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ASSESSMENT OF THE PAEDIATRIC NEEDS CARDIOVASCULAR PRODUCTS

DISCLAIMER

The Paediatric Working Party (PEG) is working to identify the needs in the different therapeutic areas where there should be research and development of medicinal products for children, either old (i.e. off patent) or new ones (including those under development). Products on the list are not in any order of priority.

The lists should not be viewed as a prescription tool nor as recommendations for treatment. Accuracy of data including in particular authorised doses cannot be guaranteed.

Information on existing marketing authorisations is very limited and therefore information under "authorised" includes the indication in broad term (only related to cardiology), the lower age group authorised in at least one Member State, the authorised dose(s) (if authorised for use in patients less than 18 years of age) and formulation(s) in at least in one Member State.

Please refer to the EMEA/PEG procedure for identifying the paediatric needs for further information.

Comments from third parties are expected especially to complete and or update the list as necessary.

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INOTROPES, PHOSPHO	DDIESTERASE INHIBITORS, INODILATORS, VASODILATORS
	LEVOSIMENDAN
Authorised indication	Heart failure
Authorised age group	> 15 years
Authorised dose	12-24 μg/kg, followed by 0.1 μg/kg/min
Authorised formulation	2.5 mg/ml intravenous solution
Needs ¹	Extension of the indication (efficacy, long term safety data and dose) <
	15 years
	Age appropriate formulation
	MILRINONE
Authorised indication	Heart failure, low cardiac output following cardiac surgery
Authorised age group	> 12 years
Authorised dose	0.3-0.75 μg/kg/min
Authorised formulation	Intravenous solution
Needs	Extension of the indication (efficacy, long term safety data and dose) <
	12 years
	Age appropriate formulation
	ENOXIMONE
Authorised indication	Heart failure
Authorised age group	Adults
Authorised dose	-
Authorised formulation	100mg/ml, 150mg/ml solution for injection
Needs	Extension of the indication (efficacy, long term safety data and dose) to
	all age groups
	Age appropriate formulation
	INHALED NITRIC OXIDE
Authorised indication	Pulmonary hypertension
Authorised age group	Preterms ≥ 34 weeks of gestational age, neonates and infants
Authorised dose	5-20 ppm
Authorised formulation	400 ppm mol/mol Inhalation gas
Needs	Extension of the indication to preterms < 34 weeks (efficacy and
Treeds	safety data) and in post-operative use in all age groups
	safety data, and in post operative use in an age groups
	BOSENTAN
Authorised indication	Pulmonary arterial hypertension
Authorised age group	> 12 years
Authorised dose	62.5 mg b.i.d for 4 weeks, maintenance 125 mg b.i.d
Authorised formulation	62.5 mg tablet
Needs	Although there are some dosing regimen mentioned in the SPC for
	children ≥ 10 kg, additional data on efficacy and safety needed
	Data on efficacy, safety and dose < 3 years
	Age appropriate formulation
	SILDENAFIL
Authorised indication	Pulmonary hypertension
Authorised age group	Adults
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¹ The list will specify which kind of data would be needed but neither the design, nor the number of studies (e.g. PK, efficacy). The lists will indicate the need for 'age-appropriate' formulations, without specifying which one, to keep options open and room for innovation.

Authorised dose	-
Authorised formulation	20, 25, 50 and 100 mg film-coated tablet
Needs	Extension of the indication (efficacy, long term safety data and dose) to all age groups Age appropriate formulation
	ILOPROST
Authorised indication	Pulmonary hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Nebuliser solution 10 micrograms/ml
Needs	Extension of the indication (efficacy, long term safety data and dose) to all age groups Age appropriate formulation
	DOPAMINE
Authorised indication	Cardiogenic shock, acute heart failure
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Intravenous solution
Needs	Extension of the indications to all age groups, including neonates
	(efficacy, safety data and dose)
	Age appropriate formulation
	DOBUTAMINE
Authorised indication	Cardiogenic shock, acute heart failure
Authorised age group	Children (Spain, Germany)
Authorised dose	1-15 μg/kg/min
Authorised formulation	Intravenous solution
Needs	Define the lower age limit based on data on efficacy and safety and
	investigate where needed.
	Age appropriate formulation
	ARGININE-VASOPRESSIN
Authorised indication	Cardiogenic shock
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Intravenous solution
Needs	Extension of the indication (safety, efficacy and dose) to all age groups
	Age appropriate formulation
	DIHYDRALAZINE
Authorised indication	Hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Powder and solvent for injection 25 mg/2 ml
Needs	Extension of the indication (efficacy, safety data and dose) to all age
	groups
	Age appropriate formulation
	NITROPRUSSIDE
Authorised indication	Heart failure, hypertensive crisis
Authorised age group	Adults
Authorised dose	
Authorised formulation	Intravenous solution

Needs	Extension of the indications (efficacy, safety data and dose) to all groups
	Age appropriate formulation
	EPINEPHRINE
Authorised indication	Cardiac arrest
Authorised age group	Adults and children (unspecified lower age group)
Authorised dose	0,01-0,03 mg/kg
Authorised formulation	Intravenous solution
Needs	To define lower age group and investigate where there is a need
	NOREPINEPHRINE
Authorised indication	Acute hypotension
Authorised age group	Adults and children (unspecified lower age group)
Authorised dose	0,01-0,03 mg/kg
Authorised formulation	Intravenous solution
Needs	To define lower age group and investigate where there is a need
	INDOMETACIN (IV)
Authorised indication	Patent Ductus Arteriosus (PDA) closure
Authorised age group	Preterms (United Kingdom and Belgium)
Authorised dose	0,2 mg/kg every 12 hours x 3
Authorised formulation	Intravenous solution
Needs	Age appropriate formulation
1,0000	Availability in all Member States
ACE-INHIBITORS	
	CAPTOPRIL
Authorised indication	Hypertension, heart failure
Authorised age group	Adults
Authorised dose	-
Authorised formulation	12.5 mg tablet, 25 mg tablet
Needs	Re-analysis of the benefit/risk in children based on existing data,
1,000	Define lower age limits in both indications and investigate where
	needed
	Age appropriate formulation
	RAMIPRIL
Authorised indication	Hypertension, heart failure
Authorised age group	Adults
Authorised dose	-
Authorised formulation	1,25 mg, 2,5 mg, 5 mg, and 10 mg tablet
Needs	Re-analysis of the benefit/risk in children based on existing data
	Define lower age limit in both indications and investigate where needed
	Age appropriate formulation
	ENALAPRIL
Authorised indication	Hypertension, heart failure
Authorised age group	Adults
Authorised dose	-
L	

Needs CALCIUM-ANTAGONIS	Re-analysis of the benefit/risk in children based on existing data Define lower age limits in both indications and investigate where needed Liquid formulation known to be technically challenging – Need for information on extemporaneous formulation in Summary of Product Characteristics
CHECICIA MITTAGONIA	NIFEDIPINE
Authorised indication	Hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	20 mg sustained release tablet, oral solution (drops) in some Member States, Capsules
Needs	Extension of the indication (efficacy, safety data and dose) to all age groups Age appropriate formulation, including prolonged release form
	NED A DAMII
Authorized in die et en	VERAPAMIL
Authorised indication	Arrhythmias Adults
Authorised age group Authorised dose	Adults
Authorised formulation	40 mg, 80 mg and 120 mg tablets, 40 mg capsule, 2.5 mg/ml
Tumorisca jornimanon	intravenous solution
Needs	Extension of the indication (data on efficacy, safety and dose) to all age
	groups
	Age appropriate formulation
	AMLODIPINE
Authorised indication	Hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	5 mg and 10 mg capsule
Needs	Extension of the indication (efficacy, safety data and dose) to all age
	groups
	Age appropriate formulation
	NICARDIPINE
Authorised indication	Hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	50 mg prolonged release capsule, 20 mg tablet, 10 mg/10 ml intravenous solution
Needs	Extension of the indication (efficacy, safety data and dose) to all age
110000	groups
	Age appropriate formulation
HYPERTENSION CENT	RAL ACTION MECHANISM
	CLONIDINE
Authorised indication	Hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	100, 150, 300 μg capsules, 25 μg tablets, intravenous solution (Norway,
	Finland, United Kingdom)

Needs	Extension of the indication (efficacy, safety data and dose) to all age groups
	Age appropriate oral formulation
	IV formulation to be made available in all Member States
α - AND β -BLOCKERS	
•	LABETALOL
Authorised indication	Hypertension emergencies, hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	50, 100 mg and 200 mg scored tablet, 5, 10 mg/ml intravenous solution
Needs	Extension of the indications (efficacy, safety data and dose)
	Age appropriate formulation
	PRAZOSIN
Authorised indication	Hypertension
Authorised age group	Children > 12 years
Authorised dose	2.5 mg per day up to 5 mg/day
Authorised formulation	1 mg and 5 mg scored tablet, 2.5 and 5 mg prolonged release tablet
Needs	Extension of the indication to children < 12 years (efficacy, safety data and dose)
	Age appropriate formulation
β - BLOCKERS	
	PROPRANOLOL
Authorised indication	Arrhythmias, hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	20 mg tablet, 40 mg scored tablet, 160 mg prolonged release tablet, intravenous solution (5 mg/5 ml), oral liquid formulation (<i>United Kingdom</i>)
Needs	Extension of the indication for arrhythmias only (efficacy, safety data and dose) to all age groups
	Age appropriate formulation and intravenous solution to be made available in all Member States
	SOTALOL
Authorised indication	Supraventricular and ventricular arrhythmias
Authorised age group	Adults
Authorised dose	-
Authorised formulation	40 and 80 mg tablet, 160 mg tablet, intravenous solution
Needs	Extension of the indication (efficacy, safety data and dose) to all age
	groups
	Age appropriate formulation
	CARVEDILOL
Authorised indication	Hypertension, heart failure, Angina
Authorised age group	Adults
Authorised dose	-
Authorised formulation	3.125 mg, 6.25 mg, 12.5 mg, 25 mg tablet

Needs	Extension of the indication (efficacy, safety data and dose) in both indications for hypertension and heart failure to all age groups
	Age appropriate formulation
	ATENOLOL
Authorised indication	Hypertension, arrhythmias
Authorised age group	Adults
Authorised dose	-
Authorised formulation	25 mg tablet, 50 mg and 100 mg tablet, intravenous solution, oral solution (<i>United Kingdom</i>)
Needs	Extension of the indications (efficacy, safety data and dose) to all age groups Age appropriate formulation in all Member States
And mind in the	METOPROLOL Unpertoncion ambuthmics
Authorised indication	Hypertension, arrhythmias
Authorised age group	Adults
Authorised dose	10 150 (11 (200 1 1 1) 1)
Authorised formulation	10 mg and 50 mg tablet, 200 mg prolonged tablet, 1 mg/ml intravenous solution
Needs	Extension of the indications (efficacy, safety data and dose) to all age
	groups
	Age appropriate formulation
	ACEBUTOLOL
Authorised indication	Hypertension
Authorised age group	Adults and Children
Authorised dose	10 mg/kg/day
Authorised formulation	200 mg, 400 mg coated tablet, 500 mg prolonged release tablet, 40 mg/ml oral solution (<i>France</i>)
Needs	Indication and age appropriate formulation to be made available in all Member States
	ESMOLOL
Authorised indication	Hypertension, arrhythmias
Authorised age group	Adults
Authorised dose	-
Authorised formulation	10 mg/ml intravenous solution, 250 mg/ml concentrate for intravenous solution
Needs	Extension of the indications (efficacy, safety data and dose) to all age
	groups
	Age appropriate formulation
OTHER ANTI-ARRHYT	
	AMIODARONE
Authorised indication	Arrhythmias
Authorised age group	> 3 years (United Kingdom)
Authorised dose	-
Authorised formulation	100 mg tablet, 200 mg tablet, intravenous solution

Needs	Extension of the indication (efficacy, safety data and dose) < 3 years. Lower age limit to be defined in children due to iodine intoxication and thyroid adverse effects Age appropriate formulation (benzyl alcohol in current iv formulation)
	FLECAINIDE
Authorised indication	Arrhythmias
Authorised age group	Adults
Authorised dose	-
Authorised formulation	100 mg scored tablet, 50 mg tablet (France) intravenous solution
Needs	Extension of the indication (efficacy, safety data and dose) to all age groups Age appropriate formulation
	ADENOSINE TP
Authorised indication	Reduction of supraventricular tachycardia - Cardioversion
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Intravenous solution
Needs	Extension of the indication (efficacy, safety data and dose) to all age groups Age appropriate formulation
	PROPAFENONE
Authorised indication	Arrhythmias
Authorised age group	Infants and children (Germany)
Authorised dose	10-20 mg/kg (Germany)
	6-12mg/kg/d in divided doses (Malta)
Authorised formulation	10 mg coated tablets, 300 mg scored tablets, (Germany, Italy)
Needs	Safety data especially on the risk of thrombopenia and arrhythmia Re-analysis of the benefit/risk in children based on existing data to define lower age limit
	LIDOCAINE
Authorised indication	Ventricular fibrillation, tachycardia
Authorised age group	Adults
Authorised dose	-
Authorised formulation	20 mg/ml intravenous solution
Needs	Extension of the indications (efficacy, safety data and dose) to all age groups Age appropriate formulation
DIURETICS	,
1 .7 . 7 . 7	FUROSEMIDE
Authorised indication	Hypertension, heart failure, oedema
Authorised age group	Children (for treatment of oedema in Sweden, hypertension in France)
Authorised dose	1 to 2 mg/kg/day (oral) for oedema
	0.5 to 1 mg/kg/day (iv)
Authorised formulation	20 mg scored tablet, 40 mg tablet, 10 mg/ml intravenous solution, 10 mg/ml oral solution in some Member States (<i>France</i>)

Needs	Indications for oedema and hypertension and age appropriate formulation to be made available in all Member States
	SPIRONOLACTONE
Authorised indication	Hypertension, heart failure
Authorised age group	Adults and Children (United Kingdom)
Authorised dose	3 mg/kg/day (United Kingdom)
Authorised formulation	25 mg, 50 mg and 100 mg tablet
Needs	Age appropriate formulation Availability in all Member States
HYI	DROCHLOROTHIAZIDE/ CHLOROTHIAZIDE
Authorised indication	Hypertension, heart failure
Authorised age group	Adults
Authorised dose	-
Authorised formulation	25 mg and 50 mg tablet
Needs	Extension of the indications for hypertension and heart failure (efficacy, safety data and dose) to all age groups Data on efficacy, safety and dose in oedema of bronchopulmonary dysplasia Age appropriate formulation
AT II-RECEPTOR ANT	AGONISTS IRBESARTAN
Authorised indication	Hypertension, Renal disease
Authorised age group	Adults
Authorised dose	-
Authorised formulation	75 mg tablet, 150 and 300 mg tablet and 75 mg, 150 mg, 300 mg film-coated tablet
Needs	Extension of the indication (efficacy, safety data and dose) to all age groups Age appropriate formulation
	CANDESARTAN
Authorised indication	Hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	4 mg, 8 mg and 16 mg tablet
Needs	Extension of the indication (efficacy, safety data and dose) to all age groups Age appropriate formulation
	VALSARTAN
Authorised indication	Hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	80 mg tablet

Needs	Extension of the indication (efficacy, safety data and dose) to all age
	groups
	Age appropriate formulation
	TELMISARTAN
Authorised indication	Essential hypertension
Authorised age group	Adults
Authorised dose	-
Authorised formulation	80 mg tablet
Needs	Extension of the indication (efficacy, safety data and dose) to all age
	groups
	Age appropriate formulation
HYPO LIPIDAEMICS	
STATINS	
	ATORVASTATIN
Authorised indication	Dyslipidemia
Authorised age group	Adults
Authorised dose	-
Authorised formulation	10 mg, 20 mg, 40 mg and 80 mg tablet
Needs	Extension of the indications (efficacy, safety data and dose)
	Age appropriate formulation
	Data on efficacy, safety and dose in secondary dyslipidaemia
	Lower age limit to be defined
	FLUVASTATIN
Authorised indication	Dyslipidemia
Authorised age group	Adults
Authorised dose	
Authorised formulation	20 mg, 40 mg and 80 mg tablet
Needs	Lower age limit to be defined
Iveeus	Extension of the indications (efficacy, safety data and dose) as per
	lower age limit defined
	Age appropriate formulation
	Data on efficacy, safety and dose in secondary dyslipidaemia
	PRAVASTATIN
Authorised indication	Heterozygous hypercholesterolemia
Authorised age group	> 8 years
Authorised dose	10 to 20 mg daily
Authorised formulation	10, 20 mg and 40 mg tablet
Needs	Data on clinical outcome and safety in long term use
	Data on efficacy, safety and dose in secondary dyslipidaemia
	LOVASTATIN
Authorised indication	Dyslipidemia
Authorised age group	> 12 years
Authorised dose	10-80 mg daily
Authorised formulation	10 mg, 20 mg and 40 mg tablet

Needs	Data on clinical outcome and safety in long term use
110003	Data on efficacy, safety and dose in secondary dyslipidaemia
	SIMVASTATIN
Authorised indication	Prevention of cardiovascular complications, hypercholesterolemia
Authorised age group	Adults
Authorised dose	-
Authorised formulation	5, 10, 20 and 40 mg, 80 mgtablet
Needs	Lower age limit to be defined
	Extension of the indications (efficacy, safety data and dose) as per
	lower age limit defined
	Age appropriate formulation
	Data on efficacy, safety and dose in secondary dyslipidaemia
	COLESEVELAM
Authorised indication	Primary hypercholesterinaemia
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Tablets
Needs	Extension of the indications (efficacy, safety data and dose)
	Define lower age limit
	Age appropriate formulation
	Data on efficacy, safety and dose in secondary dyslipidaemia
ANTITHROMBOTICS	
	UROKINASE
Authorised indication	Thrombotic events
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Intravenous solution
Needs	Data on efficacy, safety and dose on catheter obstruction, vascular
	access in all age groups
	Age appropriate formulation
OTHERS	
	CLOPIDOGREL
Authorised indication	Prevention of atherothrombotic events
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Oral solution, 75 mg film-coated tablets
Needs	Extension of the indication (efficacy, safety data and dose) in all age
	groups Age appropriate formulation
	Age appropriate formulation
	ALTEPLASE
Authorised indication	Thrombolysis
Authorised age group	Adults
Authorised dose	-
Authorised formulation	Intravenous solution
	•

Needs	Data on efficacy, safety and dose in thrombotic events in all age groups Age appropriate formulation
	ENOXAPARINE
Authorised indication	Prevention and treatment of deep venous thrombosis
Authorised age group	Adults
Authorised dose	-
Authorised formulation	100 mg/ml, 150 mg/mlsolution for injection
Needs	Extension of the indication (efficacy, safety data and dose) to all age
	groups Age appropriate formulation
	DALTEPARINE
Authorised indication	Prevention and treatment of deep venous thrombosis, Myocardial
	Infarction, anticoagulation for hemodialysis and hemofiltration
Authorised age group	Adults
Authorised dose	-
Authorised formulation	10000-25000 IU antiX/ml solution for injection
Needs	- V
rveeas	Extension of the indications (efficacy, safety data and dose) to all age
	groups Age appropriate formulation
	Age appropriate formulation
	Acetylsalicylic acid (aspirin)
Authorised indication	Prevention of arterial thrombosis
	Kawasaki disease
Authorised age group	> 6 months (for fever in some Member States)
Authorised dose	-
Authorised formulation	50 mg powder and tablet, 75 mg tablet, 100 mg tablet, 100 mg/ml solution for injection
Needs	Age appropriate IV formulation Indication for Kawasaki disease in all Member States
	DIPYRIDAMOLE
Authorised indication	Prevention of arterial thrombosis
Authorised age group	Adults
Authorised dose	-
Authorised formulation	25, 50, 75 mg 100 mg tablet
Needs	Re-analysis of benefit risk in children based on existing data to define age lower limit
	HEPARIN
Authorised indication	Prevention and treatment of venous and arterial thrombosis
Authorised age group	Adults and children (unspecified age limit)
Authorised dose	20 UI/kg.h (initial dose)
Authorised formulation	IV formulation
Needs	Availability in all Member States
	LOW MOLECULAR WEIGHT HEPARINS
Authorised indication	Prevention and treatment of thrombosis
Authorised age group	Adults
Authorised dose	-

Authorised formulation	Injectable (SC) formulation, 150mg/ml solution for injection
Needs	Extension of the indications (efficacy, safety data and dose) to all age groups Age appropriate formulation
WARFARIN	
Authorised indication	Prevention and treatment of thrombosis
Authorised age group	Adult and children (unspecified lower age limit)
Authorised dose	< 12 months: 0.32 mg/kg/d (mean stable dose)
	12 months – 10 yrs: no data
	11- 18 yrs: 0.09 mg/kg/d
Authorised formulation	Scored Tablet 2 mg, 5 mg
Needs	Data on dose in all age groups Age appropriate formulation