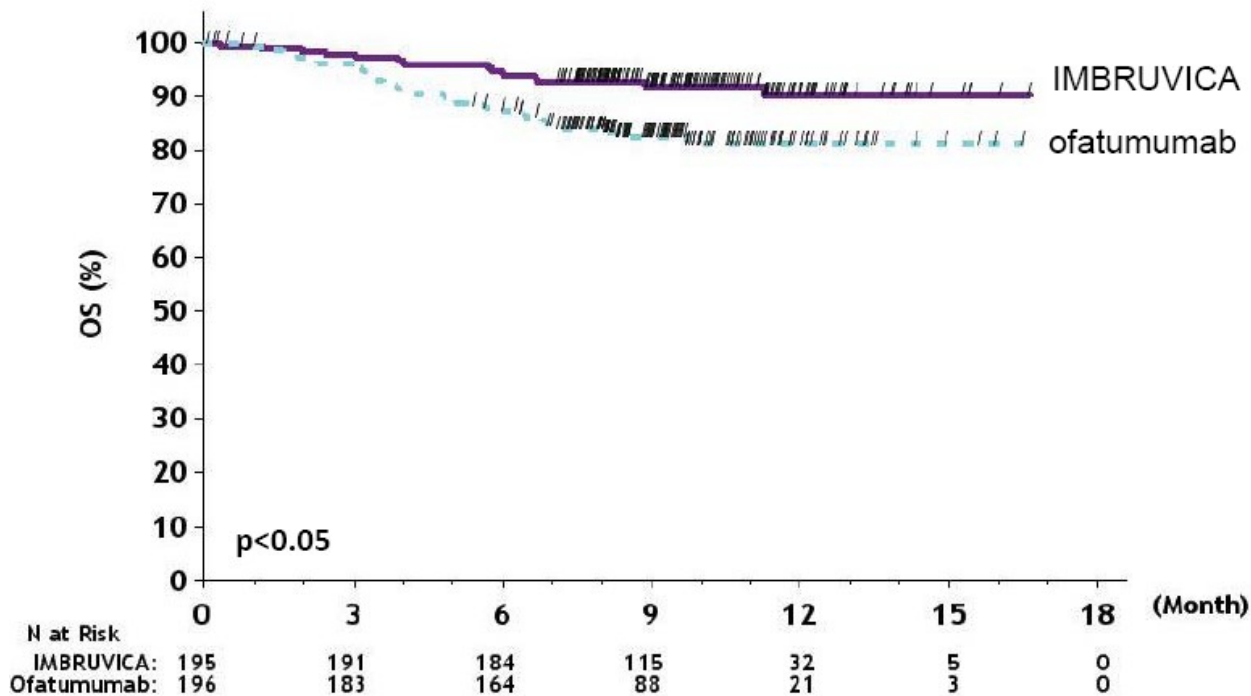
<sup>b</sup> IRC evaluated. All partial responses achieved; none of the patients achieved a complete response. CI = confidence interval; HR = hazard ratio; NE = not evaluable

**Figure 1: Kaplan-Meier Curve of Progression Free Survival (ITT Population) in Patients with CLL/SLL in RESONATE**





**Figure 2: Kaplan-Meier Curve of Overall Survival (ITT Population) in Patients with CLL/SLL in RESONATE**



*63-Month Follow-Up*

With an overall follow-up of 63 months, the median investigator-assessed PFS per IWCLL criteria was 44.1 months [95% CI (38.5, 56.9)] in the IMBRUVICA arm and 8.1 months [95% CI (7.8, 8.3)] in the ofatumumab arm, respectively. Overall response rate as assessed by

investigators was 87.2% in the IMBRUVICA arm versus 22.4% in the ofatumumab arm.

### CLL/SLL with 17p deletion (del 17p CLL/SLL) in RESONATE

RESONATE included 127 patients with del 17p CLL/SLL. The median age was 67 years (range, 30 to 84 years), 62% were male, and 88% were White. All patients had a baseline ECOG performance status of 0 or 1. PFS and ORR were assessed by an IRC. Efficacy results for del 17p CLL/SLL are shown in [Table 22](#).

**Table 22: Efficacy Results in Patients with del 17p CLL/SLL in RESONATE**

<b>Endpoint</b>	<b>IMBRUVICA N=63</b>	<b>Ofatumumab N=64</b>
<b>Progression Free Survival<sup>a</sup></b>		
Number of events (%)	16 (25.4)	38 (59.4)
Disease progression	12	31
Death events	4	7
Median (95% CI), months	NE	5.8 (5.3, 7.9)
HR (95% CI)	0.25 (0.14, 0.45)	
Overall Response Rate <sup>a</sup>	47.6%	4.7%

<sup>a</sup> IRC evaluated. All partial responses achieved; none of the patients achieved a complete response. CI = confidence interval; HR = hazard ratio; NE = not evaluable

### *63-Month Follow-Up*

With an overall follow-up of 63 months, the median investigator-assessed PFS in patients with del 17p per IWCLL criteria was 40.6 months [95% CI (25.4, 44.6)] in the IMBRUVICA arm and 6.2 months [95% CI (4.6, 8.1)] in the ofatumumab arm, respectively. Overall response rate as assessed by investigators in patients with del 17p was 88.9% in the IMBRUVICA arm versus 18.8% in the ofatumumab arm.

### RESONATE-2

The RESONATE-2 study, a randomized, multicenter, open label, phase 3 study of IMBRUVICA versus chlorambucil (NCT01722487), was conducted in patients with treatment naïve CLL or SLL who were 65 years of age or older. Patients (n = 269) were randomized 1:1 to receive either IMBRUVICA 420 mg daily until disease progression or unacceptable toxicity, or chlorambucil at a starting dose of 0.5 mg/kg on Days 1 and 15 of each 28-day cycle for a maximum of 12 cycles, with an allowance for inpatient dose increases up to 0.8 mg/kg based on

tolerability.

The median age was 73 years (range, 65 to 90 years), 63% were male, and 91% were White. Ninety one percent of patients had a baseline ECOG performance status of 0 or 1 and 9% had an ECOG performance status of 2. The trial enrolled 249 patients with CLL and 20 patients with SLL. At baseline, 20% of patients had 11q deletion. The most common reasons for initiating CLL therapy include: progressive marrow failure demonstrated by anemia and/or thrombocytopenia (38%), progressive or symptomatic lymphadenopathy (37%), progressive or symptomatic splenomegaly (30%), fatigue (27%) and night sweats (25%).

With a median follow-up of 28.1 months, there were 32 observed death events [11 (8.1%) and 21 (15.8%) in IMBRUVICA and chlorambucil treatment arms, respectively]. With 41% of patients switching from chlorambucil to IMBRUVICA, the overall survival analysis in the ITT patient population resulted in a statistically significant HR of 0.44 [95% CI (0.21, 0.92)] and 2-year survival rate estimates of 94.7% [95% CI (89.1, 97.4)] and 84.3% [95% CI (76.7, 89.6)] in the IMBRUVICA and chlorambucil arms, respectively.

Efficacy results for RESONATE-2 are shown in [Table 23](#) and the Kaplan-Meier curve for PFS, assessed by an IRC according to IWCLL criteria is shown in [Figure 3](#).

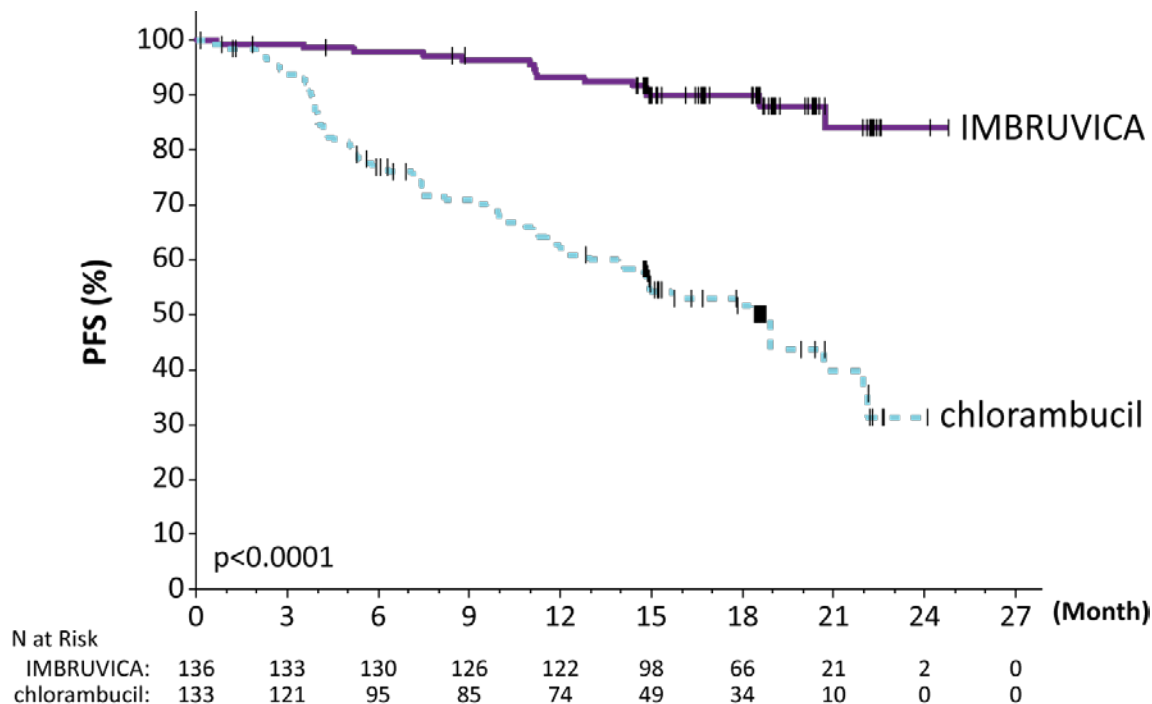
**Table 23: Efficacy Results in Patients with CLL/SLL in RESONATE-2**

Endpoint	IMBRUVICA N=136	Chlorambucil N=133
<b>Progression Free Survival<sup>a</sup></b>		
Number of events (%)	15 (11.0)	64 (48.1)
Disease progression	12	57
Death events	3	7
Median (95% CI), months	NE	18.9 (14.1, 22.0)
HR <sup>b</sup> (95% CI)	0.16 (0.09, 0.28)	
<b>Overall Response Rate<sup>a</sup> (CR + PR)</b>	82.4%	35.3%
P-value	<0.0001	

<sup>a</sup> IRC evaluated; Five subjects (3.7%) in the IMBRUVICA arm and two subjects (1.5%) in the Chlorambucil arm achieved complete response

<sup>b</sup> HR = hazard ratio; NE = not evaluable

**Figure 3: Kaplan-Meier Curve of Progression-Free Survival (ITT Population) in Patients with CLL/SLL in RESONATE-2**



#### 55-Month Follow-Up

With an overall follow-up of 55 months, the median PFS was not reached in the IMBRUVICA arm.

#### HELIOS

The HELIOS study, a randomized, double-blind, placebo-controlled phase 3 study of IMBRUVICA in combination with bendamustine and rituximab (BR) (NCT01611090), was conducted in patients with previously treated CLL or SLL. Patients (n = 578) were randomized 1:1 to receive either IMBRUVICA 420 mg daily or placebo in combination with BR until disease progression, or unacceptable toxicity. All patients received BR for a maximum of six 28-day cycles. Bendamustine was dosed at 70 mg/m<sup>2</sup> infused IV over 30 minutes on Cycle 1, Days 2 and 3, and on Cycles 2-6, Days 1 and 2 for up to 6 cycles, and all patients had a CLCr ≥ 40 mL/min at baseline. Rituximab was administered at a dose of 375 mg/m<sup>2</sup> in the first cycle, Day 1, and 500 mg/m<sup>2</sup> Cycles 2 through 6, Day 1.

The median age was 64 years (range, 31 to 86 years), 66% were male, and 91% were White. All patients had a baseline ECOG performance status of 0 or 1. The median time since diagnosis was 5.9 years and the median number of prior treatments was 2 (range, 1 to 11 treatments). At baseline, 56% of patients had at least one tumor ≥ 5 cm and 26% presented with del11q.

Efficacy results for HELIOS are shown in [Table 24](#) and the Kaplan-Meier curves for PFS are shown in [Figure 4](#).

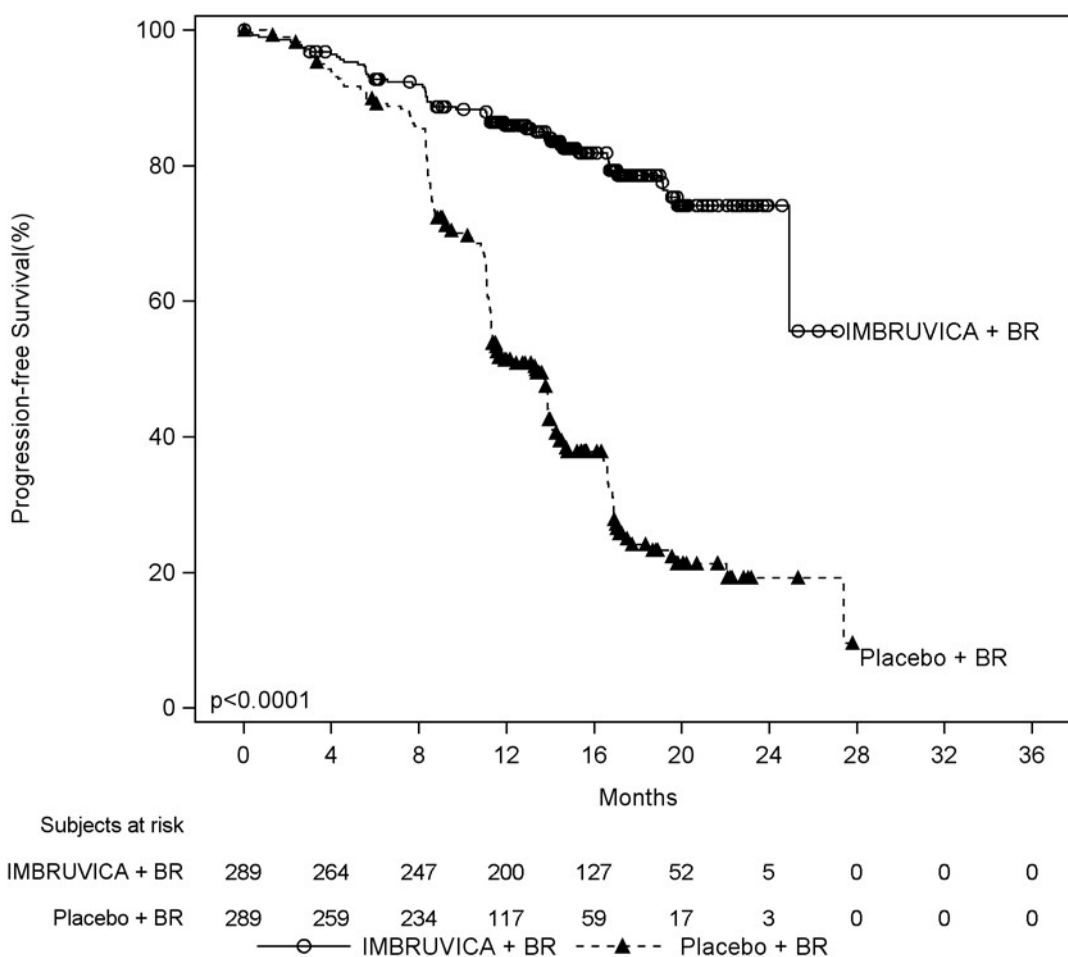
**Table 24: Efficacy Results in Patients with CLL/SLL in HELIOS**

Endpoint	IMBRUVICA + BR N=289	Placebo + BR N=289
<b>Progression Free Survival<sup>a</sup></b>		
Number of events (%)	56 (19.4)	183 (63.3)
Median (95% CI), months	NE	13.3 (11.3, 13.9)
HR (95% CI)	0.20 (0.15, 0.28)	
Overall Response Rate <sup>a</sup>	82.7%	67.8%

<sup>a</sup> IRC evaluated, twenty-four subjects (8.3%) in the IMBRUVICA + BR arm and six subjects (2.1%) in the placebo + BR arm achieved complete response

BR = bendamustine and rituximab; CI = confidence interval; HR = hazard ratio; NE = not evaluable

**Figure 4: Kaplan-Meier Curve of Progression-Free Survival (ITT Population) in Patients with CLL/SLL in HELIOS**



iLLUMINATE

The iLLUMINATE study, a randomized, multi-center, phase 3 study of IMBRUVICA in combination with obinutuzumab versus chlorambucil in combination with obinutuzumab (NCT02264574), was conducted in patients with treatment naïve CLL or SLL. Patients were 65 years of age or older or < 65 years of age with coexisting medical conditions, reduced renal function as measured by creatinine clearance < 70 mL/min, or presence of del 17p/TP53 mutation. Patients (n = 229) were randomized 1:1 to receive either IMBRUVICA 420 mg daily until disease progression or unacceptable toxicity or chlorambucil at a dose of 0.5 mg/kg on Days 1 and 15 of each 28-day cycle for 6 cycles. In both arms, patients received 1,000 mg of obinutuzumab on Days 1, 8, and 15 of the first cycle, followed by treatment on the first day of 5 subsequent cycles (total of 6 cycles, 28 days each). The first dose of obinutuzumab was divided between Day 1 (100 mg) and Day 2 (900 mg).

The median age was 71 years (range, 40 to 87 years), 64% were male, and 96% were White. All patients had a baseline ECOG performance status of 0 (48%) or 1-2 (52%). The trial enrolled 214 patients with CLL and 15 patients with SLL. At baseline, 65% of patients presented with CLL/SLL with high risk factors (del 17p/TP53 mutation [18%], del 11q [15%], or unmutated immunoglobulin heavy-chain variable region (unmutated IGHV) [54%]). The most common reasons for initiating CLL therapy included: lymphadenopathy (38%), night sweats (34%), progressive marrow failure (31%), fatigue (29%), splenomegaly (25%), and progressive lymphocytosis (21%).

With a median follow-up time on study of 31 months, efficacy results for iLLUMINATE assessed by an IRC according to IWCLL criteria are shown in [Table 25](#), and the Kaplan-Meier curve for PFS is shown in [Figure 5](#).

**Table 25: Efficacy Results in Patients with CLL/SLL in iLLUMINATE**

<b>Endpoint</b>	<b>IMBRUVICA + Obinutuzumab N=113</b>	<b>Chlorambucil + Obinutuzumab N=116</b>
<b>Progression Free Survival<sup>a</sup></b>		
Number of events (%)	24 (21)	74 (64)
Disease progression	11	64
Death events	13	10
Median (95% CI), months	NE	19.0 (15.1, 22.1)
HR (95% CI)	0.23 (0.15, 0.37)	
P-value <sup>b</sup>	<0.0001	
<b>Overall Response Rate (%)<sup>a</sup></b>	88.5	73.3
CR <sup>c</sup> (%)	19.5	7.8
PR <sup>d</sup> (%)	69.0	65.5

<sup>a</sup> IRC-evaluated

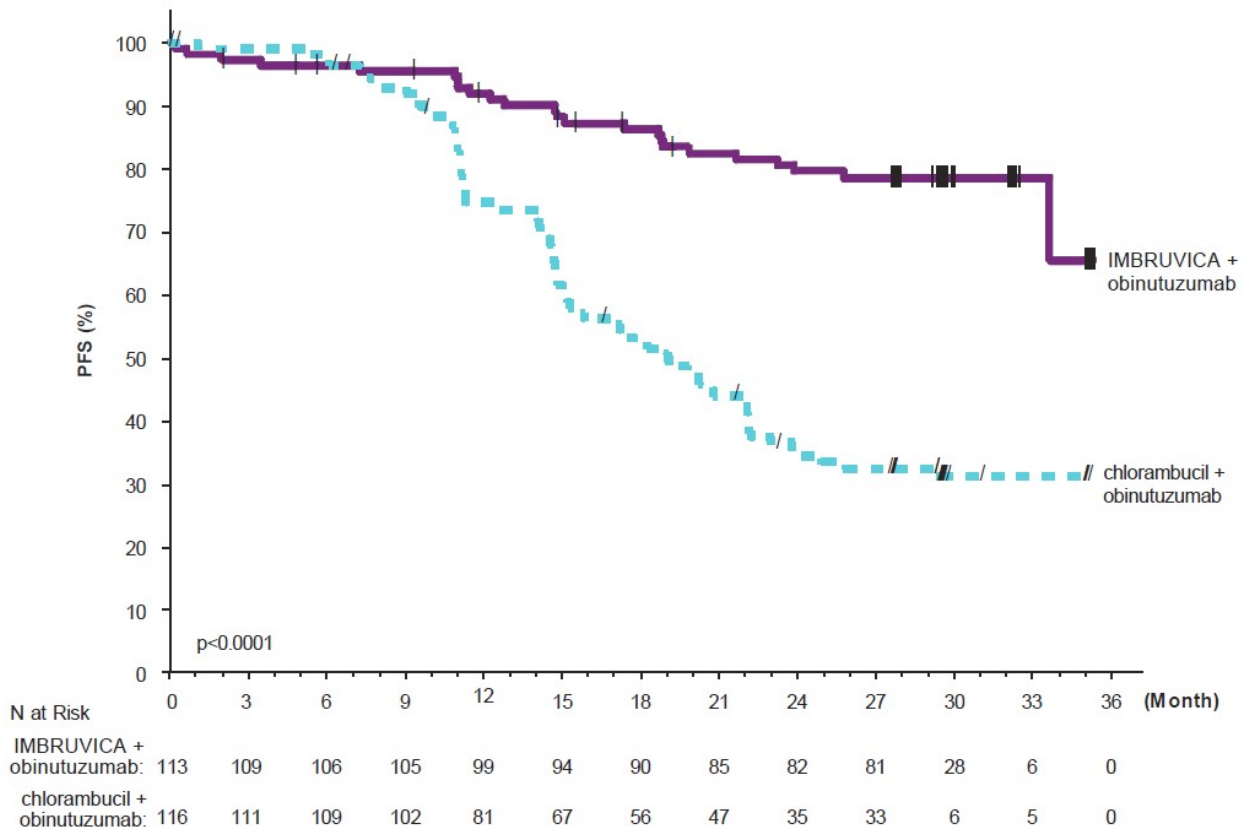
<sup>b</sup> P-value is from unstratified log-rank test

<sup>c</sup> Includes 1 patient in the IMBRUVICA + obinutuzumab arm with a complete response with incomplete marrow recovery (CRi)

<sup>d</sup> PR = nPR + PR

HR = hazard ratio; NE = not evaluable

**Figure 5: Kaplan-Meier Curve of Progression-Free Survival (ITT Population) in Patients with CLL/SLL in iLLUMINATE**



In the high risk CLL/SLL population (del 17p/TP53 mutation, del 11q, or unmutated IGHV), the PFS HR was 0.15 [95% CI (0.09, 0.27)].

### Lymphocytosis

Upon initiation of single-agent IMBRUVICA, an increase in lymphocyte counts (i.e.,  $\geq 50\%$  increase from baseline and above absolute lymphocyte count of 5,000/mcL) occurred in 66% of patients in the CLL studies. The onset of isolated lymphocytosis occurs during the first month of IMBRUVICA therapy and resolves by a median of 14 weeks (range, 0.1 to 104 weeks). When IMBRUVICA was administered in combination, lymphocytosis was 7% with IMBRUVICA + BR versus 6% with placebo + BR and 7% with IMBRUVICA + obinutuzumab versus 1% with chlorambucil + obinutuzumab.

### **16.3 Waldenström’s Macroglobulinemia**

The safety and efficacy of IMBRUVICA in patients with WM were demonstrated in two single-arm trials and one randomized, controlled trial.

#### Study 1118 and INNOVATE Monotherapy Arm

Study 1118 (NCT01614821), an open-label, multi-center, single-arm trial was conducted in 63 previously treated patients with WM. IMBRUVICA was administered orally at 420 mg once daily until disease progression or unacceptable toxicity. The responses were assessed by investigators and an IRC using criteria adopted from the International Workshop of Waldenström's Macroglobulinemia.

The median age was 63 years (range, 44 to 86 years), 76% were male, and 95% were White. All patients had a baseline ECOG performance status of 0 or 1. The median time since diagnosis was 74 months, and the median number of prior treatments was 2 (range, 1 to 11 treatments). At baseline, the median serum IgM value was 3.5 g/dL (range, 0.7 to 8.4 g/dL). Responses, defined as partial response or better, per IRC are shown in Table 27.

**Table 27: Response Rate and Duration of Response (DOR) Based on IRC Assessment in Patients with WM in Study 1118**

	Total (N=63)
Response rate (CR+VGPR+PR), (%)	61.9
95% CI (%)	(48.8, 73.9)
Complete Response (CR)	0
Very Good Partial Response (VGPR), (%)	11.1
Partial Response (PR), (%)	50.8
Median duration of response, months (range)	NE (2.8+, 18.8+)

CI = confidence interval; NE = not evaluable

The median time to response was 1.2 months (range, 0.7-13.4 months).

The INNOVATE monotherapy arm included 31 patients with previously treated WM who failed prior rituximab-containing therapy and received single-agent IMBRUVICA. The median age was 67 years (range, 47 to 90 years). Eighty-one percent of patients had a baseline ECOG performance status of 0 or 1, and 19% had a baseline ECOG performance status of 2. The median number of prior treatments was 4 (range, 1 to 7 treatments). With an overall follow-up of 61 months, the response rate observed in the INNOVATE monotherapy arm per IRC assessment was 77% (0% CR, 29% VGPR, 48% PR). The median duration of response was 33 months (range, 2.4 to 60.2+ months).

### INNOVATE

The INNOVATE study, a randomized, double-blind, placebo-controlled, phase 3 study of IMBRUVICA or placebo in combination with rituximab (NCT02165397), was conducted in treatment naïve or previously treated patients with WM. Patients (n = 150) were randomized 1:1 to receive either IMBRUVICA 420 mg daily or placebo in combination with rituximab until disease progression or unacceptable toxicity. Rituximab was administered weekly at a dose of 375 mg/m<sup>2</sup> for 4 consecutive weeks (weeks 1-4) followed by a second course of weekly rituximab for 4 consecutive weeks (weeks 17-20). The major efficacy outcome measure is progression-free survival (PFS) assessed by an IRC with additional efficacy measure of response rate.



The median age was 69 years (range, 36 to 89 years), 66% were male, and 79% were White. Ninety-three percent of patients had a baseline ECOG performance status of 0 or 1, and 7% of patients had a baseline ECOG performance status of 2. Forty-five percent of patients were treatment naïve, and 55% of patients were previously treated. Among previously treated patients, the median number of prior treatments was 2 (range, 1 to 6 treatments). At baseline, the median serum IgM value was 3.2 g/dL (range, 0.6 to 8.3 g/dL), and MYD88 L265P mutations were present in 77% of patients, absent in 13% of patients, and 9% of patients were not evaluable for mutation status.

An exploratory analysis demonstrated a sustained hemoglobin improvement (defined as increase of  $\geq 2$  g/dL over baseline for at least 8 weeks without blood transfusions or growth factor support) in 65% of patients in the IMBRUVICA + R group and 39% of patients in the placebo + R group.

With an overall follow-up of 63 months, efficacy results as assessed by an IRC at the time of the final analysis for INNOVATE are shown in Table 28, and the Kaplan-Meier curves for PFS are shown in Figure 7.

**Table 28 Efficacy Results in Patients with WM by IRC in INNOVATE (Final Analysis)**

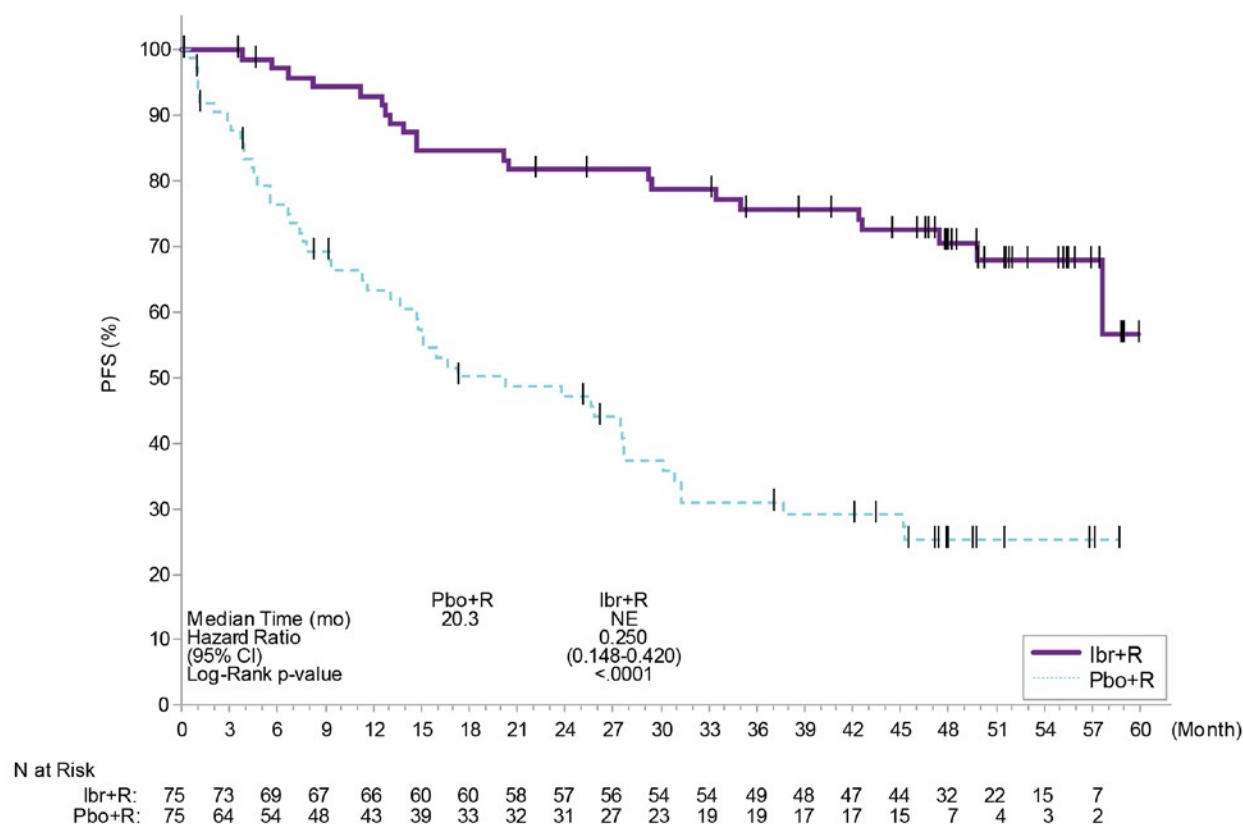
<b>Endpoint</b>	<b>IMBRUVICA + R N=75</b>	<b>Placebo + R N=75</b>
<b>Progression Free Survival</b>		
Number of events (%)	22 (29)	50 (67)
Median (95% CI), months	NE (57.7, NE)	20.3 (13.0, 27.6)
HR (95% CI)	0.25 (0.15, 0.42)	
P-value <sup>a</sup>	<0.0001	
<b>Response Rate (CR+VGPR+PR)<sup>b</sup></b>	76%	31%
95% CI (%)	(65, 85)	(21, 42)
Complete Response (CR)	1%	1%
Very Good Partial Response (VGPR)	29%	4%
Partial Response (PR)	45%	25%
Median duration of response, months (range)	NE (1.9+, 58.9+)	NE (4.6+, 49.7+)

CI = confidence interval; HR = hazard ratio; NE = not evaluable; R = rituximab

<sup>a</sup> P-value is from the stratified log-rank test

<sup>b</sup> P-value associated with response rate was <0.0001

**Figure 7: Kaplan-Meier Curve of Progression-Free Survival (ITT Population) in Patients with WM in INNOVATE**



Median overall survival was not reached for either treatment arm. With an overall follow-up of 63 months, 9 (12%) patients on IMBRUVICA + R and 10 (13.3%) patients on placebo + R had died. Forty-seven percent of patients randomized to the placebo + R arm crossed over to receive IMBRUVICA.

### 16.4 Marginal Zone Lymphoma

The safety and efficacy of IMBRUVICA in MZL were evaluated in Study 1121 (NCT01980628), an open-label, multi-center, single-arm trial of patients who received at least one prior therapy. IMBRUVICA was administered orally at 560 mg once daily until disease progression or unacceptable toxicity. The responses were assessed by investigators and an IRC using criteria adopted from the International Working Group criteria for malignant lymphoma.

The efficacy analysis included 63 patients with 3 sub-types of MZL: mucosa-associated lymphoid tissue (MALT; N=32), nodal (N=17), and splenic (N=14). The median age was 66 years (range, 30 to 92 years), 59% were female, and 84% were White. Ninety two percent of patients had a baseline ECOG performance status of 0 or 1 and 8% had ECOG performance status 2. The median time since diagnosis was 3.8 years, and the median number of prior treatments was 2 (range, 1 to 9 treatments). Responses per IRC are shown in [Table 29](#).

**Table 29: Overall Response Rate (ORR) and Duration of Response (DOR) Based on IRC Assessment in Patients with MZL in Study 1121**

	<b>Total (N=63)</b>
Response rate (CR + PR), (%)	46.0%
95% CI (%)	(33.4, 59.1)
Complete Response (CR), (%)	3.2
Partial Response (PR), (%)	42.9
Median duration of response, months (range)	NE (16.7, NE)

CI = confidence interval; NE = not evaluable

Median follow-up time on study = 19.4 months

The median time to response was 4.5 months (range, 2.3 to 16.4 months). Overall response rates were 46.9%, 41.2%, and 50.0% for the 3 MZL sub-types (MALT, nodal, splenic), respectively.

### 16.5 Chronic Graft versus Host Disease

The safety and efficacy of IMBRUVICA in cGVHD were evaluated in Study 1129 (NCT02195869), an open-label, multi-center, single-arm trial of 42 patients with cGVHD after failure of first line corticosteroid therapy and requiring additional therapy. IMBRUVICA was administered orally at 420 mg once daily. The responses were assessed by investigators using the 2005 National Institute of Health (NIH) Consensus Panel Response Criteria with two modifications to align with the updated 2014 NIH Consensus Panel Response Criteria. The median age was 56 years (range, 19 to 74 years), 52% were male, and 93% were White. The most common underlying malignancies leading to transplantation were acute lymphocytic leukemia, acute myeloid leukemia, and CLL. The median time since cGVHD diagnosis was 14 months, the median number of prior cGVHD treatments was 2 (range, 1 to 3 treatments), and 60% of patients had a Karnofsky performance score of  $\leq 80$ . The majority of patients (88 %) had at least 2 organs involved at baseline, with the most commonly involved organs being mouth (86%), skin (81%), and gastrointestinal tract (33%). The median daily corticosteroid dose (prednisone or prednisone equivalent) at baseline was 0.3 mg/kg/day, and 52% of patients were receiving ongoing immunosuppressants in addition to systemic corticosteroids at baseline. Prophylaxis for infections were managed per institutional guidelines with 79% of patients receiving combinations of sulfonamides and trimethoprim and 64% receiving triazole derivatives. Efficacy results are shown in [Table 30](#).

**Table 30: Best Overall Response Rate (ORR) and Sustained Response Rate Based on Investigator Assessment<sup>a</sup> in Patients with cGVHD in Study 1129**

	<b>Total (N=42)</b>
ORR	28 (67%)
95% CI	(51%, 80%)
Complete Response (CR)	9 (21%)
Partial Response (PR)	19 (45%)

Sustained response rate <sup>b</sup>	20 (48%)
--------------------------------------	----------

CI = confidence interval

<sup>a</sup> Investigator assessment based on the 2005 NIH Response Criteria with two modifications (added “not evaluable” for organs with non-cGVHD abnormalities, and organ score change from 0 to 1 was not considered disease progression)

<sup>b</sup> Sustained response rate is defined as the proportion of patients who achieved a CR or PR that was sustained for at least 20 weeks.

The median time to response coinciding with the first scheduled response assessment was 12.3 weeks (range, 4.1 to 42.1 weeks). Responses were seen across all organs involved for cGVHD (skin, mouth, gastrointestinal tract, and liver).

ORR results were supported by exploratory analyses of patient-reported symptom bother which showed at least a 7-point decrease in Lee Symptom Scale overall summary score in 24% (10/42) of patients on at least 2 consecutive visits.

## 17 PHARMACEUTICAL PARTICULARS

### 17.1 List of excipients

Capsules

Microcrystalline cellulose

Crosscarmellos sodium

Sodium lauryl sulfate

Magnesium Stearate

Size 0, white, opaque, hard gelatin capsule with black “iiibr” 140mg” print

Quantitative Composition of Colorcon Opacode® Printing Ink Black S-1-17822 Printing ink-Shellac Glaze-45% (20% esterified) in ethanol

Iron Oxide Black

n-Butyl Alcohol

2-Propanol

Propylene Glycol

Ammonium Hydroxide 28%

Quantitative Composition of Colorcon Opacode® Printing Ink Black S-1-17823 Printing ink-Shellac Glaze-45% (20% esterified) in ethanol

2-Propanol

Iron Oxide Black

n-Butyl Alcohol

Propylene Glycol

Ammonium Hydroxide 28%

#### *Tablets:*

Lactose monohydrate,

Croscarmellose sodium

Microcrystalline cellulose

Povidone

Sodium lauryl sulfate

Colloidal anhydrous silica

Magnesium stearate

Imbruvica 140 mg Tablet: Opadry II Film Coating Powder 85F210036 Green (Polyvinyl alcohol, Titanium

Dioxide, Macrogol, Talc, Yellow Iron Oxide, Black Iron Oxide)

Imbruvica 280mg Tablet: Opadry II Film Coating Powder 85F200011 Purple (Polyvinyl alcohol, Titanium Dioxide, Macrogol, Talc, Black Iron Oxide, Red Iron Oxide)

Imbruvica 420mg Tablet: Opadry II Film Coating Powder 85F210036 Green (Polyvinyl alcohol, Titanium Dioxide, Macrogol, Talc, Yellow Iron Oxide, Black Iron Oxide)

Imbruvica 560mg Tablet: Opadry II Film Coating Powder 85F32547 Yellow (Polyvinyl alcohol, Titanium Dioxide, Macrogol, Talc, Yellow Iron Oxide, Red Iron Oxide)

## 17.2 Shelf life

The expiry date of the product for Capsules and Tablets is indicated on the packaging materials

## 18 HOW SUPPLIED/STORAGE AND HANDLING

### Capsules

The 140 mg capsules are supplied as white opaque hard gelatin capsules, marked with “ibr 140 mg” in black ink, containing off white to white powder and are available in white HDPE bottles with a child-resistant closure and foil induction seal::

- 90 capsules per bottle
- 120 capsules per bottle

Store bottles at room temperature 20°C to 25°C Excursions are permitted between 15°C and 30°C Retain in original package until dispensing.

The product should be used within 120 days from first opening

### Tablets

The IMBRUVICA (ibrutinib) tablets are supplied in 4 strengths in the following packaging configurations:

- 140 mg tablets: Yellow green to green round tablets debossed with “ibr” on one side and “140” on the other side. Carton of one folded blister card containing two 15-count blister strips for a total of 30 tablets
- 280 mg tablets: Purple oblong tablets debossed with “ibr” on one side and “280” on the other side. Carton of one folded blister card containing two 15-count blister strips for a total of 30 tablets
- 420 mg tablets: Yellow green to green oblong tablets debossed with “ibr” on one side and “420” on the other side. Carton of one folded blister card containing two 15-count blister strips for a total of 30 tablets
- 560 mg tablets: Yellow to orange oblong tablets debossed with “ibr” on one side and “560” on the other side. Carton of one folded blister card containing two 15-count blister

strips for a total of 30 tablets

Store tablets in original packaging at room temperature 20°C to 25°C. Excursions are permitted between 15°C and 30°C

The product should be swallowed whole with a glass of water without opening, breaking or chewing the capsules or cutting, crushing or chewing the tablets approximately the same time each day.

**Importer and Marketing authorization holder:** J-C Health Care Ltd., Kibbutz Shefayim 6099000, Israel

**Revised in JUL2021 according to MoH guidelines**