1. Product Name

VERPAMIL SR, 120 mg and 240 mg, sustained release tablets.

2. Qualitative and Quantitative Composition

Each sustained released tablet contains 120 mg or 240 mg of verampmil hydrochloride.

VERPAMIL SR 120 contains lactose.

For the full list of excipients, see section 6.1.

3. Pharmaceutical Form

120 mg sustained-release tablets: Clear, film coated, white biconvex tablet, 11/32" (8.7 mm) diameter.

240 mg sustained-release tablets: Light green, film coated, modified capsule shaped biconvex tablet, 18.5 mm x 6.5 mm, plain on both sides.

Do not halve VERPAMIL SR tablets.

4. Clinical Particulars

4.1 Therapeutic indications

- Essential Hypertension

- Secondary Prevention Post Myocardial Infarction:
  For secondary prevention after acute myocardial infarction, especially where β blocking agents are not tolerated such as in patients with asthma, diabetes, peripheral vascular disease with intermittent claudication, etc

- Angina pectoris:
  For the prophylaxis and treatment of coronary insufficiency: Chronic stable angina pectoris; angina at rest including vasospastic (Prinzmetal's, variant angina) and unstable angina (crescendo, pre-infarction angina); angina pectoris post myocardial infarction.

4.2 Dose and method of administration

The individual dose, and frequency of dosing, should be determined in accordance with the indication and individual patient response.
Adults

Hypertension

One tablet VERPAMIL SR 240 mg daily. For elderly patients and patients new to verapamil therapy, doctors should consider an initial daily dose of VERPAMIL SR 120 mg.

Maximum dose: one tablet VERPAMIL SR 240 mg twice daily (any single dose should not exceed 240 mg).

Secondary prevention of myocardial infarction

Data from studies available suggest that treatment with VERPAMIL SR can be initiated from 7 days post myocardial infarction.

Generally doses will be 240 mg - 480 mg VERPAMIL SR daily in 1-2 divided doses. The average daily dose is 360mg. It is advised that any single dose should not exceed 240 mg.

Angina pectoris

Generally doses will be 120 mg - 480 mg VERPAMIL SR daily in 1-2 divided doses. The average daily dose is 360mg. It is advised that any single dose should not exceed 240 mg.

The doses of verapamil prescribed by the physician are to be taken regularly preferably with or shortly after meals together with some liquid.

When switching from immediate release verapamil to VERPAMIL SR (see above) the total daily dose in milligrams may remain the same.

Special populations

Children

VERPAMIL SR is not intended for use in children.

Method of administration

The doses of VERPAMIL SR as prescribed by the physician are to be taken regularly, preferably with or shortly after meals with some liquid.

Do not halve VERPAMIL SR tablets.

4.3 Contraindications

Verapamil hydrochloride is contraindicated in:

- Severe left ventricular dysfunction (see section 4.4).
- Hypotension (less than 90 mmHg systolic pressure) or cardiogenic shock.
- Sick sinus syndrome (except in patients with a functioning artificial ventricular pacemaker).
- Second- or third-degree AV block (except in patients with a functioning artificial ventricular pacemaker).
- Patients with atrial flutter or atrial fibrillation and an accessory bypass tract (e.g. Wolff-Parkinson-White, Lown-Ganong-Levine syndromes) (see section 4.4). These patients are at risk to develop ventricular tachyarrhythmia including ventricular fibrillation if verapamil hydrochloride is administered.
- Heart failure with reduced ejection fraction of less than 35% and/or pulmonary wedge pressure above 20 mmHg.
- Patients concomitantly administered ivabradine (see section 4.5)
- Patients with known hypersensitivity to verapamil hydrochloride or any of the inactive ingredients listed in section 6.1.
4.4 Special warnings and precautions for use

Heart failure
Verapamil has a negative inotropic effect which, in most patients, is compensated by its afterload reduction (decreased systemic vascular resistance) properties without a net impairment of ventricular performance. In clinical experience with 4,954 patients, 87 (1.8%) developed congestive heart failure or pulmonary oedema. Verapamil should be avoided in patients with severe left ventricular dysfunction (e.g. ejection fraction less than 30%, pulmonary wedge pressure above 20mmHg, or severe symptoms of cardiac failure) and in patients with any degree of ventricular dysfunction if they are receiving a beta-adrenergic blocker (see section 4.5).

Patients with milder ventricular dysfunction should, if possible, be controlled with optimum doses of digitalis and/or diuretics before verapamil treatment. (Note interactions with digoxin under section 4.8).

Acute myocardial infarction
Use with caution in patients with acute myocardial infarction complicated by bradycardia marked hypotension, or left ventricular dysfunction.

Hypotension
Occasionally, the pharmacologic action of verapamil may produce a decrease in blood pressure below normal levels which may result in dizziness or symptomatic hypotension. The incidence of hypotension observed in 4,954 patients enrolled in clinical trials was 2.5%. In hypertensive patients, decreases in blood pressure below normal are unusual. Tilt table testing (60 degrees) was not able to induce orthostatic hypotension.

Elevated liver enzymes
Elevations of transaminases with and without concomitant elevations in alkaline phosphatase and bilirubin have been reported. Such elevations have sometimes been transient and may disappear even in the face of continued verapamil treatment. Several cases of hepatocellular injury related to verapamil have been proven by rechallenge. Half of these had clinical symptoms (malaise, fever, and/or right upper quadrant pain) in addition to elevations of SGOT, SGPT and alkaline phosphatase. Periodic monitoring of liver function in patients receiving verapamil is therefore prudent.

Accessory bypass tract (Wolff-Parkinson-White or Lown-Ganong-Levine)
Some patients with paroxysmal and/or chronic atrial fibrillation or atrial flutter and a co-existing accessory AV pathway have developed increased antegrade conduction across the accessory pathway bypassing the AV node, producing a very rapid ventricular response or ventricular fibrillation after receiving intravenous verapamil (or digitalis). Although a risk of this occurring with oral verapamil has not been established, such patients receiving oral verapamil may be at risk and its use in these patients is contraindicated (see section 4.3).

Treatment is usually DC-cardioversion. Cardioversion has been used safely and effectively after oral verapamil.

Atrioventricular block
Verapamil affects the AV and SA nodes and prolongs AV conduction time. Use with caution as development of second-or-third-degree (contraindication) or unifascicular, bifascicular or trifascicular bundle branch block enquires discontinuation in subsequent doses of verapamil hydrochloride and institution of appropriate therapy, if needed.

Verapamil hydrochloride affects the AV and SA nodes and may produce second-or-third degree AV block, bradycardia, and, in extreme cases, asystole. This is more likely to occur in patients with a sick sinus syndrome (SA nodal disease), which is more common in older patients.
Asystole in patients other than those with sick sinus syndrome is usually of short duration (few seconds or less), with spontaneous return to AV nodal or normal sinus rhythm. If this does not occur promptly, appropriate treatment should be initiated immediately.

In studies using verapamil SR, prolongation of PR interval values of 0.21 to 0.22 sec occurred in 59 of 3,670 patients (=1.6%) and to 0.23 to 0.28 sec in 4 patients whose PR intervals had been normal before treatment (0.1 to 0.2 sec). Second or third degree AV block was not observed. Higher degrees of AV block, however, were infrequently (0.8%) observed.

Patients with hypertrophic cardiomyopathy (IHSS)

In 120 patients with hypertrophic cardiomyopathy (most of them refractory or intolerant to propranolol) who received therapy with verapamil at doses up to 720 mg/day, a variety of serious adverse effects were seen: three patients died of pulmonary oedema; all had severe left ventricular outflow obstruction and a past history of left ventricular dysfunction. Eight other patients had pulmonary oedema and/or severe hypotension; abnormally high (over 20 mmHg) capillary wedge pressure and a marked left ventricular outflow obstruction were present in most of these patients.

Concomitant administration of quinidine (see section 4.5) preceded the severe hypotension in 3 of the 8 patients (2 of whom developed pulmonary oedema). Sinus bradycardia occurred in 11% of the patients, second-degree AV block in 4% and sinus arrest in 2%. It must be appreciated that this group of patients had a serious disease with a high mortality rate. Most adverse effects responded well to dose reduction and only rarely did verapamil have to be discontinued.

Use in patients with impaired hepatic function

Since verapamil is highly metabolised by the liver, it should be administered cautiously to patients with impaired hepatic function. Severe liver dysfunction prolongs the elimination half-life of immediate release verapamil to about 14 to 16 hours, hence, approximately 30% of the dose given to patients with normal liver function should be administered to these patients. Careful monitoring for abnormal prolongation of the PR interval or other signs of excessive pharmacologic effects (see section 4.9) should be carried out.

Use in patients with impaired neuromuscular transmission

Verapamil should be used with caution in the presence of diseases in which neuromuscular transmission is affected (myasthenia gravis, Lambert-Eaton syndrome, advanced Duchenne muscular dystrophy).

It has been reported that verapamil decreases neuromuscular transmission in patients with Duchenne's muscular dystrophy, and that verapamil prolongs recovery from the neuromuscular blocking agent vecuronium. It may be necessary to decrease the dosage of verapamil when it is administered to patients with attenuated neuromuscular transmission.

Use in patients with impaired renal function

About 70% of an administered dose of verapamil is excreted as metabolites in the urine. Although impaired renal function has been shown to have no effect on verapamil pharmacokinetics in patients with end-stage renal failure, verapamil should be used cautiously and with close monitoring in patients with impaired renal function. These patients should be carefully monitored for abnormal prolongation of the PR interval or other signs of overdosage (see section 4.9). Verapamil is not removed by haemodialysis.

4.5 Interaction with other medicines and other forms of interaction

In vitro metabolic studies indicate that verapamil hydrochloride is metabolised by cytochrome P450 CYP3A4, CYP1A2, CYP2C8, CYP2C9 and CYP2C18. Verapamil has been shown to be an inhibitor of CYP3A4 enzymes and P-glycoprotein (P-gp). Clinically significant interactions have been reported with inhibitors of CYP3A4 causing elevation of plasma levels of verapamil while inducers of CYP3A4 have caused a lowering of plasma levels of verapamil, therefore, patients should be monitored for medicine interactions.
**Beta blockers**

Concomitant therapy with beta-adrenergic blockers and verapamil may result in additive negative effects on heart rate, atrioventricular conduction, and/or cardiac contractility. The combination of sustained-release verapamil and beta-adrenergic blocking agents has not been studied. However, there have been reports of excessive bradycardia and AV block, including complete heart block, when the combination has been used for the treatment of hypertension. For hypertensive patients, the risks of combined therapy may outweigh the potential benefits. The combination should be used only with caution and close monitoring.

Asymptomatic bradycardia (36 beats/min) with a wandering atrial pacemaker has been observed in a patient receiving concomitant timolol (a beta-adrenergic blocker) eye drops and oral verapamil.

Atenolol, metoprolol and propranolol plasma levels may be increased by concomitant administration of verapamil.

**Ivabradine**

Concomitant administration of verapamil and ivabradine is contraindicated. Ivabradine use in combination with verapamil is associated with increased plasma concentrations of ivabradine and additional heart rate lowering effects (see section 4.3).

**Digitalis**

Clinical use of verapamil in digitalised patients has shown the combination to be well tolerated if digoxin doses are properly adjusted. Chronic verapamil treatment can increase serum digoxin levels by 50 to 75% during the first week of therapy, and this can result in digitalis toxicity. In patients with hepatic cirrhosis the influence of verapamil on digoxin kinetics is magnified. Verapamil may reduce total body clearance and extrarenal clearance of digoxin by 27% and 29%, respectively. Maintenance digitalis doses should be reduced when verapamil is administered, and the patient should be carefully monitored to avoid over- or under-digitalisation. Whenever over-digitalisation is suspected, the daily dose of digitalis should be reduced or temporarily discontinued. Upon discontinuation of verapamil, the patient should be reassessed to avoid under-digitalisation. In clinical trials related to the control of ventricular response in digitalised patients who had atrial fibrillation or atrial flutter, ventricular rates below 50/min at rest occurred in 15% of patients and asymptomatic hypotension occurred in 5% of patients.

**Antihypertensive agents**

Verapamil administered concomitantly with oral antihypertensive agents (e.g. vasodilators, angiotensin-converting enzyme inhibitors, diuretics, beta blockers) will usually have an additive effect on lowering blood pressure. Patients receiving these combinations should be appropriately monitored. Concomitant use of agents that attenuate alpha-adrenergic function with verapamil may result in a reduction in blood pressure that is excessive in some patients. Such an effect was observed in one study following the concomitant administration of verapamil and prazosin.

**Antiarrhythmic agents**

When combined with antiarrhythmic medicines (e.g. disopyramide, flecainide, mexiletine, amiodarone) additive (depressant) effects on myocardial contractility and AV conduction may occur.

In a small number of patients with hypertrophic cardiomyopathy (IHSS), concomitant use of verapamil and quinidine resulted in significant hypotension. Until further data are obtained, combined therapy of verapamil and quinidine in patients with hypertrophic cardiomyopathy should probably be avoided.

The electrophysiological effects of quinidine and verapamil on AV conduction were studied in 8 patients. Verapamil significantly counteracted the effects of quinidine on AV conduction. There has been a report of increased quinidine levels during verapamil therapy.
Nitrates
Verapamil has been given concomitantly with short-and long-acting nitrates without any undesirable medicine interactions. The pharmacologic profile of both medicines and the clinical experience suggest beneficial interactions.

Other
Cimetidine
The interaction between cimetidine and chronically administered verapamil has not been studied. Variable results on clearance have been obtained in acute studies of healthy volunteers, clearance of verapamil was either reduced or unchanged.

Lithium
Increased sensitivity to the effects of lithium (neurotoxicity) has been reported during concomitant verapamil-lithium therapy with either no change or an increase in serum lithium levels. However, the addition of verapamil has also resulted in the lowering of serum lithium levels in patients receiving chronic stable oral lithium. Patients receiving both medicines must be monitored carefully.

Prazosin, terazosin
Additive hypotensive effect.

HIV antiviral agents
Due to the metabolic inhibitory potential of some of the HIV antiviral agents, such as ritonavir, plasma concentrations of verapamil may increase. Caution should be used or the dose of verapamil may be decreased.

Carbamazepine
Verapamil therapy may increase carbamazepine concentrations during combined therapy. This may produce carbamazepine side effects such as diplopia, headache, ataxia, or dizziness.

Erythromycin, clarithromycin and telithromycin
Erythromycin, clarithromycin and telithromycin therapy may increase serum levels of verapamil.

Rifampicin
Blood pressure lowering effect may be reduced.

Phenobarbital
Phenobarbital therapy may increase verapamil clearance.

Ciclosporin
Verapamil therapy may increase serum levels of ciclosporin.

Everolimus, sirolimus and tacrolimus
Verapamil therapy may increase serum levels of everolimus, sirolimus and tacrolimus.

Buspirone
Verapamil therapy may increase plasma levels of buspirone.

Midazolam
Verapamil therapy may increase plasma levels of midazolam.

Theophylline
Verapamil therapy may inhibit the clearance and increase the plasma levels of theophylline.
**Phenytoin**
Verapamil therapy may alter plasma levels of phenytoin.

**Alcohol**
Verapamil therapy may inhibit metabolism of alcohol increasing its CNS depressant effects.

**Inhalation anaesthetics**
Animal experiments have shown that inhalation anaesthetics depress cardiovascular activity by decreasing the inward movement of calcium ions. When used concomitantly, inhalation anaesthetics and calcium antagonists, such as verapamil, should be titrated carefully to avoid excessive cardiovascular depression.

**Neuromuscular blocking agents**
Clinical data and animal studies suggest that verapamil may potentiate the activity of neuromuscular blocking agents (curare-like and depolarising). It may be necessary to decrease the dose of verapamil and/or the dose of the neuromuscular blocking agent when the medicines are used concomitantly.

**Grapefruit juice**
Grapefruit juice has been shown to increase the plasma levels of verapamil, and therefore grapefruit and its juice should not be taken with verapamil.

**HMG-CoA reductase inhibitors**
Treatment with HMG-CoA reductase inhibitors (e.g. simvastatin or atorvastatin) in a patient taking verapamil should be started at the lowest possible dose and titrated upwards. If verapamil hydrochloride treatment is to be added to patients already taking a HMG-CoA reductase inhibitor (e.g. simvastatin or atorvastatin), consider a reduction in statin dose and retitrate against serum cholesterol concentrations.

Verapamil hydrochloride may increase the serum levels of HMG-CoA reductase inhibitors primarily metabolised by CYP3A enzymes (e.g. atorvastatin and simvastatin). Similarly, verapamil AUC may increase by approximately 42.8% with atorvastatin. Consider using caution when these HMG-CoA reductase inhibitors and verapamil are concomitantly administered.

Fluvastatin, pravastatin and rosuvastatin are not metabolised by CYP3A4 and are less likely to interact with verapamil.

**Sulfinpyrazone**
Blood pressure lowering effect may be reduced.

**Aspirin**
Increased tendency to bleed.

**Dabigatran**
Use of dabigatran with verapamil may increase dabigatran plasma concentrations (C\text{max} up to 90% and AUC up to 70%). The risk of bleeding may increase. When co-administered with oral verapamil, the dose of dabigatran may need to be reduced (refer to dabigatran data sheet for dabigatran dosing instructions).

**Doxorubicin**
Caution should be used when oral verapamil is administered in combination with doxorubicin due to the potential for increased doxorubicin levels.
Colchicine
Colchicine is a substrate for both CYP3A and the efflux transporter, P-glycoprotein (P-gp). Verapamil is known to inhibit CYP3A and P-gp. When verapamil and colchicines are administered together, inhibition of P-gp and/or CYP3A by verapamil may lead to increased exposure to colchicine. Combined use is not recommended.

Imipramine
Verapamil therapy may increase serum levels of imipramine.

Glibenclamide
Verapamil therapy may increase serum levels of glibenclamide.

4.6 Fertility, pregnancy and lactation

Use in pregnancy
Category C

Verapamil carries the potential to produce foetal hypoxia associated with maternal hypotension. Reproduction studies have been performed in rabbits and rats at oral doses up to 1.5 (15 mg/kg/day) and 6 (60 mg/kg/day) times the human oral daily dose, respectively, and have revealed no evidence of teratogenicity. In the rat, however, this multiple of the human dose was embryocidal and retarded foetal growth and development, probably because of adverse maternal effects reflected in the reduced weight gains of the dams. This oral dose has also been shown to cause hypotension in rats. There are no adequate and well controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this medicine should be used during pregnancy only if clearly needed. Verapamil crosses the placental barrier and can be detected in umbilical vein blood at delivery.

Labour and delivery
Verapamil crosses the placental barrier and can be detected in umbilical vein blood at delivery. It is not known whether the use of verapamil during labour or delivery has immediate or delayed adverse effects on the foetus or whether it prolongs the duration of labour or increases the need for forceps delivery or other obstetric intervention. Such adverse experiences have not been reported in the literature, despite a long history of use of verapamil in Europe in the treatment of cardiac side effects of beta-adrenergic agonist agents used to treat premature labour.

Use in lactation
Verapamil is excreted in human milk. Limited human data from oral administration has shown that the infant relative dose of verapamil is low (0.1 - 1% of the mother's oral dose) and that verapamil use may be compatible with breastfeeding. Due to the potential for serious adverse reactions in nursing infants, verapamil should only be used during lactation if it is essential for the welfare of the mother.

Fertility
No data available. For pre-clinical fertility data refer to section 5.3.

4.7 Effects on ability to drive and use machines
Due to its antihypertensive effect, depending on the individual response, verapamil hydrochloride may affect the ability to react to the point of impairing the ability to drive a vehicle, operate machinery or work under hazardous conditions. This applies all the more at the start of treatment, when the dose is raised, when switching from another medicine and in conjunction with alcohol. Verapamil may increase the blood levels of alcohol and slow its elimination. Therefore, the effects of alcohol may be exaggerated.
4.8 Undesirable effects

Verapamil is usually well tolerated.

Serious adverse reactions are uncommon when verapamil therapy is initiated with upward dose titration within the recommended single and total daily dose. See section 4.4 for discussion of heart failure, hypotension, elevated liver enzymes, AV block and rapid ventricular response.

The following reactions, the majority at rates of 1% or less, occurred under verapamil administration in general and most of them under conditions (open trials, marketing experience) where a causal relationship is uncertain; they are listed to alert the physician to a possible relationship:

Cardiovascular
Angina pectoris, atrioventricular dissociation, chest pain, claudication, myocardial infarction, palpitations, purpura (vasculitis), syncope.

Digestive system
Diarrhoea, dry mouth, gastrointestinal distress, abdominal discomfort and pain, gingival hyperplasia.

Haemic and lymphatic
Ecchymosis or bruising.

Nervous system
Cerebrovascular accident, confusion, equilibrium disorders, insomnia, muscle cramps, paraesthesia, psychotic symptoms, shakiness, somnolence.

Skin
Arthralgia and rash, exanthema, hair loss, hyperkeratosis, maculae, sweating, urticaria, Stevens-Johnson syndrome, erythema multiforme.

Special senses
Blurred vision, tinnitus, vertigo.

Urogenital
Gynaecomastia, impotence, increased urination, spotty menstruation.

Treatment of acute cardiovascular adverse reactions
The frequency of cardiovascular adverse reactions which require therapy is rare; hence, experience with their treatment is limited. Whenever severe hypotension or complete AV block occur following oral administration of verapamil, the appropriate emergency measures should be applied immediately, e.g. intravenously administered isoprenolol, noradrenaline, atropine (all in the usual doses), or calcium gluconate (10% solution). In patients with hypertrophic cardiomyopathy (IHSS), alpha-adrenergic agents (phenylephrine, metaraminol bitartrate or methoxamine) should be used to maintain blood pressure, and isoprenolol and noradrenaline should be avoided. If further support is necessary, inotropic agents (dopamine or dobutamine) may be administered. Actual treatment and dosage should depend on the severity and the clinical situation and the judgement and experience of the treating physician.

Tabulated below are the incidence of adverse events for verapamil SR based on clinical trials.
Verapamil SR

In 11 clinical trials with verapamil SR including a phase IV multicentre trial, on a total of 4,538 patients, the following side effects occurred at rates of 1% or more which appeared to be medicine-related:

- Constipation 4.1%
- Headaches 1.2%
- Dizziness 2.6%
- Nausea 1.2%
- Flush 1.2%
- Tiredness 1.0%

The following side effects occurred at rates of 0.25 to 0.99%:

- Cardiovascular: bradycardia, palpitations, oedema, orthostasis, abrupt BP fall

- Digestive system: gastric complaints/discomfort.

- Skin: itching, urticaria, exanthema.

Adverse effects from post-marketing surveillance:

There has been a single post marketing report of paralysis (tetraparesis) associated with the combined use of verapamil and colchicine. This may have been caused by colchicine crossing the blood-brain barrier due to CYP3A and P-gp inhibition by verapamil. Combined use of verapamil and colchicine is not recommended.

Other adverse effects reported from post-marketing surveillance include myalgia, vomiting, tachycardia, ileus, galactorrhea, increased blood prolactin, extrapyramidal syndrome, hyperkalaemia, dyspnoea and renal failure.

Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicine is important. It allows continued monitoring of the benefit/risk balance of the medicine. Healthcare professionals are asked to report any suspected adverse reactions https://nzphvc.otago.ac.nz/reporting/.

4.9 Overdose

Symptoms

Bradydrcardia, cardiac arrest, second and third-degree AV block, hypotension and myocardial insufficiency.

Fatalities have occurred as a result of overdose.

Treatment

Treatment of overdosage should be supportive. Beta-adrenergic stimulation or parenteral administration of calcium solutions may increase calcium ion flux across the slow channel, and have been used effectively in treatment of deliberate overdosage with verapamil. Verapamil cannot be removed by haemodialysis. Clinically significant hypotensive reactions or fixed high degree AV block should be treated with vasopressor agents or cardiac pacing, respectively. Asystole should be handled by the usual measures including cardiopulmonary resuscitation.

In poisoning with large quantities of the sustained-release preparation one should bear in mind that the active substance may be released into and absorbed by the intestine over a period exceeding 48 hours after ingestion. Dependent upon the time of intake, agglomerates of puffed tablet residues are to be anticipated along the whole length of the G.I. tract, acting as depots.
Thus, in suspected verapamil SR poisoning intensive measures for complete elimination of the medicine are indicated: induced vomiting, endoscope-monitored aspiration of G.I. contents, intestinal lavage, purgation, high enemas.

For further advice on management of overdose please contact the National Poisons Information Centre (0800 POISON or 0800 764 766).

5. Pharmacological Properties

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: selective calcium channel blockers with direct cardiac effects, ATC code: C08DA01

Verapamil is a calcium ion influx inhibitor (slow channel blocker or calcium ion antagonist) which exerts its pharmacologic effects by modulating the influx of ionic calcium across the cell membrane of the arterial smooth muscle as well as in conductile and contractile myocardial cells.

Mechanism of action

Essential hypertension

Verapamil exerts antihypertensive effects by decreasing systemic vascular resistance, usually without orthostatic decreases in blood pressure or reflex tachycardia; bradycardia (rate less than 50 beats/min) is uncommon (1.4%). During isometric or dynamic exercise verapamil does not alter systolic cardiac function in patients with normal ventricular function.

Angina pectoris

Verapamil dilates the main coronary arteries and coronary arterioles, both in normal and ischaemic regions, and is a potent inhibitor of coronary artery spasm, whether spontaneous or ergonovine-induced. This property increases myocardial oxygen delivery in patients with coronary artery spasm, and is responsible for the effectiveness of verapamil in vasospastic (Prinzmetal's or variant) as well as unstable angina at rest. Whether this effect plays any role in classical effort angina is not clear, but studies of exercise tolerance have not shown an increase in the maximum exercise rate-pressure product, a widely accepted measure of oxygen utilisation. This suggests that, in general, relief of spasm or dilation of coronary arteries is not an important factor in classical angina.

Verapamil regularly reduces the total systemic resistance (afterload) against which the heart works both at rest and at a given level of exercise by dilating peripheral arterioles.

Verapamil does not alter total serum calcium levels. However, one report suggested that calcium levels above the normal range may alter the therapeutic effect of verapamil.

Other pharmacological actions of verapamil include the following

Electrical activity through the AV node depends, to a significant degree, upon calcium influx through the slow channel. By decreasing the influx of calcium, verapamil prolongs the effective refractory period within the AV node and slows AV conduction in a rate-related manner. Normal sinus rhythm is usually not affected, but in patients with sick sinus syndrome, verapamil may interfere with sinus node impulse generation and may induce sinus arrest or sinoatrial block. Atrioventricular block can occur in patients without pre-existing conduction defects (see section 4.4).

Verapamil does not alter the normal atrial action potential or intraventricular conduction time, but depresses amplitude, velocity of depolarisation and conduction in depressed atrial fibres. Verapamil may shorten the antegrade effective refractory period of accessory bypass tracts. Acceleration of ventricular rate and/or ventricular fibrillation has been reported in patients with atrial flutter or atrial fibrillation and a co-existing accessory AV pathway following administration of verapamil (see section 4.4).
Verapamil has a local anaesthetic action that is 1.6 times that of procaine on an equimolar basis. It is not known whether this action is important at the doses used in humans.

5.2 Pharmacokinetic properties

With the immediate release formulation, more than 90% of the orally administered dose of verapamil is absorbed. Because of rapid biotransformation of verapamil during its first pass through the portal circulation, bioavailability ranges from 20% to 35%. Peak plasma concentrations are reached between 1 and 2 hours after oral administration. Chronic oral administration of 120 mg of verapamil every 6 hours resulted in plasma levels of verapamil ranging from 125 to 400 nanograms/mL with higher values reported occasionally. A nonlinear correlation between the verapamil dose administered and verapamil plasma levels does exist.

In early dose titration with verapamil a relationship exists between verapamil plasma concentrations and the prolongation of the PR interval. However, during chronic administration this relationship may disappear. The mean elimination half-life in single dose studies ranged from 2.8 to 7.4 hours. In these same studies, after repetitive dosing the half-life increased to a range from 4.5 to 12.0 hours (after less than 10 consecutive doses given 6 hours apart). Half-life of verapamil may increase during titration.

Aging may affect the pharmacokinetics of verapamil. Elimination half-life may be prolonged in the elderly.

In multiple dose studies under fasting conditions the bioavailability measured by AUC of verapamil SR was similar to verapamil immediate release; rates of absorption were, of course, different. In a randomised, single dose, crossover study using healthy volunteers, administration of 240 mg verapamil SR with food produced peak plasma verapamil concentrations of 63 nanograms/mL, time to peak plasma verapamil concentration of about 12 hours, and AUC (0-∞) of 1,300 nanograms-hr/mL. When verapamil SR was administered to fasting subjects, peak plasma verapamil concentration was 92 nanograms/mL, time to peak plasma concentration was about 7 hours, and AUC (0-∞) was 1,270 nanograms-hr/mL. Similar results were demonstrated for plasma norverapamil. Good correlation of dose and response is not available but controlled studies of verapamil SR have shown effectiveness of doses similar to the effective doses of verapamil (immediate release) in hypertensive patients. Plasma verapamil levels are not directly related to antihypertensive efficacy at the dosages usually administered (240 to 480 mg/day).

In healthy man, orally administered verapamil undergoes extensive metabolism in the liver. Twelve metabolites have been identified in plasma. Norverapamil can reach steady-state plasma concentrations approximately equal to those of verapamil itself. The cardiovascular activity of norverapamil appears to be approximately 20% that of verapamil. Approximately 70% of an administered dose is excreted as metabolites in the urine and 16% or more in the faeces within 5 days. About 3% to 4% is excreted in the urine as unchanged medicine. Approximately 90% is bound to plasma proteins.

In patients with hepatic insufficiency, metabolism of immediate release verapamil is delayed and elimination half-life prolonged up to 14 to 16 hours (see section 4.4); the volume of distribution is increased and plasma clearance reduced to about 30% of normal. Verapamil clearance values suggest that patients with liver dysfunction may attain therapeutic verapamil plasma concentrations with one-third of the oral daily dose required for patients with normal liver function.

Impaired renal function has no effect on verapamil hydrochloride pharmacokinetics in patients with end-stage renal failure and subjects with healthy kidneys.

After four weeks of oral dosing (120 mg q.i.d.), verapamil and norverapamil levels were noted in the cerebrospinal fluid. Estimated partition coefficient of 0.06 for verapamil and 0.04 for norverapamil.

Haemodynamics and myocardial metabolism

Verapamil reduces afterload and myocardial contractility. Improved left ventricular diastolic function in patients with hypertrophic cardiomyopathy (IHSS) and those with coronary heart disease has also
been observed with verapamil therapy. In most patients, including those with organic cardiac
disease, the negative inotropic action of verapamil is countered by reduction of afterload and cardiac
index is usually not reduced. In patients with severe left ventricular dysfunction however, (e.g.
pulmonary wedge pressure above 20 mmHg or ejection fraction lower than 30%), or in patients on
beta-adrenergic blocking agents or other cardiodepressant medicines, deterioration of ventricular
function may occur (see section 4.5).

**Pulmonary function**
Verapamil does not induce broncho-constriction and hence, does not impair ventilatory function.

### 5.3 Preclinical safety data

#### Carcinogenesis, mutagenesis, impairment of fertility
An 18-month toxicity study in rats, at a low multiple (6 fold) of the maximum recommended human
dose, and not the maximum tolerated dose, did not suggest a tumorigenic potential. There was no
evidence of a carcinogenic potential of verapamil administered in the diet of rats for two years at
doses of 10, 35 and 120 mg/kg/day or approximately 1x, 3.5x and 12x, respectively, the maximum
recommended human daily dose (480 mg/day or 9.6 mg/kg/day).

Verapamil was not mutagenic in the Ames test in 5 test strains at 3mg per plate, with or without
metabolic activation.

Studies in female rats at daily dietary doses up to 5.5 times (55 mg/kg/day) the maximum
recommended human dose did not show impaired fertility. Effects on male fertility have not been
determined.

#### Animal pharmacology and/or animal toxicology
In chronic animal toxicology studies verapamil caused lenticular and/or suture line changes at
30mg/kg/day or greater and frank cataracts at 62.5 mg/kg/day or greater in the beagle dog but not
the rat.

Development of cataracts due to verapamil has not been reported in humans.

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### 6. Pharmaceutical Particulars

#### 6.1 List of excipients
VERPAMIL SR 120 tablets also contain lactose monohydrate, methacrylic acid copolymer,
hydrogenated castor oil, purified talc, magnesium stearate, hypromellose and diethyl phthalate. The
tablets are polished with carnauba wax.

VERPAMIL 240 SR tablets also contain sodium alginate, povidone, microcrystalline cellulose,
purified talc, magnesium stearate, polyvinyl alcohol, titanium dioxide, macrogol, D & C yellow #10
aluminium lake, brilliant blue FCF aluminium lake, and sunset yellow FCF aluminium lake (E110).

VERPAMIL SR 120 are gluten-free.

VERPAMIL SR 240 are lactose-free and gluten-free.

#### 6.2 Incompatibilities
Not applicable.

#### 6.3 Shelf life
3 years.
6.4 Special precautions for storage
Store at or below 25°C.
Protect from moisture. Keep container tightly closed.

6.5 Nature and contents of container
Not all pack types and sizes may be marketed.

6.6 Special precautions for disposal
Not applicable.

7. Medicines Schedule
Prescription Medicine

8. Sponsor Details
Mylan New Zealand Ltd
PO Box 11183
Ellerslie
AUCKLAND
Telephone 09-579-2792

9. Date of First Approval
VERPAMIL SR 120: 22 January 1986
VERPAMIL SR 240: 26 June 1987

10. Date of Revision of the Text
02 July 2018 Revised to SmPC format