

## 1. NAME OF THE MEDICINAL PRODUCT

Xarelto 15 mg film-coated tablets

## 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each film-coated tablet contains 15 mg rivaroxaban.

### Excipient with known effect

Each film-coated tablet contains 24.13 mg lactose (as monohydrate), see section 4.4.

For the full list of excipients, see section 6.1.

## 3. PHARMACEUTICAL FORM

Film-coated tablet (tablet)

Red, round biconvex tablets (6 mm diameter, 9 mm radius of curvature) marked with the BAYER-cross on one side and "15" and a triangle on the other side.

## 4. CLINICAL PARTICULARS

### 4.1 Therapeutic indications

Prevention of stroke and systemic embolism in adult patients with non-valvular atrial fibrillation with one or more risk factors, such as congestive heart failure, hypertension, age  $\geq$  75 years, diabetes mellitus, prior stroke or transient ischaemic attack.

Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE), and prevention of recurrent DVT and PE in adults. (See section 4.4 for haemodynamically unstable PE patients.)

### 4.2 Posology and method of administration

#### Posology

##### *Prevention of stroke and systemic embolism*

The recommended dose is 20 mg once daily, which is also the recommended maximum dose.

Therapy with Xarelto should be continued long term provided the benefit of prevention of stroke and systemic embolism outweighs the risk of bleeding (see section 4.4).

If a dose is missed the patient should take Xarelto immediately and continue on the following day with the once daily intake as recommended. The dose should not be doubled within the same day to make up for a missed dose.

##### *Treatment of DVT, treatment of PE and prevention of recurrent DVT and PE*

The recommended dose for the initial treatment of acute DVT or PE is 15 mg twice daily for the first three weeks followed by 20 mg once daily for the continued treatment and prevention of recurrent DVT and PE.

Short duration of therapy (at least 3 months) should be considered in patients with DVT or PE provoked by major transient risk factors (i.e. recent major surgery or trauma). Longer duration of therapy should be considered in patients with provoked DVT or PE not related to major transient risk factors, unprovoked DVT or PE, or a history of recurrent DVT or PE.

When extended prevention of recurrent DVT and PE is indicated (following completion of at least 6 months therapy for DVT or PE), the recommended dose is 10 mg once daily. In patients in whom the risk of recurrent DVT or PE is considered high, such as those with complicated comorbidities, or who have developed recurrent DVT or PE on extended prevention with Xarelto 10 mg once daily, a dose of Xarelto 20 mg once daily should be considered.

The duration of therapy and dose selection should be individualised after careful assessment of the treatment benefit against the risk for bleeding (see section 4.4).

|  | <b>Time period</b>  | <b>Dosing schedule</b>               | <b>Total daily dose</b> |
|--|---|--------------------------------------|-------------------------|
| Treatment and prevention of recurrent DVT and PE | Day 1 - 21  | 15 mg twice daily                    | 30 mg                   |
|  | Day 22 onwards  | 20 mg once daily                     | 20 mg                   |
| Prevention of recurrent DVT and PE               | Following completion of at least 6 months therapy for DVT or PE | 10 mg once daily or 20 mg once daily | 10 mg or 20 mg          |

To support the dose switch from 15 mg to 20 mg after Day 21 a first 4 weeks treatment initiation pack of Xarelto for treatment of DVT/PE is available.

If a dose is missed during the 15 mg twice daily treatment phase (day 1 - 21), the patient should take Xarelto immediately to ensure intake of 30 mg Xarelto per day. In this case two 15 mg tablets may be taken at once. The patient should continue with the regular 15 mg twice daily intake as recommended on the following day.

If a dose is missed during the once daily treatment phase, the patient should take Xarelto immediately, and continue on the following day with the once daily intake as recommended. The dose should not be doubled within the same day to make up for a missed dose.

#### *Converting from Vitamin K Antagonists (VKA) to Xarelto*

- Prevention of stroke and systemic embolism:  
VKA treatment should be stopped and Xarelto therapy should be initiated when the International Normalised Ratio (INR) is  $\leq 3.0$ .
- Treatment of DVT, PE and prevention of recurrence:  
VKA treatment should be stopped and Xarelto therapy should be initiated once the INR is  $\leq 2.5$ .

When converting patients from VKAs to Xarelto, INR values will be falsely elevated after the intake of Xarelto. The INR is not valid to measure the anticoagulant activity of Xarelto, and therefore should not be used (see section 4.5).

#### *Converting from Xarelto to Vitamin K antagonists (VKA)*

There is a potential for inadequate anticoagulation during the transition from Xarelto to VKA. Continuous adequate anticoagulation should be ensured during any transition to an alternate anticoagulant. It should be noted that Xarelto can contribute to an elevated INR.

In patients converting from Xarelto to VKA, VKA should be given concurrently until the INR is  $\geq 2.0$ . For the first two days of the conversion period, standard initial dosing of VKA should be used followed by VKA dosing, as guided by INR testing. While patients are on both Xarelto and VKA the INR should not be tested earlier than 24 hours after the previous dose but prior to the next dose of Xarelto. Once Xarelto is discontinued INR testing may be done reliably at least 24 hours after the last dose (see sections 4.5 and 5.2).

#### *Converting from parenteral anticoagulants to Xarelto*

For patients currently receiving a parenteral anticoagulant, discontinue the parenteral anticoagulant and start Xarelto 0 to 2 hours before the time that the next scheduled administration of the parenteral medicinal product (e.g. low molecular weight heparins) would be due or at the time of discontinuation of a continuously administered parenteral medicinal product (e.g. intravenous unfractionated heparin).

### *Converting from Xarelto to parenteral anticoagulants*

Discontinue Xarelto and give the first dose of parenteral anticoagulant at the time the next Xarelto dose would be taken.

### *Special populations*

#### Renal impairment

Limited clinical data for patients with severe renal impairment (creatinine clearance 15 - 29 ml/min) indicate that rivaroxaban plasma concentrations are significantly increased. Therefore, Xarelto is to be used with caution in these patients. Use is not recommended in patients with creatinine clearance < 15 ml/min (see sections 4.4 and 5.2).

In patients with moderate (creatinine clearance 30 - 49 ml/min) or severe (creatinine clearance 15-29 ml/min) renal impairment the following dose recommendations apply:

- For the prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation, the recommended dose is 15 mg once daily (see section 5.2).
- For the treatment of DVT, treatment of PE and prevention of recurrent DVT and PE: patients should be treated with 15 mg twice daily for the first 3 weeks. Thereafter, when the recommended dose is 20 mg once daily, a reduction of the dose from 20 mg once daily to 15 mg once daily should be considered if the patient's assessed risk for bleeding outweighs the risk for recurrent DVT and PE. The recommendation for the use of 15 mg is based on PK modelling and has not been studied in this clinical setting (see sections 4.4, 5.1 and 5.2).  
When the recommended dose is 10 mg once daily, no dose adjustment from the recommended dose is necessary.

No dose adjustment is necessary in patients with mild renal impairment (creatinine clearance 50 - 80 ml/min) (see section 5.2).

#### Hepatic impairment

Xarelto is contraindicated in patients with hepatic disease associated with coagulopathy and clinically relevant bleeding risk including cirrhotic patients with Child Pugh B and C (see sections 4.3 and 5.2).

#### Elderly population

No dose adjustment (see section 5.2)

#### Body weight

No dose adjustment (see section 5.2)

#### Gender

No dose adjustment (see section 5.2)

#### Patients undergoing cardioversion

Xarelto can be initiated or continued in patients who may require cardioversion.

For transesophageal echocardiogram (TEE) guided cardioversion in patients not previously treated with anticoagulants, Xarelto treatment should be started at least 4 hours before cardioversion to ensure adequate anticoagulation (see sections 5.1 and 5.2). For all patients, confirmation should be sought prior to cardioversion that the patient has taken Xarelto as prescribed. Decisions on initiation and duration of treatment should take established guideline recommendations for anticoagulant treatment in patients undergoing cardioversion into account.

#### Patients with non-valvular atrial fibrillation who undergo PCI (percutaneous coronary intervention) with stent placement

There is limited experience of a reduced dose of 15 mg Xarelto once daily (or 10 mg Xarelto once daily for patients with moderate renal impairment [creatinine clearance 30 - 49 ml/min]) in addition to a P2Y12 inhibitor for a maximum of 12 months in patients with non-valvular atrial fibrillation who require oral anticoagulation and undergo PCI with stent placement (see sections 4.4 and 5.1).

### Paediatric population

The safety and efficacy of Xarelto in children aged 0 to < 18 years have not been established in the indication prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation.

No data are available. Therefore, it is not recommended for use in children below 18 years of age in indications other than the treatment of VTE and prevention of VTE recurrence.

### Method of administration

Xarelto is for oral use.

The tablets are to be taken with food (see section 5.2).

### Crushing of tablets

For patients who are unable to swallow whole tablets, Xarelto tablet may be crushed and mixed with water or apple puree immediately prior to use and administered orally. After the administration of crushed Xarelto 15 mg or 20 mg film-coated tablets, the dose should be immediately followed by food.

The crushed tablet may also be given through gastric tubes (see sections 5.2 and 6.6).

## **4.3 Contraindications**

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

Active clinically significant bleeding.

Lesion or condition, if considered to be a significant risk for major bleeding. This may include current or recent gastrointestinal ulceration, presence of malignant neoplasms at high risk of bleeding, recent brain or spinal injury, recent brain, spinal or ophthalmic surgery, recent intracranial haemorrhage, known or suspected oesophageal varices, arteriovenous malformations, vascular aneurysms or major intraspinal or intracerebral vascular abnormalities.

Concomitant treatment with any other anticoagulants, e.g. unfractionated heparin (UFH), low molecular weight heparins (enoxaparin, dalteparin, etc.), heparin derivatives (fondaparinux, etc.), oral anticoagulants (warfarin, dabigatran etexilate, apixaban, etc.) except under specific circumstances of switching anticoagulant therapy (see section 4.2) or when UFH is given at doses necessary to maintain an open central venous or arterial catheter (see section 4.5).

Hepatic disease associated with coagulopathy and clinically relevant bleeding risk including cirrhotic patients with Child Pugh B and C (see section 5.2).

Pregnancy and breast-feeding (see section 4.6).

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

Clinical surveillance in line with anticoagulation practice is recommended throughout the treatment period.

### Haemorrhagic risk

As with other anticoagulants, patients taking Xarelto are to be carefully observed for signs of bleeding. It is recommended to be used with caution in conditions with increased risk of haemorrhage. Xarelto administration should be discontinued if severe haemorrhage occurs (see section 4.9).

In the clinical studies mucosal bleedings (i.e. epistaxis, gingival, gastrointestinal, genito urinary including abnormal vaginal or increased menstrual bleeding) and anaemia were seen more frequently during long term rivaroxaban treatment compared with VKA treatment. Thus, in addition to adequate clinical surveillance, laboratory testing of haemoglobin/haematocrit could be of value to detect occult bleeding and quantify the clinical relevance of overt bleeding, as judged to be appropriate.

Several sub-groups of patients, as detailed below, are at increased risk of bleeding. These patients are to be carefully monitored for signs and symptoms of bleeding complications and anaemia after initiation of treatment (see section 4.8).

Any unexplained fall in haemoglobin or blood pressure should lead to a search for a bleeding site.

Although treatment with rivaroxaban does not require routine monitoring of exposure, rivaroxaban levels measured with a calibrated quantitative anti-factor Xa assay may be useful in exceptional situations where knowledge of rivaroxaban exposure may help to inform clinical decisions, e.g. overdose and emergency surgery (see sections 5.1 and 5.2).

#### Renal impairment

In patients with severe renal impairment (creatinine clearance < 30 ml/min) rivaroxaban plasma levels may be significantly increased (1.6 fold on average) which may lead to an increased bleeding risk.

Xarelto is to be used with caution in patients with creatinine clearance 15 - 29 ml/min. Use is not recommended in patients with creatinine clearance < 15 ml/min (see sections 4.2 and 5.2).

Xarelto should be used with caution in patients with renal impairment concomitantly receiving other medicinal products which increase rivaroxaban plasma concentrations (see section 4.5).

#### Interaction with other medicinal products

The use of Xarelto is not recommended in patients receiving concomitant systemic treatment with azole-antimycotics (such as ketoconazole, itraconazole, voriconazole and posaconazole) or HIV protease inhibitors (e.g. ritonavir). These active substances are strong inhibitors of both CYP3A4 and P-gp and therefore may increase rivaroxaban plasma concentrations to a clinically relevant degree (2.6 fold on average) which may lead to an increased bleeding risk (see section 4.5).

Care is to be taken if patients are treated concomitantly with medicinal products affecting haemostasis such as non-steroidal anti-inflammatory medicinal products (NSAIDs), acetylsalicylic acid and platelet aggregation inhibitors or selective serotonin reuptake inhibitors (SSRIs), and serotonin norepinephrine reuptake inhibitors (SNRIs). For patients at risk of ulcerative gastrointestinal disease an appropriate prophylactic treatment may be considered (see section 4.5).

#### Other haemorrhagic risk factors

As with other antithrombotics, rivaroxaban is not recommended in patients with an increased bleeding risk such as:

- congenital or acquired bleeding disorders
- uncontrolled severe arterial hypertension
- other gastrointestinal disease without active ulceration that can potentially lead to bleeding complications (e.g. inflammatory bowel disease, oesophagitis, gastritis and gastroesophageal reflux disease)
- vascular retinopathy
- bronchiectasis or history of pulmonary bleeding

#### Patients with cancer

Patients with malignant disease may simultaneously be at higher risk of bleeding and thrombosis. The individual benefit of antithrombotic treatment should be weighed against risk for bleeding in patients with active cancer dependent on tumour location, antineoplastic therapy and stage of disease. Tumours located in the gastrointestinal or genitourinary tract have been associated with an increased risk of bleeding during rivaroxaban therapy.

In patients with malignant neoplasms at high risk of bleeding, the use of rivaroxaban is contraindicated (see section 4.3).

#### Patients with prosthetic valves

Rivaroxaban should not be used for thromboprophylaxis in patients having recently undergone transcatheter aortic valve replacement (TAVR). Safety and efficacy of Xarelto have not been studied in patients with prosthetic heart valves; therefore, there are no data to support that Xarelto provides adequate anticoagulation in this patient population. Treatment with Xarelto is not recommended for these patients.

#### Patients with antiphospholipid syndrome

Direct acting Oral Anticoagulants (DOACs) including rivaroxaban are not recommended for patients with a history of thrombosis who are diagnosed with antiphospholipid syndrome. In particular for patients that are triple positive (for lupus anticoagulant, anticardiolipin antibodies, and anti-beta 2-glycoprotein I antibodies), treatment with DOACs could be associated with increased rates of recurrent thrombotic events compared with vitamin K antagonist therapy.

#### Patients with non-valvular atrial fibrillation who undergo PCI with stent placement

Clinical data are available from an interventional study with the primary objective to assess safety in patients with non-valvular atrial fibrillation who undergo PCI with stent placement. Data on efficacy in this population are limited (see sections 4.2 and 5.1). No data are available for such patients with a history of stroke/ transient ischaemic attack (TIA).

#### Haemodynamically unstable PE patients or patients who require thrombolysis or pulmonary embolectomy

Xarelto is not recommended as an alternative to unfractionated heparin in patients with pulmonary embolism who are haemodynamically unstable or may receive thrombolysis or pulmonary embolectomy since the safety and efficacy of Xarelto have not been established in these clinical situations.

#### Spinal/epidural anaesthesia or puncture

When neuraxial anaesthesia (spinal/epidural anaesthesia) or spinal/epidural puncture is employed, patients treated with antithrombotic agents for prevention of thromboembolic complications are at risk of developing an epidural or spinal haematoma which can result in long-term or permanent paralysis. The risk of these events may be increased by the post-operative use of indwelling epidural catheters or the concomitant use of medicinal products affecting haemostasis. The risk may also be increased by traumatic or repeated epidural or spinal puncture. Patients are to be frequently monitored for signs and symptoms of neurological impairment (e.g. numbness or weakness of the legs, bowel or bladder dysfunction). If neurological compromise is noted, urgent diagnosis and treatment is necessary. Prior to neuraxial intervention the physician should consider the potential benefit versus the risk in anticoagulated patients or in patients to be anticoagulated for thromboprophylaxis. There is no clinical experience with the use of 15 mg rivaroxaban in these situations.

To reduce the potential risk of bleeding associated with the concurrent use of rivaroxaban and neuraxial (epidural/spinal) anaesthesia or spinal puncture, consider the pharmacokinetic profile of rivaroxaban. Placement or removal of an epidural catheter or lumbar puncture is best performed when the anticoagulant effect of rivaroxaban is estimated to be low. However, the exact timing to reach a sufficiently low anticoagulant effect in each patient is not known and should be weighed against the urgency of a diagnostic procedure.

For the removal of an epidural catheter and based on the general PK characteristics at least 2x half-life, i.e. at least 18 hours in young patients and 26 hours in elderly patients should elapse after the last administration of rivaroxaban (see section 5.2). Following removal of the catheter, at least 6 hours should elapse before the next rivaroxaban dose is administered.

If traumatic puncture occurs the administration of rivaroxaban is to be delayed for 24 hours.

#### Dosing recommendations before and after invasive procedures and surgical intervention

If an invasive procedure or surgical intervention is required, Xarelto 15 mg should be stopped at least 24 hours before the intervention, if possible and based on the clinical judgement of the physician.

If the procedure cannot be delayed the increased risk of bleeding should be assessed against the urgency of the intervention.

Xarelto should be restarted as soon as possible after the invasive procedure or surgical intervention provided the clinical situation allows and adequate haemostasis has been established as determined by the treating physician (see section 5.2).

#### Elderly population

Increasing age may increase haemorrhagic risk (see section 5.2).

### Dermatological reactions

Serious skin reactions, including Stevens-Johnson syndrome/toxic epidermal necrolysis and DRESS syndrome, have been reported during post-marketing surveillance in association with the use of rivaroxaban (see section 4.8). Patients appear to be at highest risk for these reactions early in the course of therapy: the onset of the reaction occurring in the majority of cases within the first weeks of treatment. Rivaroxaban should be discontinued at the first appearance of a severe skin rash (e.g. spreading, intense and/or blistering), or any other sign of hypersensitivity in conjunction with mucosal lesions.

### Information about excipients

Xarelto contains lactose. Patients with rare hereditary problems of galactose intolerance, total lactase deficiency or glucose-galactose malabsorption should not take this medicinal product.

This medicinal product contains less than 1 mmol sodium (23 mg) per dosage unit, that is to say essentially “sodium-free”.

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

### CYP3A4 and P-gp inhibitors

Co-administration of rivaroxaban with ketoconazole (400 mg once a day) or ritonavir (600 mg twice a day) led to a 2.6 fold / 2.5 fold increase in mean rivaroxaban AUC and a 1.7 fold / 1.6 fold increase in mean rivaroxaban  $C_{max}$ , with significant increases in pharmacodynamic effects which may lead to an increased bleeding risk. Therefore, the use of Xarelto is not recommended in patients receiving concomitant systemic treatment with azole-antimycotics such as ketoconazole, itraconazole, voriconazole and posaconazole or HIV protease inhibitors. These active substances are strong inhibitors of both CYP3A4 and P-gp (see section 4.4).

Active substances strongly inhibiting only one of the rivaroxaban elimination pathways, either CYP3A4 or P-gp, are expected to increase rivaroxaban plasma concentrations to a lesser extent. Clarithromycin (500 mg twice a day), for instance, considered as a strong CYP3A4 inhibitor and moderate P-gp inhibitor, led to a 1.5 fold increase in mean rivaroxaban AUC and a 1.4 fold increase in  $C_{max}$ . The interaction with clarithromycin is likely not clinically relevant in most patients but can be potentially significant in high-risk patients. (For patients with renal impairment: see section 4.4).

Erythromycin (500 mg three times a day), which inhibits CYP3A4 and P-gp moderately, led to a 1.3 fold increase in mean rivaroxaban AUC and  $C_{max}$ . The interaction with erythromycin is likely not clinically relevant in most patients but can be potentially significant in high-risk patients. In subjects with mild renal impairment erythromycin (500 mg three times a day) led to a 1.8 fold increase in mean rivaroxaban AUC and 1.6 fold increase in  $C_{max}$  when compared to subjects with normal renal function. In subjects with moderate renal impairment, erythromycin led to a 2.0 fold increase in mean rivaroxaban AUC and 1.6 fold increase in  $C_{max}$  when compared to subjects with normal renal function. The effect of erythromycin is additive to that of renal impairment (see section 4.4).

Fluconazole (400 mg once daily), considered as a moderate CYP3A4 inhibitor, led to a 1.4 fold increase in mean rivaroxaban AUC and a 1.3 fold increase in mean  $C_{max}$ . The interaction with fluconazole is likely not clinically relevant in most patients but can be potentially significant in high-risk patients. (For patients with renal impairment: see section 4.4).

Given the limited clinical data available with dronedarone, co-administration with rivaroxaban should be avoided.

### Anticoagulants

After combined administration of enoxaparin (40 mg single dose) with rivaroxaban (10 mg single dose) an additive effect on anti-factor Xa activity was observed without any additional effects on clotting tests (PT, aPTT). Enoxaparin did not affect the pharmacokinetics of rivaroxaban.

Due to the increased bleeding risk care is to be taken if patients are treated concomitantly with any other anticoagulants (see sections 4.3 and 4.4).

### NSAIDs/platelet aggregation inhibitors

No clinically relevant prolongation of bleeding time was observed after concomitant administration of rivaroxaban (15 mg) and 500 mg naproxen. Nevertheless, there may be individuals with a more pronounced pharmacodynamic response.

No clinically significant pharmacokinetic or pharmacodynamic interactions were observed when rivaroxaban was co-administered with 500 mg acetylsalicylic acid.

Clopidogrel (300 mg loading dose followed by 75 mg maintenance dose) did not show a pharmacokinetic interaction with rivaroxaban (15 mg) but a relevant increase in bleeding time was observed in a subset of patients which was not correlated to platelet aggregation, P-selectin or GPIIb/IIIa receptor levels.

Care is to be taken if patients are treated concomitantly with NSAIDs (including acetylsalicylic acid) and platelet aggregation inhibitors because these medicinal products typically increase the bleeding risk (see section 4.4).

### SSRIs/SNRIs

As with other anticoagulants the possibility may exist that patients are at increased risk of bleeding in case of concomitant use with SSRIs or SNRIs due to their reported effect on platelets. When concomitantly used in the rivaroxaban clinical programme, numerically higher rates of major or non-major clinically relevant bleeding were observed in all treatment groups.

### Warfarin

Converting patients from the vitamin K antagonist warfarin (INR 2.0 to 3.0) to rivaroxaban (20 mg) or from rivaroxaban (20 mg) to warfarin (INR 2.0 to 3.0) increased prothrombin time/INR (Neoplastin) more than additively (individual INR values up to 12 may be observed), whereas effects on aPTT, inhibition of factor Xa activity and endogenous thrombin potential were additive.

If it is desired to test the pharmacodynamic effects of rivaroxaban during the conversion period, anti-factor Xa activity, PiCT, and Heptest can be used as these tests were not affected by warfarin. On the fourth day after the last dose of warfarin, all tests (including PT, aPTT, inhibition of factor Xa activity and ETP) reflected only the effect of rivaroxaban.

If it is desired to test the pharmacodynamic effects of warfarin during the conversion period, INR measurement can be used at the  $C_{\text{trough}}$  of rivaroxaban (24 hours after the previous intake of rivaroxaban) as this test is minimally affected by rivaroxaban at this time point.

No pharmacokinetic interaction was observed between warfarin and rivaroxaban.

### CYP3A4 inducers

Co-administration of rivaroxaban with the strong CYP3A4 inducer rifampicin led to an approximate 50% decrease in mean rivaroxaban AUC, with parallel decreases in its pharmacodynamic effects. The concomitant use of rivaroxaban with other strong CYP3A4 inducers (e.g. phenytoin, carbamazepine, phenobarbital or St. John's Wort (*Hypericum perforatum*)) may also lead to reduced rivaroxaban plasma concentrations. Therefore, concomitant administration of strong CYP3A4 inducers should be avoided unless the patient is closely observed for signs and symptoms of thrombosis.

### Other concomitant therapies

No clinically significant pharmacokinetic or pharmacodynamic interactions were observed when rivaroxaban was co-administered with midazolam (substrate of CYP3A4), digoxin (substrate of P-gp), atorvastatin (substrate of CYP3A4 and P-gp) or omeprazole (proton pump inhibitor). Rivaroxaban neither inhibits nor induces any major CYP isoforms like CYP3A4.

### Laboratory parameters

Clotting parameters (e.g. PT, aPTT, HepTest) are affected as expected by the mode of action of rivaroxaban (see section 5.1).

## **4.6 Fertility, pregnancy and lactation**

### Pregnancy

Safety and efficacy of Xarelto have not been established in pregnant women. Studies in animals have shown reproductive toxicity (see section 5.3). Due to the potential reproductive toxicity, the intrinsic



risk of bleeding and the evidence that rivaroxaban passes the placenta, Xarelto is contraindicated during pregnancy (see section 4.3).  
 Women of child-bearing potential should avoid becoming pregnant during treatment with rivaroxaban.

#### Breast-feeding

Safety and efficacy of Xarelto have not been established in breast-feeding women. Data from animals indicate that rivaroxaban is secreted into milk. Therefore Xarelto is contraindicated during breast-feeding (see section 4.3). A decision must be made whether to discontinue breast-feeding or to discontinue/abstain from therapy.

#### Fertility

No specific studies with rivaroxaban in humans have been conducted to evaluate effects on fertility. In a study on male and female fertility in rats no effects were seen (see section 5.3).

### **4.7 Effects on ability to drive and use machines**

Xarelto has minor influence on the ability to drive and use machines. Adverse reactions like syncope (frequency: uncommon) and dizziness (frequency: common) have been reported (see section 4.8). Patients experiencing these adverse reactions should not drive or use machines.

### **4.8 Undesirable effects**

#### Summary of the safety profile

The safety of rivaroxaban has been evaluated in thirteen pivotal phase III studies (see Table 1).

Overall, 69,608 patients in nineteen phase III studies were exposed to rivaroxaban.

**Table 1: Number of patients studied, total daily dose and maximum treatment duration in phase III studies**

| <b>Indication</b>  | <b>Number of patients*</b> | <b>Total daily dose</b>  | <b>Maximum treatment duration</b> |
|--|----------------------------|--|-----------------------------------|
| Prevention of venous thromboembolism (VTE) in adult patients undergoing elective hip or knee replacement surgery | 6,097                      | 10 mg  | 39 days                           |
| Prevention of VTE in medically ill patients  | 3,997                      | 10 mg  | 39 days                           |
| Treatment of deep vein thrombosis (DVT), pulmonary embolism (PE) and prevention of recurrence                    | 6,790                      | Day 1 - 21: 30 mg<br>Day 22 and onwards:<br>20 mg<br>After at least 6 months:<br>10 mg or 20 mg    | 21 months                         |
| Prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation                     | 7,750                      | 20 mg  | 41 months                         |
| Prevention of atherothrombotic events in patients after an ACS   | 10,225                     | 5 mg or 10 mg respectively, co-administered with either ASA or ASA plus clopidogrel or ticlopidine | 31 months                         |
| Prevention of atherothrombotic events in patients with CAD/PAD   | 18,244                     | 5 mg co-administered with ASA or 10 mg alone   | 47 months                         |
|  | 3,256**                    | 5 mg co-administered with ASA  | 42 months                         |

\* Patients exposed to at least one dose of rivaroxaban

\*\* From the VOYAGER PAD study

The most commonly reported adverse reactions in patients receiving rivaroxaban were bleedings (see section 4.4. and ‘Description of selected adverse reactions’ below) (Table 2). The most commonly reported bleedings were epistaxis (4.5 %) and gastrointestinal tract haemorrhage (3.8 %).

**Table 2: Bleeding\* and anaemia events rates in patients exposed to rivaroxaban across the completed phase III studies**

| Indication   | Any bleeding                            | Anaemia                                    |
|--|---|--|
| Prevention of venous thromboembolism (VTE) in adult patients undergoing elective hip or knee replacement surgery | 6.8% of patients                        | 5.9% of patients                           |
| Prevention of venous thromboembolism in medically ill patients   | 12.6% of patients                       | 2.1% of patients                           |
| Treatment of DVT, PE and prevention of recurrence  | 23% of patients                         | 1.6% of patients                           |
| Prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation                     | 28 per 100 patient years                | 2.5 per 100 patient years                  |
| Prevention of atherothrombotic events in patients after an ACS   | 22 per 100 patient years                | 1.4 per 100 patient years                  |
| Prevention of atherothrombotic events in patients with CAD/PAD   | 6.7 per 100 patient years               | 0.15 per 100 patient years**               |
|  | 8.38 per 100 patient years <sup>#</sup> | 0.74 per 100 patient years*** <sup>#</sup> |

\* For all rivaroxaban studies all bleeding events are collected, reported and adjudicated.

\*\* In the COMPASS study, there is a low anaemia incidence as a selective approach to adverse event collection was applied

\*\*\* A selective approach to adverse event collection was applied

<sup>#</sup> From the VOYAGER PAD study

#### Tabulated list of adverse reactions

The frequencies of adverse reactions reported with Xarelto are summarised in Table 3 below by system organ class (in MedDRA) 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 the available data)

**Table 3: All adverse reactions reported in patients in phase III clinical studies or through post-marketing use\***

| Common   | Uncommon  | Rare | Very rare | Not known |
|--|---|------|-----------|-----------|
| <b>Blood and lymphatic system disorders</b>      |   |      |           |           |
| Anaemia (incl. respective laboratory parameters) | Thrombocytosis (incl. platelet count increased) <sup>A</sup> , thrombocytopenia |      |           |           |
| <b>Immune system disorders</b>                   |   |      |           |           |

|   |   |  |   |                  |
|---|---|--|---|------------------|
|   | Allergic reaction, dermatitis allergic, angioedema and allergic oedema  |  | Anaphylactic reactions including anaphylactic shock                 |                  |
| <b>Nervous system disorders</b>   |   |  |   |                  |
| Dizziness, headache   | Cerebral and intracranial haemorrhage, syncope  |  |   |                  |
| <b>Eye disorders</b>  |   |  |   |                  |
| Eye haemorrhage (incl. conjunctival haemorrhage)  |   |  |   |                  |
| <b>Cardiac disorders</b>  |   |  |   |                  |
|   | Tachycardia   |  |   |                  |
| <b>Vascular disorders</b>   |   |  |   |                  |
| Hypotension, haematoma  |   |  |   |                  |
| <b>Respiratory, thoracic and mediastinal disorders</b>  |   |  |   |                  |
| Epistaxis, haemoptysis  |   |  | Eosinophilic pneumonia  |                  |
| <b>Gastrointestinal disorders</b>   |   |  |   |                  |
| Gingival bleeding, gastrointestinal tract haemorrhage (incl. rectal haemorrhage), gastrointestinal and abdominal pains, dyspepsia, nausea, constipation <sup>A</sup> , diarrhoea, vomiting <sup>A</sup> | Dry mouth   |  |   |                  |
| <b>Hepatobiliary disorders</b>  |   |  |   |                  |
| Increase in transaminases   | Hepatic impairment, increased bilirubin, increased blood alkaline phosphatase <sup>A</sup> , increased GGT <sup>A</sup> | Jaundice, bilirubin conjugated increased (with or without concomitant increase of ALT), cholestasis, hepatitis (incl. hepatocellular injury) |   |                  |
| <b>Common</b>   | <b>Uncommon</b>   | <b>Rare</b>  | <b>Very rare</b>  | <b>Not known</b> |
| <b>Skin and subcutaneous tissue disorders</b>   |   |  |   |                  |
| Pruritus (incl. uncommon cases of generalised pruritus), rash, ecchymosis, cutaneous and subcutaneous haemorrhage   | Urticaria   |  | Stevens-Johnson syndrome/Toxic Epidermal Necrolysis, DRESS syndrome |                  |
| <b>Musculoskeletal and connective tissue disorders</b>  |   |  |   |                  |

|  |   |                                      |  |  |
|--|---|--------------------------------------|--|--|
| Pain in extremity <sup>A</sup>   | Haemarthrosis   | Muscle haemorrhage                   |  | Compartment syndrome secondary to a bleeding   |
| <b>Renal and urinary disorders</b>   |   |                                      |  |  |
| Urogenital tract haemorrhage (incl. haematuria and menorrhagia <sup>B</sup> ), renal impairment (incl. blood creatinine increased, blood urea increased) |   |                                      |  | Renal failure/acute renal failure secondary to a bleeding sufficient to cause hypoperfusion, Anticoagulant-related nephropathy |
| <b>General disorders and administration site conditions</b>  |   |                                      |  |  |
| Fever <sup>A</sup> , peripheral oedema, decreased general strength and energy (incl. fatigue and asthenia)   | Feeling unwell (incl. malaise)  | Localised oedema <sup>A</sup>        |  |  |
| <b>Investigations</b>  |   |                                      |  |  |
|  | Increased LDH <sup>A</sup> , increased lipase <sup>A</sup> , increased amylase <sup>A</sup> |                                      |  |  |
| <b>Injury, poisoning and procedural complications</b>  |   |                                      |  |  |
| Postprocedural haemorrhage (incl. postoperative anaemia, and wound haemorrhage), contusion, wound secretion <sup>A</sup>                                 |   | Vascular pseudoaneurysm <sup>C</sup> |  |  |

A: observed in prevention of VTE in adult patients undergoing elective hip or knee replacement surgery

B: observed in treatment of DVT, PE and prevention of recurrence as very common in women < 55 years

C: observed as uncommon in prevention of atherothrombotic events in patients after an ACS (following percutaneous coronary intervention)

\* A pre-specified selective approach to adverse event collection was applied in selected phase III studies. The incidence of adverse reactions did not increase and no new adverse drug reaction was identified after analysis of these studies.

#### Description of selected adverse reactions

Due to the pharmacological mode of action, the use of Xarelto may be associated with an increased risk of occult or overt bleeding from any tissue or organ which may result in post haemorrhagic anaemia. The signs, symptoms, and severity (including fatal outcome) will vary according to the location and degree or extent of the bleeding and/or anaemia (see section 4.9 “Management of bleeding”). In the clinical studies mucosal bleedings (i.e. epistaxis, gingival, gastrointestinal, genito urinary including abnormal vaginal or increased menstrual bleeding) and anaemia were seen more frequently during long term rivaroxaban treatment compared with VKA treatment. Thus, in addition to adequate clinical surveillance, laboratory testing of haemoglobin/haematocrit could be of value to detect occult bleeding and quantify the clinical relevance of overt bleeding, as judged to be appropriate. The risk of bleedings may be increased in certain patient groups, e.g. those patients with uncontrolled severe arterial hypertension and/or on concomitant treatment affecting haemostasis (see section 4.4 “Haemorrhagic risk”). Menstrual bleeding may be intensified and/or prolonged.

Haemorrhagic complications may present as weakness, paleness, dizziness, headache or unexplained swelling, dyspnoea and unexplained shock. In some cases as a consequence of anaemia, symptoms of cardiac ischaemia like chest pain or angina pectoris have been observed.

Known complications secondary to severe bleeding such as compartment syndrome and renal failure due to hypoperfusion, or anticoagulant-related nephropathy have been reported for Xarelto. Therefore, the possibility of haemorrhage is to be considered in evaluating the condition in any anticoagulated patient.

#### 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:

#### **Saudi Arabia:**

The National Pharmacovigilance Centre (NPC).

SFDA Call Center: 19999

E-mail: npc.drug@sfd.gov.sa

Website: <https://ade.sfda.gov.sa>

#### **United Arab Emirates (UAE):**

Pharmacovigilance & Medical Device section

Tel: 800111111 / +971 42301000

Email: pv@mohap.gov.ae

Website: [www.mohap.gov.ae](http://www.mohap.gov.ae)

P.O.Box 1853 Dubai

#### **Jordan:**

Tel: +962-6-5632000

JFDA email : jpc@jfda.jo

JFDA website: [www.jfda.jo](http://www.jfda.jo)

<http://primaryreporting.who-umc.org/JO>

#### **Oman:**

Tel: +968 - 2444 1999

Fax: +968 - 24602287

Email: pharma-vigil@moh.gov.om

Website: [www.moh.gov.om](http://www.moh.gov.om)

#### **Kuwait:**

Drug & Food Control, Ministry of Health

Tel.: +965-24811532

Fax: +965-24811507

Email : Adr\_reporting@moh.gov.kw

Website: <http://eservices.moh.gov.kw/SPCMS/DrugCmp.aspx>

#### **Egypt:**

Egyptian Pharmaceutical Vigilance Centre

Hotline: 15301

Email: pv.followup@edaegypt.gov.eg

Website: [www.edaegypt.gov.eg](http://www.edaegypt.gov.eg)

#### **Other Countries:**

Please contact the relevant competent authority

## **4.9 Overdose**

Rare cases of overdose up to 1,960 mg have been reported. In case of overdose, the patient should be observed carefully for bleeding complications or other adverse reactions (see section "Management of

bleeding”). Due to limited absorption a ceiling effect with no further increase in average plasma exposure is expected at supratherapeutic doses of 50 mg rivaroxaban or above.

A specific reversal agent (andexanet alfa) antagonising the pharmacodynamic effect of rivaroxaban is available (refer to the Summary of Product Characteristics of andexanet alfa).

The use of activated charcoal to reduce absorption in case of rivaroxaban overdose may be considered.

### Management of bleeding

Should a bleeding complication arise in a patient receiving rivaroxaban, the next rivaroxaban administration should be delayed or treatment should be discontinued as appropriate. Rivaroxaban has a half-life of approximately 5 to 13 hours (see section 5.2). Management should be individualised according to the severity and location of the haemorrhage. Appropriate symptomatic treatment could be used as needed, such as mechanical compression (e.g. for severe epistaxis), surgical haemostasis with bleeding control procedures, fluid replacement and haemodynamic support, blood products (packed red cells or fresh frozen plasma, depending on associated anaemia or coagulopathy) or platelets.

If bleeding cannot be controlled by the above measures, either the administration of a specific factor Xa inhibitor reversal agent (andexanet alfa), which antagonises the pharmacodynamic effect of rivaroxaban, or a specific procoagulant agent, such as prothrombin complex concentrate (PCC), activated prothrombin complex concentrate (APCC) or recombinant factor VIIa (r-FVIIa), should be considered. However, there is currently very limited clinical experience with the use of these medicinal products in individuals receiving rivaroxaban. The recommendation is also based on limited non-clinical data. Re-dosing of recombinant factor VIIa shall be considered and titrated depending on improvement of bleeding. Depending on local availability, a consultation with a coagulation expert should be considered in case of major bleedings (see section 5.1).

Protamine sulphate and vitamin K are not expected to affect the anticoagulant activity of rivaroxaban. There is limited experience with tranexamic acid and no experience with aminocaproic acid and aprotinin in individuals receiving rivaroxaban. There is neither scientific rationale for benefit nor experience with the use of the systemic haemostatic desmopressin in individuals receiving rivaroxaban. Due to the high plasma protein binding rivaroxaban is not expected to be dialysable.

## **5. PHARMACOLOGICAL PROPERTIES**

### **5.1 Pharmacodynamic properties**

Pharmacotherapeutic group: Antithrombotic agents, direct factor Xa inhibitors, ATC code: B01AF01

#### Mechanism of action

Rivaroxaban is a highly selective direct factor Xa inhibitor with oral bioavailability. Inhibition of factor Xa interrupts the intrinsic and extrinsic pathway of the blood coagulation cascade, inhibiting both thrombin formation and development of thrombi. Rivaroxaban does not inhibit thrombin (activated factor II) and no effects on platelets have been demonstrated.

#### Pharmacodynamic effects

Dose-dependent inhibition of factor Xa activity was observed in humans. Prothrombin time (PT) is influenced by rivaroxaban in a dose dependent way with a close correlation to plasma concentrations (r value equals 0.98) if Neoplastin is used for the assay. Other reagents would provide different results. The readout for PT is to be done in seconds, because the INR is only calibrated and validated for coumarins and cannot be used for any other anticoagulant.

In patients receiving rivaroxaban for treatment of DVT and PE and prevention of recurrence, the 5/95 percentiles for PT (Neoplastin) 2 - 4 hours after tablet intake (i.e. at the time of maximum effect) for 15 mg rivaroxaban twice daily ranged from 17 to 32 s and for 20 mg rivaroxaban once daily from 15 to 30 s. At trough (8 - 16 h after tablet intake) the 5/95 percentiles for 15 mg twice daily ranged from 14 to 24 s and for 20 mg once daily (18 - 30 h after tablet intake) from 13 to 20 s.

In patients with non-valvular atrial fibrillation receiving rivaroxaban for the prevention of stroke and systemic embolism, the 5/95 percentiles for PT (Neoplastin) 1 - 4 hours after tablet intake (i.e. at the time of maximum effect) in patients treated with 20 mg once daily ranged from 14 to 40 s and in

patients with moderate renal impairment treated with 15 mg once daily from 10 to 50 s. At trough (16 - 36 h after tablet intake) the 5/95 percentiles in patients treated with 20 mg once daily ranged from 12 to 26 s and in patients with moderate renal impairment treated with 15 mg once daily from 12 to 26 s.

In a clinical pharmacology study on the reversal of rivaroxaban pharmacodynamics in healthy adult subjects (n=22), the effects of single doses (50 IU/kg) of two different types of PCCs, a 3-factor PCC (Factors II, IX and X) and a 4-factor PCC (Factors II, VII, IX and X) were assessed. The 3-factor PCC reduced mean Neoplastin PT values by approximately 1.0 second within 30 minutes, compared to reductions of approximately 3.5 seconds observed with the 4-factor PCC. In contrast, the 3-factor PCC had a greater and more rapid overall effect on reversing changes in endogenous thrombin generation than the 4-factor PCC (see section 4.9).

The activated partial thromboplastin time (aPTT) and HepTest are also prolonged dose-dependently; however, they are not recommended to assess the pharmacodynamic effect of rivaroxaban. There is no need for monitoring of coagulation parameters during treatment with rivaroxaban in clinical routine. However, if clinically indicated rivaroxaban levels can be measured by calibrated quantitative anti-factor Xa tests (see section 5.2).

### Clinical efficacy and safety

#### Prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation

The rivaroxaban clinical programme was designed to demonstrate the efficacy of rivaroxaban for the prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation.

In the pivotal double-blind ROCKET AF study, 14,264 patients were assigned either to rivaroxaban 20 mg once daily (15 mg once daily in patients with creatinine clearance 30 - 49 ml/min) or to warfarin titrated to a target INR of 2.5 (therapeutic range 2.0 to 3.0). The median time on treatment was 19 months and overall treatment duration was up to 41 months.

34.9% of patients were treated with acetylsalicylic acid and 11.4% were treated with class III antiarrhythmic including amiodarone.

Rivaroxaban was non-inferior to warfarin for the primary composite endpoint of stroke and non-CNS systemic embolism. In the per-protocol population on treatment, stroke or systemic embolism occurred in 188 patients on rivaroxaban (1.71% per year) and 241 on warfarin (2.16% per year) (HR 0.79; 95% CI, 0.66 - 0.96; P<0.001 for non-inferiority). Among all randomised patients analysed according to ITT, primary events occurred in 269 on rivaroxaban (2.12% per year) and 306 on warfarin (2.42% per year) (HR 0.88; 95% CI, 0.74 - 1.03; P<0.001 for non-inferiority; P=0.117 for superiority). Results for secondary endpoints as tested in hierarchical order in the ITT analysis are displayed in Table 4. Among patients in the warfarin group, INR values were within the therapeutic range (2.0 to 3.0) a mean of 55% of the time (median, 58%; interquartile range, 43 to 71). The effect of rivaroxaban did not differ across the level of centre TTR (Time in Target INR Range of 2.0 - 3.0) in the equally sized quartiles (P=0.74 for interaction). Within the highest quartile according to centre, the Hazard Ratio (HR) with rivaroxaban versus warfarin was 0.74 (95% CI, 0.49 - 1.12).

The incidence rates for the principal safety outcome (major and non-major clinically relevant bleeding events) were similar for both treatment groups (see Table 5).

Table 4: Efficacy results from phase III ROCKET AF

| Study population  | ITT analyses of efficacy in patients with non-valvular atrial fibrillation   |  |   |
|---|--|--|---|
|   | Rivaroxaban<br>20 mg once daily<br>(15 mg once daily in<br>patients with moderate<br>renal impairment)<br>Event rate (100 pt-yr) | Warfarin<br>titrated to a target<br>INR of 2.5 (therapeutic<br>range 2.0 to 3.0)<br>Event rate (100 pt-yr) | HR (95% CI)<br>p-value, test for<br>superiority |
| Stroke and non-CNS<br>systemic embolism                 | 269<br>(2.12)  | 306<br>(2.42)  | 0.88 (0.74 - 1.03)<br>0.117                     |
| Stroke, non-CNS systemic<br>embolism and vascular death | 572<br>(4.51)  | 609<br>(4.81)  | 0.94 (0.84 - 1.05)<br>0.265                     |

|   |               |               |                             |
|---|---------------|---------------|-----------------------------|
| Stroke, non-CNS systemic embolism, vascular death and myocardial infarction | 659<br>(5.24) | 709<br>(5.65) | 0.93 (0.83 - 1.03)<br>0.158 |
| Stroke  | 253<br>(1.99) | 281<br>(2.22) | 0.90 (0.76 - 1.07)<br>0.221 |
| Non-CNS systemic embolism   | 20<br>(0.16)  | 27<br>(0.21)  | 0.74 (0.42 - 1.32)<br>0.308 |
| Myocardial infarction   | 130<br>(1.02) | 142<br>(1.11) | 0.91 (0.72 - 1.16)<br>0.464 |

**Table 5: Safety results from phase III ROCKET AF**

| Study population   | Patients with non-valvular atrial fibrillation <sup>a)</sup>   |  |                             |
|--|--|--|-----------------------------|
|  | Rivaroxaban<br>20 mg once daily<br>(15 mg once daily in<br>patients with moderate<br>renal impairment)<br>Event rate (100 pt-yr) | Warfarin<br>titrated to a target INR<br>of 2.5 (therapeutic<br>range 2.0 to 3.0)<br>Event rate (100 pt-yr) | HR (95% CI)<br>p-value      |
| Major and non-major clinically relevant bleeding events                  | 1,475<br>(14.91)   | 1,449<br>(14.52)   | 1.03 (0.96 - 1.11)<br>0.442 |
| Major bleeding events  | 395<br>(3.60)  | 386<br>(3.45)  | 1.04 (0.90 - 1.20)<br>0.576 |
| Death due to bleeding*   | 27<br>(0.24)   | 55<br>(0.48)   | 0.50 (0.31 - 0.79)<br>0.003 |
| Critical organ bleeding*   | 91<br>(0.82)   | 133<br>(1.18)  | 0.69 (0.53 - 0.91)<br>0.007 |
| Intracranial haemorrhage*  | 55<br>(0.49)   | 84<br>(0.74)   | 0.67 (0.47 - 0.93)<br>0.019 |
| Haemoglobin drop*  | 305<br>(2.77)  | 254<br>(2.26)  | 1.22 (1.03 - 1.44)<br>0.019 |
| Transfusion of 2 or more units of packed red blood cells or whole blood* | 183<br>(1.65)  | 149<br>(1.32)  | 1.25 (1.01 - 1.55)<br>0.044 |
| Non-major clinically relevant bleeding events                            | 1,185<br>(11.80)   | 1,151<br>(11.37)   | 1.04 (0.96 - 1.13)<br>0.345 |
| All-cause mortality  | 208<br>(1.87)  | 250<br>(2.21)  | 0.85 (0.70 - 1.02)<br>0.073 |

a) Safety population, on treatment

\* Nominally significant

In addition to the phase III ROCKET AF study, a prospective, single-arm, post-authorisation, non-interventional, open-label cohort study (XANTUS) with central outcome adjudication including thromboembolic events and major bleeding has been conducted. 6,704 patients with non-valvular atrial fibrillation were enrolled for prevention of stroke and non-central nervous system (CNS) systemic embolism in clinical practice. The mean CHADS<sub>2</sub> score was 1.9 and HAS-BLED score was 2.0 in XANTUS, compared to a mean CHADS<sub>2</sub> and HAS-BLED score of 3.5 and 2.8 in ROCKET AF, respectively. Major bleeding occurred in 2.1 per 100 patient years. Fatal haemorrhage was reported in 0.2 per 100 patient years and intracranial haemorrhage in 0.4 per 100 patient years. Stroke or non-CNS systemic embolism was recorded in 0.8 per 100 patient years.

These observations in clinical practice are consistent with the established safety profile in this indication.



In a post-authorisation, non-interventional study, in more than 162,000 patients from four countries, rivaroxaban was prescribed for the prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation. The event rate for ischaemic stroke was 0.70 (95% CI 0.44 - 1.13) per 100 patient-years. Bleeding resulting in hospitalisation occurred at event rates per 100 patient-years of 0.43 (95% CI 0.31 - 0.59) for intracranial bleeding, 1.04 (95% CI 0.65 - 1.66) for gastrointestinal bleeding, 0.41 (95% CI 0.31 - 0.53) for urogenital bleeding and 0.40 (95% CI 0.25 - 0.65) for other bleeding.

#### *Patients undergoing cardioversion*

A prospective, randomised, open-label, multicentre, exploratory study with blinded endpoint evaluation (X-VERT) was conducted in 1504 patients (oral anticoagulant naive and pre-treated) with non-valvular atrial fibrillation scheduled for cardioversion to compare rivaroxaban with dose-adjusted VKA (randomised 2:1), for the prevention of cardiovascular events. TEE- guided (1 - 5 days of pre-treatment) or conventional cardioversion (at least three weeks of pre-treatment) strategies were employed. The primary efficacy outcome (all stroke, transient ischaemic attack, non-CNS systemic embolism, myocardial infarction (MI) and cardiovascular death) occurred in 5 (0.5%) patients in the rivaroxaban group (n = 978) and 5 (1.0%) patients in the VKA group (n = 492; RR 0.50; 95% CI 0.15-1.73; modified ITT population). The principal safety outcome (major bleeding) occurred in 6 (0.6%) and 4 (0.8%) patients in the rivaroxaban (n = 988) and VKA (n = 499) groups, respectively (RR 0.76; 95% CI 0.21-2.67; safety population). This exploratory study showed comparable efficacy and safety between rivaroxaban and VKA treatment groups in the setting of cardioversion.

#### *Patients with non-valvular atrial fibrillation who undergo PCI with stent placement*

A randomised, open-label, multicentre study (PIONEER AF-PCI) was conducted in 2,124 patients with non-valvular atrial fibrillation who underwent PCI with stent placement for primary atherosclerotic disease to compare safety of two rivaroxaban regimens and one VKA regimen. Patients were randomly assigned in a 1:1:1 fashion for an overall 12-month-therapy. Patients with a history of stroke or TIA were excluded.

Group 1 received rivaroxaban 15 mg once daily (10 mg once daily in patients with creatinine clearance 30 - 49 ml/min) plus P2Y12 inhibitor. Group 2 received rivaroxaban 2.5 mg twice daily plus DAPT (dual antiplatelet therapy i.e. clopidogrel 75 mg [or alternate P2Y12 inhibitor] plus low-dose acetylsalicylic acid [ASA]) for 1, 6 or 12 months followed by rivaroxaban 15 mg (or 10 mg for subjects with creatinine clearance 30 - 49 ml/min) once daily plus low-dose ASA. Group 3 received dose-adjusted VKA plus DAPT for 1, 6 or 12 months followed by dose-adjusted VKA plus low-dose ASA.

The primary safety endpoint, clinically significant bleeding events, occurred in 109 (15.7%), 117 (16.6%), and 167 (24.0%) subjects in group 1, group 2 and group 3, respectively (HR 0.59; 95% CI 0.47-0.76; p<0.001, and HR 0.63; 95% CI 0.50-0.80; p<0.001, respectively). The secondary endpoint (composite of cardiovascular events CV death, MI, or stroke) occurred in 41 (5.9%), 36 (5.1%), and 36 (5.2%) subjects in the group 1, group 2 and group 3, respectively. Each of the rivaroxaban regimens showed a significant reduction in clinically significant bleeding events compared to the VKA regimen in patients with non-valvular atrial fibrillation who underwent a PCI with stent placement.

The primary objective of PIONEER AF-PCI was to assess safety. Data on efficacy (including thromboembolic events) in this population are limited.

#### *Treatment of DVT, PE and prevention of recurrent DVT and PE*

The rivaroxaban clinical programme was designed to demonstrate the efficacy of rivaroxaban in the initial and continued treatment of acute DVT and PE and prevention of recurrence.

Over 12,800 patients were studied in four randomised controlled phase III clinical studies (Einstein DVT, Einstein PE, Einstein Extension and Einstein Choice) and additionally a predefined pooled analysis of the Einstein DVT and Einstein PE studies was conducted. The overall combined treatment duration in all studies was up to 21 months.

In Einstein DVT 3,449 patients with acute DVT were studied for the treatment of DVT and the prevention of recurrent DVT and PE (patients who presented with symptomatic PE were excluded from this study). The treatment duration was for 3, 6 or 12 months depending on the clinical judgement of the investigator.

For the initial 3 week treatment of acute DVT 15 mg rivaroxaban was administered twice daily. This was followed by 20 mg rivaroxaban once daily.

In Einstein PE, 4,832 patients with acute PE were studied for the treatment of PE and the prevention of recurrent DVT and PE. The treatment duration was for 3, 6 or 12 months depending on the clinical judgement of the investigator.

For the initial treatment of acute PE 15 mg rivaroxaban was administered twice daily for three weeks. This was followed by 20 mg rivaroxaban once daily.

In both the Einstein DVT and the Einstein PE study, the comparator treatment regimen consisted of enoxaparin administered for at least 5 days in combination with vitamin K antagonist treatment until the PT/INR was in therapeutic range ( $\geq 2.0$ ). Treatment was continued with a vitamin K antagonist dose-adjusted to maintain the PT/INR values within the therapeutic range of 2.0 to 3.0.

In Einstein Extension 1,197 patients with DVT or PE were studied for the prevention of recurrent DVT and PE. The treatment duration was for an additional 6 or 12 months in patients who had completed 6 to 12 months of treatment for venous thromboembolism depending on the clinical judgment of the investigator. Rivaroxaban 20 mg once daily was compared with placebo.

Einstein DVT, PE and Extension used the same pre-defined primary and secondary efficacy outcomes. The primary efficacy outcome was symptomatic recurrent VTE defined as the composite of recurrent DVT or fatal or non-fatal PE. The secondary efficacy outcome was defined as the composite of recurrent DVT, non-fatal PE and all-cause mortality.

In Einstein Choice, 3,396 patients with confirmed symptomatic DVT and/or PE who completed 6-12 months of anticoagulant treatment were studied for the prevention of fatal PE or non-fatal symptomatic recurrent DVT or PE. Patients with an indication for continued therapeutic-dosed anticoagulation were excluded from the study. The treatment duration was up to 12 months depending on the individual randomisation date (median: 351 days). Rivaroxaban 20 mg once daily and rivaroxaban 10 mg once daily were compared with 100 mg acetylsalicylic acid once daily. The primary efficacy outcome was symptomatic recurrent VTE defined as the composite of recurrent DVT or fatal or non-fatal PE.

In the Einstein DVT study (see Table 6) rivaroxaban was demonstrated to be non-inferior to enoxaparin/VKA for the primary efficacy outcome ( $p < 0.0001$  (test for non-inferiority); HR: 0.680 (0.443 - 1.042),  $p=0.076$  (test for superiority)). The prespecified net clinical benefit (primary efficacy outcome plus major bleeding events) was reported with a HR of 0.67 ((95% CI: 0.47 - 0.95), nominal  $p$  value  $p=0.027$ ) in favour of rivaroxaban. INR values were within the therapeutic range a mean of 60.3% of the time for the mean treatment duration of 189 days, and 55.4%, 60.1%, and 62.8% of the time in the 3-, 6-, and 12-month intended treatment duration groups, respectively. In the enoxaparin/VKA group, there was no clear relation between the level of mean centre TTR (Time in Target INR Range of 2.0 - 3.0) in the equally sized tertiles and the incidence of the recurrent VTE ( $P=0.932$  for interaction). Within the highest tertile according to centre, the HR with rivaroxaban versus warfarin was 0.69 (95% CI: 0.35 - 1.35).

The incidence rates for the primary safety outcome (major or clinically relevant non-major bleeding events) as well as the secondary safety outcome (major bleeding events) were similar for both treatment groups.

Table 6: Efficacy and safety results from phase III Einstein DVT

| Study population            | 3,449 patients with symptomatic acute deep vein thrombosis |  |
|-----------------------------|--|--|
| Treatment dose and duration | Rivaroxaban <sup>a)</sup><br>3, 6 or 12 months<br>N=1,731  | Enoxaparin/VKA <sup>b)</sup><br>3, 6 or 12 months<br>N=1,718 |
| Symptomatic recurrent VTE*  | 36<br>(2.1%)   | 51<br>(3.0%)   |

|   |               |               |
|---|---------------|---------------|
| Symptomatic recurrent PE                        | 20<br>(1.2%)  | 18<br>(1.0%)  |
| Symptomatic recurrent DVT                       | 14<br>(0.8%)  | 28<br>(1.6%)  |
| Symptomatic PE and DVT                          | 1<br>(0.1%)   | 0             |
| Fatal PE/death where PE cannot be ruled out     | 4<br>(0.2%)   | 6<br>(0.3%)   |
| Major or clinically relevant non-major bleeding | 139<br>(8.1%) | 138<br>(8.1%) |
| Major bleeding events                           | 14<br>(0.8%)  | 20<br>(1.2%)  |

a) Rivaroxaban 15 mg twice daily for 3 weeks followed by 20 mg once daily

b) Enoxaparin for at least 5 days, overlapped with and followed by VKA

\*  $p < 0.0001$  (non-inferiority to a prespecified HR of 2.0); HR: 0.680 (0.443 - 1.042),  $p=0.076$  (superiority)

In the Einstein PE study (see Table 7) rivaroxaban was demonstrated to be non-inferior to enoxaparin/VKA for the primary efficacy outcome ( $p=0.0026$  (test for non-inferiority); HR: 1.123 (0.749 - 1.684)). The prespecified net clinical benefit (primary efficacy outcome plus major bleeding events) was reported with a HR of 0.849 (95% CI: 0.633 - 1.139), nominal  $p$  value  $p=0.275$ ). INR values were within the therapeutic range a mean of 63% of the time for the mean treatment duration of 215 days, and 57%, 62%, and 65% of the time in the 3-, 6-, and 12-month intended treatment duration groups, respectively. In the enoxaparin/VKA group, there was no clear relation between the level of mean centre TTR (Time in Target INR Range of 2.0 - 3.0) in the equally sized tertiles and the incidence of the recurrent VTE ( $p=0.082$  for interaction). Within the highest tertile according to centre, the HR with rivaroxaban versus warfarin was 0.642 (95% CI: 0.277 - 1.484).

The incidence rates for the primary safety outcome (major or clinically relevant non-major bleeding events) were slightly lower in the rivaroxaban treatment group (10.3% (249/2412)) than in the enoxaparin/VKA treatment group (11.4% (274/2405)). The incidence of the secondary safety outcome (major bleeding events) was lower in the rivaroxaban group (1.1% (26/2412)) than in the enoxaparin/VKA group (2.2% (52/2405)) with a HR 0.493 (95% CI: 0.308 - 0.789).

**Table 7: Efficacy and safety results from phase III Einstein PE**

| Study population                                | 4,832 patients with an acute symptomatic PE               |  |
|---|---|--|
| Treatment dose and duration                     | Rivaroxaban <sup>a)</sup><br>3, 6 or 12 months<br>N=2,419 | Enoxaparin/VKA <sup>b)</sup><br>3, 6 or 12 months<br>N=2,413 |
| Symptomatic recurrent VTE*                      | 50<br>(2.1%)  | 44<br>(1.8%)   |
| Symptomatic recurrent PE                        | 23<br>(1.0%)  | 20<br>(0.8%)   |
| Symptomatic recurrent DVT                       | 18<br>(0.7%)  | 17<br>(0.7%)   |
| Symptomatic PE and DVT                          | 0   | 2<br>( $<0.1\%$ )  |
| Fatal PE/death where PE cannot be ruled out     | 11<br>(0.5%)  | 7<br>(0.3%)  |
| Major or clinically relevant non-major bleeding | 249<br>(10.3%)  | 274<br>(11.4%)   |
| Major bleeding events                           | 26<br>(1.1%)  | 52<br>(2.2%)   |

a) Rivaroxaban 15 mg twice daily for 3 weeks followed by 20 mg once daily

b) Enoxaparin for at least 5 days, overlapped with and followed by VKA

\*  $p < 0.0026$  (non-inferiority to a prespecified HR of 2.0); HR: 1.123 (0.749 - 1.684)

A prespecified pooled analysis of the outcome of the Einstein DVT and PE studies was conducted (see Table 8).

**Table 8: Efficacy and safety results from pooled analysis of phase III Einstein DVT and Einstein PE**

| <b>Study population</b>                         | <b>8,281 patients with an acute symptomatic DVT or PE</b>          |   |
|---|--|---|
| <b>Treatment dose and duration</b>              | <b>Rivaroxaban <sup>a)</sup><br/>3, 6 or 12 months<br/>N=4,150</b> | <b>Enoxaparin/VKA <sup>b)</sup><br/>3, 6 or 12 months<br/>N=4,131</b> |
| Symptomatic recurrent VTE*                      | 86<br>(2.1%)   | 95<br>(2.3%)  |
| Symptomatic recurrent PE                        | 43<br>(1.0%)   | 38<br>(0.9%)  |
| Symptomatic recurrent DVT                       | 32<br>(0.8%)   | 45<br>(1.1%)  |
| Symptomatic PE and DVT                          | 1<br>(<0.1%)   | 2<br>(<0.1%)  |
| Fatal PE/death where PE cannot be ruled out     | 15<br>(0.4%)   | 13<br>(0.3%)  |
| Major or clinically relevant non-major bleeding | 388<br>(9.4%)  | 412<br>(10.0%)  |
| Major bleeding events                           | 40<br>(1.0%)   | 72<br>(1.7%)  |

a) Rivaroxaban 15 mg twice daily for 3 weeks followed by 20 mg once daily

b) Enoxaparin for at least 5 days, overlapped with and followed by VKA

\* p < 0.0001 (non-inferiority to a prespecified HR of 1.75); HR: 0.886 (0.661 - 1.186)

The prespecified net clinical benefit (primary efficacy outcome plus major bleeding events) of the pooled analysis was reported with a HR of 0.771 ((95% CI: 0.614 - 0.967), nominal p value p= 0.0244).

In the Einstein Extension study (see Table 9) rivaroxaban was superior to placebo for the primary and secondary efficacy outcomes. For the primary safety outcome (major bleeding events) there was a non-significant numerically higher incidence rate for patients treated with rivaroxaban 20 mg once daily compared to placebo. The secondary safety outcome (major or clinically relevant non-major bleeding events) showed higher rates for patients treated with rivaroxaban 20 mg once daily compared to placebo.

**Table 9: Efficacy and safety results from phase III Einstein Extension**

| <b>Study population</b>                     | <b>1,197 patients continued treatment and prevention of recurrent venous thromboembolism</b> |   |
|---|--|---|
| <b>Treatment dose and duration</b>          | <b>Rivaroxaban <sup>a)</sup><br/>6 or 12 months<br/>N=602</b>                                | <b>Placebo<br/>6 or 12 months<br/>N=594</b> |
| Symptomatic recurrent VTE*                  | 8<br>(1.3%)  | 42<br>(7.1%)                                |
| Symptomatic recurrent PE                    | 2<br>(0.3%)  | 13<br>(2.2%)                                |
| Symptomatic recurrent DVT                   | 5<br>(0.8%)  | 31<br>(5.2%)                                |
| Fatal PE/death where PE cannot be ruled out | 1<br>(0.2%)  | 1<br>(0.2%)                                 |
| Major bleeding events                       | 4<br>(0.7%)  | 0<br>(0.0%)                                 |
| Clinically relevant non-major bleeding      | 32<br>(5.4%)   | 7<br>(1.2%)                                 |

a) Rivaroxaban 20 mg once daily

\* p < 0.0001 (superiority), HR: 0.185 (0.087 - 0.393)

In the Einstein Choice study (see Table 10) rivaroxaban 20 mg and 10 mg were both superior to 100 mg acetylsalicylic acid for the primary efficacy outcome. The principal safety outcome (major bleeding events) was similar for patients treated with rivaroxaban 20 mg and 10 mg once daily compared to 100 mg acetylsalicylic acid.

**Table 10: Efficacy and safety results from phase III Einstein Choice**

| <b>Study population</b>   | <b>3,396 patients continued prevention of recurrent venous thromboembolism</b> |   |  |
|---|--|---|--|
| <b>Treatment dose</b>   | <b>Rivaroxaban 20 mg once daily<br/>N=1,107</b>                                | <b>Rivaroxaban 10 mg once daily<br/>N=1,127</b> | <b>ASA 100 mg once daily<br/>N=1,131</b> |
| Treatment duration median [interquartile range]                     | 349 [189-362] days   | 353 [190-362] days                              | 350 [186-362] days                       |
| Symptomatic recurrent VTE   | 17 (1.5%)*   | 13 (1.2%)**                                     | 50 (4.4%)                                |
| Symptomatic recurrent PE  | 6 (0.5%)   | 6 (0.5%)  | 19 (1.7%)                                |
| Symptomatic recurrent DVT   | 9 (0.8%)   | 8 (0.7%)  | 30 (2.7%)                                |
| Fatal PE/death where PE cannot be ruled out                         | 2 (0.2%)   | 0 (0.0%)  | 2 (0.2%)                                 |
| Symptomatic recurrent VTE, MI, stroke, or non-CNS systemic embolism | 19 (1.7%)  | 18 (1.6%)                                       | 56 (5.0%)                                |
| Major bleeding events   | 6 (0.5%)   | 5 (0.4%)  | 3 (0.3%)                                 |
| Clinically relevant non-major bleeding                              | 30 (2.7)   | 22 (2.0)  | 20 (1.8)                                 |
| <b>Study population</b>   | <b>3,396 patients continued prevention of recurrent venous thromboembolism</b> |   |  |
| <b>Treatment dose</b>   | <b>Rivaroxaban 20 mg once daily<br/>N=1,107</b>                                | <b>Rivaroxaban 10 mg once daily<br/>N=1,127</b> | <b>ASA 100 mg once daily<br/>N=1,131</b> |
| Symptomatic recurrent VTE or major bleeding (net clinical benefit)  | 23 (2.1%)+   | 17 (1.5%)++                                     | 53 (4.7%)                                |

\* p<0.001(superiority) rivaroxaban 20 mg od vs ASA 100 mg od; HR=0.34 (0.20-0.59)

\*\* p<0.001 (superiority) rivaroxaban 10 mg od vs ASA 100 mg od; HR=0.26 (0.14-0.47)

+ Rivaroxaban 20 mg od vs ASA 100 mg od; HR=0.44 (0.27-0.71), p=0.0009 (nominal)

++ Rivaroxaban 10 mg od vs ASA 100 mg od; HR=0.32 (0.18-0.55), p<0.0001 (nominal)

In addition to the phase III EINSTEIN programme, a prospective, non-interventional, open-label cohort study (XALIA) with central outcome adjudication including recurrent VTE, major bleeding and death has been conducted. 5,142 patients with acute DVT were enrolled to investigate the long-term safety of rivaroxaban compared with standard-of-care anticoagulation therapy in clinical practice. Rates of major bleeding, recurrent VTE and all-cause mortality for rivaroxaban were 0.7%, 1.4% and 0.5%, respectively. There were differences in patient baseline characteristics including age, cancer and renal impairment. A pre-specified propensity score stratified analysis was used to adjust for measured baseline differences but residual confounding may, in spite of this, influence the results. Adjusted HRs comparing rivaroxaban and standard-of-care for major bleeding, recurrent VTE and all-cause mortality were 0.77 (95% CI 0.40 - 1.50), 0.91 (95% CI 0.54 - 1.54) and 0.51 (95% CI 0.24 - 1.07), respectively. These results in clinical practice are consistent with the established safety profile in this indication.

In a post-authorisation, non-interventional study, in more than 40,000 patients without a history of cancer from four countries, rivaroxaban was prescribed for the treatment or prevention of DVT and

PE. The event rates per 100 patient-years for symptomatic/clinically apparent VTE/thromboembolic events leading to hospitalisation ranged from 0.64 (95% CI 0.40 - 0.97) in the UK to 2.30 (95% CI 2.11 - 2.51) for Germany. Bleeding resulting in hospitalisation occurred at event rates per 100 patient-years of 0.31 (95% CI 0.23 - 0.42) for intracranial bleeding, 0.89 (95% CI 0.67 - 1.17) for gastrointestinal bleeding, 0.44 (95% CI 0.26 - 0.74) for urogenital bleeding and 0.41 (95% CI 0.31 - 0.54) for other bleeding.

#### Patients with high risk triple positive antiphospholipid syndrome

In an investigator sponsored, randomised open-label multicentre study with blinded endpoint adjudication, rivaroxaban was compared to warfarin in patients with a history of thrombosis, diagnosed with antiphospholipid syndrome and at high risk for thromboembolic events (positive for all 3 antiphospholipid tests: lupus anticoagulant, anticardiolipin antibodies, and anti-beta 2-glycoprotein I antibodies). The study was terminated prematurely after the enrolment of 120 patients due to an excess of events among patients in the rivaroxaban arm. Mean follow-up was 569 days. 59 patients were randomised to rivaroxaban 20 mg (15 mg for patients with creatinine clearance (CrCl) < 50 mL/min) and 61 to warfarin (INR 2.0-3.0). Thromboembolic events occurred in 12% of patients randomised to rivaroxaban (4 ischaemic strokes and 3 myocardial infarctions). No events were reported in patients randomised to warfarin. Major bleeding occurred in 4 patients (7%) of the rivaroxaban group and 2 patients (3%) of the warfarin group.

#### Paediatric population

The European Medicines Agency has waived the obligation to submit the results of studies with Xarelto in all subsets of the paediatric population in the prevention of thromboembolic events (see section 4.2 for information on paediatric use).

## **5.2 Pharmacokinetic properties**

### Absorption

Rivaroxaban is rapidly absorbed with maximum concentrations ( $C_{max}$ ) appearing 2 - 4 hours after tablet intake.

Oral absorption of rivaroxaban is almost complete and oral bioavailability is high (80 - 100%) for the 2.5 mg and 10 mg tablet dose, irrespective of fasting/fed conditions. Intake with food does not affect rivaroxaban AUC or  $C_{max}$  at the 2.5 mg and 10 mg dose.

Due to a reduced extent of absorption an oral bioavailability of 66% was determined for the 20 mg tablet under fasting conditions. When rivaroxaban 20 mg tablets are taken together with food increases in mean AUC by 39% were observed when compared to tablet intake under fasting conditions, indicating almost complete absorption and high oral bioavailability. Rivaroxaban 15 mg and 20 mg are to be taken with food (see section 4.2).

Rivaroxaban pharmacokinetics are approximately linear up to about 15 mg once daily in fasting state. Under fed conditions rivaroxaban 10 mg, 15 mg and 20 mg tablets demonstrated dose-proportionality. At higher doses rivaroxaban displays dissolution limited absorption with decreased bioavailability and decreased absorption rate with increased dose.

Variability in rivaroxaban pharmacokinetics is moderate with inter-individual variability (CV%) ranging from 30% to 40%.

Absorption of rivaroxaban is dependent on the site of its release in the gastrointestinal tract. A 29% and 56% decrease in AUC and  $C_{max}$  compared to tablet was reported when rivaroxaban granulate is released in the proximal small intestine. Exposure is further reduced when rivaroxaban is released in the distal small intestine, or ascending colon. Therefore, administration of rivaroxaban distal to the stomach should be avoided since this can result in reduced absorption and related rivaroxaban exposure.

Bioavailability (AUC and  $C_{max}$ ) was comparable for 20 mg rivaroxaban administered orally as a crushed tablet mixed in apple puree, or suspended in water and administered via a gastric tube followed by a liquid meal, compared to a whole tablet. Given the predictable, dose-proportional pharmacokinetic profile of rivaroxaban, the bioavailability results from this study are likely applicable to lower rivaroxaban doses.

### Distribution

Plasma protein binding in adults is high at approximately 92% to 95%, with serum albumin being the main binding component. The volume of distribution is moderate with  $V_{ss}$  being approximately 50 litres.

### Biotransformation and elimination

Of the administered rivaroxaban dose, approximately 2/3 undergoes metabolic degradation, with half then being eliminated renally and the other half eliminated by the faecal route. The final 1/3 of the administered dose undergoes direct renal excretion as unchanged active substance in the urine, mainly via active renal secretion.

Rivaroxaban is metabolised via CYP3A4, CYP2J2 and CYP-independent mechanisms. Oxidative degradation of the morpholinone moiety and hydrolysis of the amide bonds are the major sites of biotransformation. Based on *in vitro* investigations rivaroxaban is a substrate of the transporter proteins P-gp (P-glycoprotein) and Bcrp (breast cancer resistance protein).

Unchanged rivaroxaban is the most important compound in human plasma, with no major or active circulating metabolites being present. With a systemic clearance of about 10 l/h, rivaroxaban can be classified as a low-clearance substance. After intravenous administration of a 1 mg dose the elimination half-life is about 4.5 hours. After oral administration the elimination becomes absorption rate limited. Elimination of rivaroxaban from plasma occurs with terminal half-lives of 5 to 9 hours in young individuals, and with terminal half-lives of 11 to 13 hours in the elderly.

### Special populations

#### *Gender*

There were no clinically relevant differences in pharmacokinetics and pharmacodynamics between male and female patients.

#### *Elderly population*

Elderly patients exhibited higher plasma concentrations than younger patients, with mean AUC values being approximately 1.5 fold higher, mainly due to reduced (apparent) total and renal clearance. No dose adjustment is necessary.

#### *Different weight categories*

Extremes in body weight (< 50 kg or > 120 kg) had only a small influence on rivaroxaban plasma concentrations (less than 25%). No dose adjustment is necessary.

#### *Inter-ethnic differences*

No clinically relevant inter-ethnic differences among Caucasian, African-American, Hispanic, Japanese or Chinese patients were observed regarding rivaroxaban pharmacokinetics and pharmacodynamics.

#### *Hepatic impairment*

Cirrhotic patients with mild hepatic impairment (classified as Child Pugh A) exhibited only minor changes in rivaroxaban pharmacokinetics (1.2 fold increase in rivaroxaban AUC on average), nearly comparable to their matched healthy control group. In cirrhotic patients with moderate hepatic impairment (classified as Child Pugh B), rivaroxaban mean AUC was significantly increased by 2.3 fold compared to healthy volunteers. Unbound AUC was increased 2.6 fold. These patients also had reduced renal elimination of rivaroxaban, similar to patients with moderate renal impairment. There are no data in patients with severe hepatic impairment.

The inhibition of factor Xa activity was increased by a factor of 2.6 in patients with moderate hepatic impairment as compared to healthy volunteers; prolongation of PT was similarly increased by a factor of 2.1. Patients with moderate hepatic impairment were more sensitive to rivaroxaban resulting in a steeper PK/PD relationship between concentration and PT.

Rivaroxaban is contraindicated in patients with hepatic disease associated with coagulopathy and clinically relevant bleeding risk, including cirrhotic patients with Child Pugh B and C (see section 4.3).

### *Renal impairment*

There was an increase in rivaroxaban exposure correlated to decrease in renal function, as assessed via creatinine clearance measurements. In individuals with mild (creatinine clearance 50 - 80 ml/min), moderate (creatinine clearance 30 - 49 ml/min) and severe (creatinine clearance 15 - 29 ml/min) renal impairment, rivaroxaban plasma concentrations (AUC) were increased 1.4, 1.5 and 1.6 fold respectively. Corresponding increases in pharmacodynamic effects were more pronounced. In individuals with mild, moderate and severe renal impairment the overall inhibition of factor Xa activity was increased by a factor of 1.5, 1.9 and 2.0 respectively as compared to healthy volunteers; prolongation of PT was similarly increased by a factor of 1.3, 2.2 and 2.4 respectively. There are no data in patients with creatinine clearance < 15 ml/min.

Due to the high plasma protein binding rivaroxaban is not expected to be dialysable.

Use is not recommended in patients with creatinine clearance < 15 ml/min. Rivaroxaban is to be used with caution in patients with creatinine clearance 15 - 29 ml/min (see section 4.4).

### Pharmacokinetic data in patients

In patients receiving rivaroxaban for treatment of acute DVT 20 mg once daily the geometric mean concentration (90% prediction interval) 2 - 4 h and about 24 h after dose (roughly representing maximum and minimum concentrations during the dose interval) was 215 (22 - 535) and 32 (6 - 239) mcg/l, respectively.

### Pharmacokinetic/pharmacodynamic relationship

The pharmacokinetic/pharmacodynamic (PK/PD) relationship between rivaroxaban plasma concentration and several PD endpoints (factor Xa inhibition, PT, aPTT, Heptest) has been evaluated after administration of a wide range of doses (5 - 30 mg twice a day). The relationship between rivaroxaban concentration and factor Xa activity was best described by an E<sub>max</sub> model. For PT, the linear intercept model generally described the data better. Depending on the different PT reagents used, the slope differed considerably. When Neoplastin PT was used, baseline PT was about 13 s and the slope was around 3 to 4 s/(100 mcg/l). The results of the PK/PD analyses in Phase II and III were consistent with the data established in healthy subjects.

### Paediatric population

Safety and efficacy have not been established in the indication prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation for children and adolescents up to 18 years.

## **5.3 Preclinical safety data**

Non-clinical data reveal no special hazard for humans based on conventional studies of safety pharmacology, single dose toxicity, phototoxicity, genotoxicity, carcinogenic potential and juvenile toxicity.

Effects observed in repeat-dose toxicity studies were mainly due to the exaggerated pharmacodynamic activity of rivaroxaban. In rats, increased IgG and IgA plasma levels were seen at clinically relevant exposure levels.

In rats, no effects on male or female fertility were seen. Animal studies have shown reproductive toxicity related to the pharmacological mode of action of rivaroxaban (e.g. haemorrhagic complications). Embryo-foetal toxicity (post-implantation loss, retarded/progressed ossification, hepatic multiple light coloured spots) and an increased incidence of common malformations as well as placental changes were observed at clinically relevant plasma concentrations. In the pre- and post-natal study in rats, reduced viability of the offspring was observed at doses that were toxic to the dams.

Rivaroxaban was tested in juvenile rats up to 3-month treatment duration starting at postnatal day 4 showing a non dose-related increase in periinsular haemorrhage. No evidence of target organ-specific toxicity was seen.



## **6. PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

#### Tablet core

Microcrystalline cellulose  
Croscarmellose sodium  
Lactose monohydrate  
Hypromellose (2910)  
Sodium laurilsulfate  
Magnesium stearate

#### Film-coat

Macrogol (3350)  
Hypromellose (2910)  
Titanium dioxide (E 171)  
Iron oxide red (E 172)

### **6.2 Incompatibilities**

Not applicable.

### **6.3 Shelf life**

3 years

#### Crushed tablets

Crushed rivaroxaban tablets are stable in water and in apple puree for up to 4 hours.

### **6.4 Special precautions for storage**

Do not store above 30°C.

### **6.5 Nature and contents of container**

Cartons containing 10, 14, 28, 42 or 98 film-coated tablets in PP/Alu foil blisters.

Cartons containing 10 x 1 or 100 x 1 film-coated tablets in PP/Alu foil perforated unit dose blisters.

Multipacks containing 10 packs of 10 x 1 (100 film-coated tablets) in PP/Alu foil perforated unit dose blisters.

Cartons containing 14 film-coated tablets in PVC/PVDC/Alu foil blisters .

HDPE bottles with a PP screw cap containing 100 film-coated tablets.

Not all pack sizes may be marketed.

### **6.6 Special precautions for disposal and other handling**

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

#### Crushing of tablets

Rivaroxaban tablets may be crushed and suspended in 50 mL of water and administered via a nasogastric tube or gastric feeding tube after confirming gastric placement of the tube. Afterwards, the tube should be flushed with water. Since rivaroxaban absorption is dependent on the site of active substance release, administration of rivaroxaban distal to the stomach should be avoided, as this can result in reduced absorption and thereby, reduced active substance exposure. After the administration of a crushed rivaroxaban 15 mg or 20 mg tablet, the dose should then be immediately followed by enteral feeding.

**7. MARKETING AUTHORISATION HOLDER**

Bayer AG  
51368 Leverkusen  
Germany

**8. MARKETING AUTHORISATION NUMBER(S)**

EU/1/08/472/011-016, EU/1/08/472/023, EU/1/08/472/036, EU/1/08/472/038, EU/1/08/472/048.

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

**07/2023**