Suggestions for Drug Monitoring in Adults in Primary Care:
A collaboration between London and South East Medicines Information Service, South West Medicines Information Service and Croydon Primary Care Trust.

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The monitoring parameters cited are derived from a range of guideline sources, other reference sources and expert opinion and must therefore be considered suggestions only. Adherence to them will not ensure a successful outcome in every case. The ultimate judgement regarding a particular clinical result must be made by the doctor in light of the clinical data presented by the patient and the diagnostic and treatment options available.

This document with be reviewed and updated on a regular basis, to check if this is the latest edition visit the NeLM website at www.nelm.nhs.uk alternatively contact David Erskine at London and South East Regional Medicines Information, email david.erskine@gstt.nhs.uk.

Safety Monitoring Parameter (see glossary for details)			**Action required if abnormal results**	**Additional notes**	**Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)**	**Reference Source**	**Link to Shared Care Guidelines**
Baseline	**At Initiation**	**Maintenance**					
ACE Inhibitors and angiotensin II receptor antagonists							
U&Es[15,6] BP[1,6] See BNF for more detail regarding initiation in patients with hyponatraemia, hypovolaemia, severe or unstable heart failure, known renovascular disease, hypotensive or taking multiple or high-dose diuretics or high-dose vasodilators..[4] Seek further advice if patient with hypertension has serum creatinine >200 micromol/L or	<u>HEART FAILURE</u> Creatinine and electrolytes should be checked 1-2 weeks after each dose increase/ relevant drug addition in low-risk patients with heart failure and after 5-7 days in higher-risk patients (e.g. those receiving spironolactone, those with existing renal dysfunction, those receiving combination therapy) [5] SIGN also recommend monitoring 1-2 weeks after initiation and each dose change[6] <u>HYPERTENSION</u> Renal function should be checked one week after starting treatment or changing dose in patients with hypertension. If patient is judged to be at higher risk of developing hyperkalaemia or deteriorating renal function (e.g. peripheral	HYPERTENSION Periodic U&Es/ BP monitoring should be conducted at least annually.[1]	Modify treatment dose if: Serum Cr increases by 50micromol/L or more. Serum K is 5.5mmol/l or more [1,6] SIGN state that an increase in creatinine of up to 50% above baseline (or 266micromol/L (whichever is smaller) is acceptable[6] If potassium rises to > 5.5mmol/L or creatinine increases by >100% or to above 310micromol/L the ACE/ ARB should be stopped and specialist advice sought[6] In Best Practice series it states that a rise in creatinine of >50% or to >256micromol/L (eGFR approximately	Angiotensin II antagonists are recommended as alternatives to ACE-inhibitors when cough is a limiting adverse effect [2, 6].	Ciclosporin Potassium-sparing diuretics and aldosterone antagonists Lithium Potassium salts	1.North of England evidence based development project: guideline for angiotensin converting enzyme inhibitors in primary care management of adults with symptomatic heart failure BMJ 1998 Vol 316 1369-1375 2.Hypertension in older people SIGN publication guideline No 49 Jan 2001 3. Chronic heart failure: management of chronic heart failure in adults in primary and secondary care. NICE Clinical Guideline 5 July 2003. 4. BNF Issue 55 5. Best Practice in primary care pathology: review 6. J Clin Pathol	

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eGFR < 30ml/min, or confirmed renovascular disease before initiating treatment[5]	vascular disease, diabetes, pre-existing renal impairment or an older patient) renal function should be checked within 4-10 days[5] Serum creatinine must be checked within 1-2 weeks of commencing ACE inhibitor (or angiotensin II receptor antagonist) therapy, because of the risk of renal artery stenosis being present in the older patient. Use with caution if creatinine is > 150µmol/L [2] Serum potassium should be checked within 1-2 weeks of commencing ACE inhibitor or angiotensin II antagonist therapy [2].		20-25ml/min) should normally prompt dose reduction or withdrawal of diuretic (if hypokalemic) and/or stopping ACEI/ARB pending further investigation or referral for concurrent treatment with diuretic and ACEI/ARB: the ACEI/ARB can be restarted if renal insufficiency improves after reduction/ withdrawal of diuretic. A creatinine rise of 30-50% (or to >200micromol/L/ eGFR <30ml/min) should prompt clinical review of volume status and temporary dose reduction or withdrawal of diuretics (if hypovolaemic) or of the ACEI/ARB[5]. A creatinine increase of >/= 30% with a large fall in BP after starting treatment may suggest renovascular disease that should be investigated[5] If creatinine > 50% above baseline or > 200µmol/L (which ever is smaller), despite adjustments of concomitant medication, then dose should be halved. If			2007;60:225-234 6. SIGN Guideline No 95: Management of heart failure (2007)	

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			blood chemistry still unsatisfactory specialist advice should be sought. [3] If K ≥ 6.0mmol/L or creatinine > 100% above baseline or > 350µmol/L, treatment should be stopped and specialist advice sought [3] If K >6mmol/L all drugs that may increase potassium and concomitant nephrotoxic drugs should be stopped and specialist advice sought. If K 5.5-5.9mmol/L patient should be monitored more frequently[5] If Na <132mmol/L specialist advice should be obtained[5]				
Amiodarone							
TFTs (including FT3, FT4 and ultrasensitive TSH assay[3]) (UK Guidelines recommend FT3, FT4, TSH and TPOAb [6]) Thyroid profile (TSH, free thyroxine and free triodothyronine where applicable) Liver enzymes	SPC states treatment should be initiated and normally monitored only under hospital or specialist supervision[3] If patient is started on warfarin INR should be	TFTs every 6 months during treatment and for some months after discontinuation[3, 5, 6] (UK guidelines recommend up to 12 months after cessation[6]) Thyrotoxicosis type 1 can occur several months after stopping amiodarone[3]; Thyroid profile (TSH, free thyroxine and free triodothyronine where applicable) Liver enzymes (AST) U&Es every 6 months. Chest X-ray, ECG and clinical assessment every 12 months[7]	Symptoms suggestive of pulmonary toxicity or hyperthyroidism require urgent specialist referral[4] If TFTs results are borderline repeat test in 6 wks[1]. Amiodarone inhibits peripheral conversion of levothyroxine (T4) to triiodothyronine (T3) and may cause isolated biochemical changes (increase in serum free-T4, free-T3 being slightly	Most patients develop corneal microdeposits and these rarely interfere with vision but drivers may be dazzled by headlights at night. However if vision impaired or if optic neuritis or neuropathy occur, amiodarone must be stopped to prevent blindness and expert opinion sought[5] Pneumonitis	Anti-arrhythmics (disopyramide, flecainide, procainamide) Antibacterials (erythromycin, moxifloxacin, cotrimoxazole) Anticoagulants (coumarins, phenindione) Antidepressants (tricyclics) Antiepileptics (phenytoin) Antihistamines (mizolastine) Antimalarials (chloroquine, hydroxychloroquine, mefloquine, quinine, artemether with lumefantrine) Antipsychotics (which prolong QT interval, phenothiazines, haloperidol, pimozide, amisulpride, sertindole). Antivirals (amprenovir,	1 Amiodarone & the Thyroid: Heart 1998; Vol 79 121-127 2. Which drugs require monitoring? Drug Data No 46 1998, Northern Ireland Drug and Poisons Information service 3.Cordarone SPC (Jul 2007) 4. Using oral amiodarone safely. DTB 2003, 41, 2, 9-11 5. BNF Issue 55	

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Baseline	**At Initiation**	**Maintenance**					
(AST) U&Es[7] Chest X-ray and LFTs[2,3] ECG and potassium level[3]	monitored weekly for first 7 weeks of warfarin[7]	Annual opthalmological examinations are recommended[3]. Although DTB states that these are usually only necessary for patients with visual symptoms[4] Chest X-ray should be repeated if pulmonary toxicity suspected, along with measurement of lung function tests and where possible measurement of transfer factor[3] Routine monitoring of LFTs is advised [3] DTB advises 6 monthly for LFTs and serum electrolytes (especially potassium) [4] Repeat ECGs recommended periodically[3]	decreased or even normal) in clinically euthyroid patients. There is no reason in such cases to discontinue amiodarone treatment if there is no clinical or further biological (usTSH) evidence of thyroid disease.[3] A raised T3 and T4 with a very low or undetectable TSH suggests the development of thyrotoxicosis[5] The diagnosis of hyperthyroidism is supported by a decrease in serum usTSH level, an elevated T3 and a reduced TSH response to thyrotropin releasing hormone. Elevation of reverse T3 (rT3) may also be found. In the case of hyperthyroidism, therapy should be withdrawn[3] The diagnosis of hypothyroidism is supported by an increase in serum usTSH and an exaggerated TSH response to TRH. T3 and T4 levels may be low. Euthyroidism is usually obtained within 3 months following the discontinuation of treatment[3].	should always be suspected if new or progressive shortness of breath or cough develops in a patient taking amiodorone[5] Fresh neurological symptoms should always raise the issue of peripheral neuropathy[5] Patients should be advised to shield the skin from light and to use a wide-spectrum sunscreen to protect against both long ultraviolet and visible light[5] Patients taking amiodarone and suspected of hyperthyroidism should have TSH, FT4 and FT3 measured[6]	atazanavir, indinavir, nelfinavir, ritonavir) Atomoxetine Beta-blockers (all) including sotalol) Calcium channel blockers (diltiazem and verapamil) Cardiac glycosides (digoxin) Dolasetron Ivabradine Lithium Simvastatin (avoid doses above 20mg daily) Pentamidine	6. UK Guidelines for thyroid function tests by Assoc. Clinical Biochemistry, British Thyroid Assoc and British Thyroid Foundation (Jul 2006) 7. Best practice in primary care pathology: review 4. J Clin Pathol 2006; 59: 893-902	

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Baseline	**At Initiation**	**Maintenance**					
			Treatment should be discontinued if severe liver function abnormalities or clinical signs of liver disease develop[5]				
Atorvastatin (see statins)							
Azathioprine:							
FBC, LFTs U&Es, creatinine TPMT assay[1]	**IN RHEUMATOLOGY** FBC and LFTs weekly for 6 weeks and continue every 2 weeks until dose stable for 6 weeks, then monthly thereafter[1]. Following a change in dose repeat FBC and LFTs after 2 weeks and then monthly[1] **IN DERMATOLOGY** FBC and LFTs weekly until stable on maintenance dose. Otherwise same as for rheumatology.[1] **IN GASTROENTEROLGY** BSG state that there is no evidence to support weekly monitoring as described above but less frequent monitoring of FBC may be adequate – they suggest once within weeks of starting treatment and then every 4 to 6 weeks[4] **IN GENERAL** BNF recommends weekly FBC monitoring for 4 weeks (more frequently if higher doses or if hepatic or renal impairment)[2] Prodigy recommends FBC, and either ALT or AST every 2 weeks until on stable dose[3]	**IN RHEUMATOLOGY** Once the maintenance dose, has been achieved and stable for 6 months consider discussing with patient to reduce monitoring of FBC and LFTs to 3-monthly unless the patient is heterozygote for TPMT in which case monitoring should continue at monthly intervals at a minimum.[1] U&Es and creatinine should be monitored every 6 months[1] **IN DERMATOLOGY** Same as for rheumatology[1] **IN GASTROENTEROLGY** BSG suggest monitoring FBC every 4 to 6 weeks[4] **IN GENERAL** BNF recommend a minimum of 3-monthly FBC monitoring[2] Prodigy recommend FBC and either ALT or AST every 1-3 months[3]	Withhold treatment until discussion with rheumatologist/ consultant if: WBC < 3.5 x 10^9/l, Neutrophils< 2 x 10^9/l, Platelets < 150 x 10^9/l, A > 2-fold increase in AST, ALT (above upper limit of normal)[1,3] (or development of jaundice[3]) (Prodigy also advise if falling trend in WCC or platelet count over 3 consecutive tests consult rheumatology service[3]) Rash or oral ulceration occurs.[1] If abnormal bruising or sore throat (withhold until FBC available)[1] If bacterial infection requiring antibiotics – consult rheumatology service about temporary withdrawal of azathioprine[3] If MCV > 105fl: check B12 , serum folate and	Pneumovax and annual flu vaccine should be given. In patients exposed to chickenpox or shingles, passive immunisation should be carried out using VZIG[1]. Prodigy state no action required in individuals that are not immunosuppress-ed [3] Patients should be warned to report immediately any signs or symptoms of bone marrow suppression e.g. inexplicable bruising or bleeding[2] Sunscreens and protective clothing should be encouraged to reduce sunlight exposure[1]	Allopurinol Antibacterials (co-trimoxazole and trimethoprim) Warfarin Clozapine BSR and BHPR recommend the following[1]: Allopurinol – reduce azathioprine dose to 25% of the original Warfarin – may need to reduce dose of azathioprine or increase dose of warfarin (consult specialist) Phenytoin, Sod. Valproate, Carbamazapine – azathioprine reduces the absorption of these ACEIs: co-prescription of azathioprine may cause anaemia - if significant consider alternative to ACE inhibitor or different DMARD.	1. BSR and BHPR guideline for disease-modifying anti-rheumatic drug therapy (DMARD) in consultation with the British Association of Dermatologists. (2008) 2. BNF Issue 55 3. Prodigy Guidance – Monitoring people on disease-modifying drugs (DMARDs) (July 2005) 4. BSG Guidelines for the management of inflammatory bowel disease in adults (2004) – Gut 2004, 53 Suppl V (1-16)	

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Baseline	**At Initiation**	**Maintenance**					
			TSH – withhold until results are available and discuss with specialist[1]				
Bendroflumethiazide (see diuretics)							
Bumetanide (see diuretics)							
Candesartan (see ACE Inhibitors and angiotensin II receptor antagonists)							
Captopril (see ACE Inhibitors and angiotensin II receptor antagonists)							

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Baseline	**At Initiation**	**Maintenance**					
Carbamazepine: ***Monitoring serum drug levels in patients with epilepsy should NOT be routinely performed unless to assess adherence or suspected toxicity***[2]							
FBC, U&Es LFTs[1] The MHRA recommend that patients of Han Chinese, Hong Kong Chinese, or Thai origin should be screened for HLA-B*1502 before prescription of carbamazepine.[7] In bipolar disorder NICE suggest that patients should have the following baseline monitoring: U&Es (incl renal function), FBC, LFTs, weight, height[6] Additionally as part an annual review of physical health patients with bipolar disorder should have TFTs, lipid profile, ECG (if indicated by history or clinical picture)	FBC, U&Es, LFTs periodically[1] **BIPOLAR DISORDER** NICE suggest that in bipolar disorder after 6 months the following monitoring should be carried out: LFTS, U&Es, FBC, weight (if patient has gained weight rapidly), plasma levels of carbamazapine should also be measured every 6 months. NICE also recommend TFTs at 6 months if patient has rapid-cycling bipolar disorder. Additionally SLAM advise that in bipolar disorder: plasma levels should be measured 2 weeks after initiation and 2 weeks after each dose change..[3]	FBC, U&Es, LFTs periodically[1] **EPILEPSY** NICE suggest that in epilepsy FBC, U&Es, liver enzymes, Vitamin D levels, and other tests of bone metabolism every 2-5 years for adults taking enzyme-inducing drugs[4] **BIPOLAR DISORDER** NICE suggest that in bipolar disorder U&Es and serum levels should be checked every 6 months. They also recommended that TFTs should be checked every 6 months if patient has rapid-cycling bipolar disorder but every 12 months otherwise [6]. As part of annual health check for all patients with bipolar disorder NICE recommend that the following monitoring should also be carried out every 12 months as part of routine physical monitoring: plasma glucose, lipid profile (if over 40 years), BP, weight and height[6]. In bipolar disorder: Plasma levels & FBC every 3-6 months [3]	Treatment should be discontinued if leucopenia develops that is severe, progressive or accompanied by clinical manifestations (e.g. fever or sore throat), or if any evidence of significant bone marrow depression.[1] Patients who test positive for HLA-B*1502 should not start carbamazepine unless the benefits clearly outweigh the risk of Stevens-Johnson syndrome[7] Patients/carers should be told how to recognise signs of blood, liver, or skin disorders and advised to seek immediate medical attention if symptoms such as fever, sore throat, rash, mouth ulcers, bruising or bleeding develop.[5] Withdraw treatment immediately in cases of aggravated liver dysfunction or acute liver disease.[1] .	Patients should be warned to monitor for clinical symptoms of neutropenia to immediately report any rash that is accompanied by fever/malaise. [1,2,3] Target plasma level in epilepsy 4-12mg/L[1, 2] Monitoring levels in patients with epilepsy should NOT be routinely performed unless to assess adherence or suspected toxicity[2,4] SLAM advise that a dose of at least 600mg/day and a plasma level of at least 7mg/L seem to be required in affective illness but acknowledge that some studies do not support this view. The studies that have demonstrated efficacy as a mood stabiliser have generally used doses of 800-1200mg daily..[3] If FBC abnormal consider serum iron[1]	*(Note: Refer to BNF appendix 1 for more details)* Analgesics (dextropropoxyphene) Antibacterials (clarithromycin, erythromycin, isoniazid, rifabutin, telithromycin) Anticoagulants (coumarins) Antidepressants (fluoxetine, fluvoxamine, mianserin, tricyclic and tricyclic-related antidepressants, MAOIs, SSRIs, St John's Wort) Antifungals (posaconazole, voriconazole) Antimalarials (mefloquine) Antipsychotics Antivirals (ritonavir) Calcium channel blockers (diltiazem, verapamil) Ciclosporin Corticosteroids Diuretics (acetazolamide, eplenerone) Hormone antagonists (danazol) Oestrogens Progestogens Ulcer-healing drugs (cimetidine)	1. SPC Tegretol tablets Jun 04 2.SIGN Guideline No 70: Diagnosis and Management of Epilepsy in Adults April 2003 3.The South London and Maudsley and Oxleas NHS Trust Prescribing Guidelines 9th edition 4 NICE Clinical Guideline No 20 (The epilepsies: diagnosis and management of the epilepsies in adults in primary and secondary care) 5. BNF Issue 55 6. NICE Guideline on the management of bipolar disorder in adults, children and adolescents in primary and secondary care (Jul 2006) 7. Carbamazepine: genetic testing recommended in some Asian populations. Drug Safety Update Vol 1 Issue 9.	

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Baseline	**At Initiation**	**Maintenance**					
plasma glucose levels and BP measured[6]							
Carbimazole: :							
TFTs All patients with hyperthyroidism should be referred to a specialist at diagnosis[1] White blood cell count[4]	UK Guidelines recommended TFTs every 1-3 months until stable[3].	UK Guidelines recommend annual monitoring once stable if being used as a long-term treatment option[3]	CSM warning (neutropenia and agranulocytosis) – patient should be asked to report symptoms and signs suggestive of infection, especially sore throat, a WBC should be performed if there is any clinical evidence of infection, carbimazole should be stopped promptly if there is clinical or laboratory evidence of neutropenia[2] Repeat WBC if patient develops fever, mouth ulcers, sore throat or other symptoms of infection[4] Stop drug and recommend immediate specialist referral if leucocyte count falls to $<1500x10^6/L$ or neutrophil count to $<500x10^6/L$[4]			1. Consensus statement for good practice and audit measures in management of hypothyroidism & hyperthyroidism BMJ 1996 Vol 313 pp539-544 2. BNF Issue 55 3. UK Guidelines for thyroid function tests by Assoc. Clinical Biochemistry, British Thyroid Assoc and British Thyroid Foundation (Jul 2006) 4. Best practice in primary care pathology: review 4. J Clin Pathol 2006; 59: 893-902	
Celecoxib: See NSAIDs and COX-2 selective NSAIDs							
Ciclosporin (Neoral):							
FBC (incl. differential white cell count), U&Es (particularly noting creatinine) (x2 two weeks apart to obtain mean value), LFTs, fasting	**Rheumatology and dermatology** FBC and LFT monthly until dose and trend stable for 3 months (if applicable).[1] Serum electrolytes (incl K and creatinine) every two weeks until dose and trend stable for 3 months (if applicable)[1]. Check BP each time patient	**Rheumatology and dermatology** FBC and LFT every 3 months[1] Serum electrolytes (incl K and creatinine) every month (watch when NSAID added particularly diclofenac) Check fasting lipids periodically[1] Check BP each time patient attends clinic and maintain	Withold and talk to specialist if - Hypertension develops that cannot be controlled to <140/90 by anti-hypertensive drugs[3] Creatinine rises by >30% of baseline on 2		ACE inhibitors and angiotensin II receptor antagonists Analgesics (NSAIDs NB diclofenac- use half normal dose) Antibacterials (clarithromycin, erythromycin, rifampicin, sulfadiazine, chloramphenicol, doxycycline, telithromycin, aminoglycosides, polymyxins, quinolones, sulphonamides,	1. BSR and BHPR guideline for disease-modifying anti-rheumatic drug therapy (DMARD) in consultation with the British Association of Dermatologists. (2008) 2 BNF Issue 55 3. Prodigy Guidance –	

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Baseline	**At Initiation**	**Maintenance**					
lipids. BP should be </= 140/90 on 2 separate occasions two weeks apart prior to treatment or treat hypertension prior to treatment[1] In psoriatic arthritis consult a dermatologist if patient has received in excess of 1000J PUVA before initiating treatment[1] In gastroenterol-ogy BSG also recommend BP, FBC, renal function, cholesterol and magnesium levels[4]	comes to clinic and maintain </=140/90 and check fasting lipids periodically[1] BNF advises creatinine every 2 weeks for first 3 months[2] **In gastroenterology** BP, FBC, renal function and ciclosporin level (aim for 100-200ng/ml) at weeks 1 and 2 then monthly[4] **In transplantation**	</= 140/90.[1] **In general** BNF recommends creatinine every 4 weeks (or more frequently if dose increased or NSAID introduced or dose increased)[2] Prodigy recommends FBC and creatinine every 4 weeks[3] **In dermatology** BNF recommends that after 3 months creatinine is monitored every 2 months if dose </= 2.5mg/kg/day and every month if dose higher than that[2] **In gastroenterology** BP, FBC, renal function and ciclosporin level (aim for 100-200ng/ml) monthly[4]	consecutive occassions[1,], Abnormal bruising (check FBC), Potassium rises above reference range, Significant rise in fasting lipids, Platelets < 150 x10^9/l. > 2-fold increase in AST, ALT or ALP above upper limit of normal range Prodigy note that if there is a falling trend (either a rapid fall or fall in WCC or platelet count over 3 consecutive counts) ciclosporin should also be stopped and the specialist consulted[3]) If > 3 fold rise in AST, ALT, from upper limit of reference range[3] BSG state that the risk of seizures with ciclosporin is increased in patients with a low cholesterol (<3.0 mmol/L) or magnesium (<0.5mmol/L)		vancomycin, macrolides, daptomycin, quinupristin/ dalfopristin, trimethoprim) Antidepressants (St John's Wort – BSR advise that it decreases ciclosporin activity[1]) Antiepileptics (carbamazepine, phenytoin, primidone) Antifungals (fluconazole, itraconazole, ketoconazole, voriconazole, miconazole, posaconazole, caspofungin , amphotericin) Antimalarials (chloroquine, hydroxychloroquine Antivirals (atazanavir, nelfinavir, ritonavir, saquinavir) Barbiturates Beta-blockers (carvedilol) Bile acids (ursodeoxycholic acid) Bosentan Calcium channel blockers (lercanidipine, diltiazem, nicardipine, verapamil, BSR advise that nifedipine should only be used with caution[1]) Cardiac glycosides (digoxin – BSR advise that levels can be increased[1]) Colchicine (BSR advise to avoid[1]) Corticosteroids (methylprednisolone) Cytotoxics (melphalan, doxorubicin, methotrexate) Diuretics (potassium-sparing and aldosterone antagonists) Grapefruit juice Hormone antagonists (danazol, octreotide) Lipid regulating drugs (ezetimibe and monitor carefully with all statins but avoid concomitant use of rosuvastatin and doses of simvastatin above 10mg – BSR advise only use simvastatin and only at a dose of 10mg/day[1]) Metoclopramide	Monitoring people on disease-modifying drugs (DMARDs) (July 2005) 4. BSG Guidelines for the management of inflammatory bowel disease in adults (2004) – Gut 2004, 53 Suppl V (1-16)	

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					Modafinil Orlistat Potassium salts Progestogens Sitaxentan Tacrolimus Ulcer-healing drugs (cimetidine)		
Corticosteroids							
Bone mineral density (BMD) recommended if patient deemed to be at increased risk[1] (see notes) High risk of corticosteroid-induced osteoporosis if dose planned >/= prednisolone 15mg per day (or equivalent) for 6 months or more, or if aged over 65[1]. Medium risk if present or planned dose is > 7.5mg but < 15mg for 3 mths or more or if aged less than 65[1]		If baseline BMD measurement undertaken, repeat measurement of lumbar spine and hip BMD after 1 year and then every 1-3 years depending on results [1] CKS advise in patients that require frequent courses of oral corticosteroids (3 or 4 courses over 12 months considered equivalent to 3 months of continuous treatment): monitor BP regularly and treat if necessary screen for diabetes mellitus regularly and treat if necessary[2]		Risk factors for corticosteroids-induced osteoporosis include: premature menopause (<45 years) Personal or family history of low-trauma fractures. History of amenorrhoea. Slender build (BMI<20kg/m2) Immobility. [1]	(Generally does not apply to inhaled or topical preparations) Antibacterials (rifamycins, Anticoagulants (coumarins) Antiepileptics (carbamazepine, phenytoin, primidone). Antifungals (amphotericin) Antivirals (ritonavir) Barbiturates Ciclosporin Cytotoxics (methotrexate) Vaccines (with high dose corticosteroids)	1. Glucocorticoid induced osteoporosis Guidelines for prevention and treatment. Produced by The Bone and Tooth Society, The National Osteoporosis Society, Royal College of Physicians. Dec 2002 2. CKS Guideline on the management of urticaria (Feb 2008)	
Digoxin							
Renal function, U&Es (paying particular attention to potassium level)[1,6]	Levels should be checked 8-10 days after any change in dose (although it is noted that up to 21 days may be required to reach steady-state concentrations in patients with renal insufficiency)[6]	NICE advise that in heart failure routine monitoring not recommended, however a digoxin concentration measured within 8-12hrs of last dose may be useful to confirm a clinical impression of toxicity or non-		Plasma concentration alone cannot indicate toxicity reliably but increases progressively through the range 1.5 to 3	Antiarrhythmics (amiodarone, propafenone), Antidepressants (St John's Wort), Antifungals (amphotericin, itraconazole), Antimalarials (chloroquine, hydroxychloroquine, quinine),	1. Which drugs require monitoring? Drug Data No 46 1998, Northern Ireland Drug and Poisons Information services 2. Chronic heart failure:	

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		compliance[2] BNF advises that when used in AF the maintenance dose of digoxin can usually be determined by the ventricular rate at rest, which should not be allowed to fall below 60 beats per minute except in special circumstances (eg with concomitant administration of a beta-blocker)[3]		microgram/l[3] If toxicity is suspected plasma potassium concentration should also always be measured with the plasma digoxin concentration – if the potassium concentration is low digoxin toxicity should be assumed without waiting for the digoxin measurement[4]. Hypokalaemia can be managed by giving a potassium-sparing diuretic or supplement[3] Hypercalcaemia and hypomagnesaemia may also be associated with increased tissue sensitivity but the available data are more difficult to interpret [4] Routine monitoring of thyroid function is not mentioned in BNF, NICE, Best practice series nor UK thyroid monitoring guidelines [2,3,5,6] Hypothyroidism increases tissue sensitivity and hyperthyroidism decreases it this	Calcium channel blockers (diltiazem, lercanidipine, nicardipine, verapamil, nifedipine) Ciclosporin Diuretics (acetazolamide, loop diuretics, thiazides and related diuretics, spironolactone).	management of chronic heart failure in adults in primary and secondary care. NICE Clinical Guideline 5 July 2003. 3. BNF Issue 55 4. Digoxin: BMJ 1992, 305: 1149-52 5. UK Guidelines for thyroid function tests by Assoc. Clinical Biochemistry, British Thyroid Assoc and British Thyroid Foundation (Jul 2006) 6. Best practice in primary care pathology: review 4. J Clin Pathol 2006; 59: 893-902	

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				makes interpretation of the plasma digoxin levels very difficult in patients with thyroid disease[4]			
Diuretics (loops and thiazides only, for eplenerone and spironolactone see separate entries)							
U&Es (noting potassium)[3,5] Glucose (urine analysis)[3]	**<u>Heart failure</u>** Blood chemistry should be checked after initiation of diuretic treatment (within one week) and following dose increments (heart failure) [1] Creatinine and electrolytes should be checked 1-2 weeks after each dose increase/ relevant drug addition in low-risk patients with heart failure and after 5-7 days in higher-risk patients (eg those receiving spironolactone, those with existing renal dysfunction, those receiving combination therapy) [5] **<u>Hypertension</u>** U&Es (noting potassium levels) should be checked within 4-6 weeks of starting low-dose thiazide therapy (hypertension)[2]	**<u>Heart failure</u>** Creatinine and electrolytes should be checked in patients with heart failure during periods of intercurrent illness and every 3-6 months in stable higher-risk patients and up to annually in stable lower-risk patients[5]	If potassium falls below 3 mmol/L (or 4mmol/L in high risk patients) it may be necessary to review diuretic therapy[3] Renal function should be remeasured within 2 weeks if serum creatinine rises by > 20% or eGFR falls by >15%[5]		*Note the possibility of interactions should be borne in mind following topical application of either brinzolamide or dorzolamide to the eye.* ACE inhibitors and angiotensin II antagonists Alpha-blockers Analgesics (indometacin) Anti-arrhythmics (disopyramide, flecainide, lidocaine, mexiletine) Antibacterials (aminoglycosides, polymixins, vancomycin with loop diuretics) Antiepileptics (carbamazepine with acetazolomide) Antipsychotics (pimozide, amisulpride, sertindole) Atomoxetine Beta-blockers (sotalol) Cardiac glycosides Ciclosporin Lithium Potassium salts Tacrolimus	1.SIGN Guideline on management of heart failure 2. SIGN Guideline on treatment of hypertension in older people. 3. Monitoring requirements for cardiovascular drugs. Prescriber 2000, 11(2): 43-56 4.NICE: Chronic heart failure: national clinical guideline for diagnosis and management 5. Best practice in primary care pathology: review 6. J. Clin Pathol. 2007; 60: 225-234	
Enalapril (see ACE Inhibitors and angiotensin II receptor antagonists)							
Eplerenone							

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
U&Es[1]	U&Es at 1, 4, 8 and 12 weeks, and 1 week after any dose increase.[1,2,3]	U&Es at 6, 9 and 12 months, and every 3 to 6 months thereafter.[2,3]	If potassium rises to >5.5mmol/L or serum creatinine rises to >220micromol/L, reduce dose to 25mg on alternate days or 12.5mg daily and monitor blood chemistry closely. If potassium rises to >6.0mmol/L or serum creatinine rises to >310micromol/L, stop eplerenone immediately and seek specialist advice.[2,3]	Eplerenone should not be started if baseline serum potassium is greater than 5.0mmol/L or if patients have a renal function of less than 50ml/minute.[1] Should advise patients to avoid NSAIDs not prescribed by a physician and salt substitutes high in potassium[2]	ACE inhibitors and Angiotensin-II receptor antagonists Alpha-blockers Analgesics (indomethacin) Antibacterials (clarithromycin, telithromycin, rifampicin) Antidepressants (St John's Wort) Antiepileptics (carbamazepine, phenytoin) Antifungals (itraconazole, ketoconazole) Antivirals (nelfinavir, ritonavir) Barbituates (Phenobarbital) Ciclosporin Lithium Potassium salts Tacrolimus	1. Summary of Product Characteristics for Inspra® 25mg & 50mg film-coated tablets (eplerenone). Date of revision of the text April 2007. 2.SIGN Guideline No 95. Management of chronic heart failure. February 2007. 3. NICE Guideline No 48. MI: Secondary Prevention. May 2007.	
Fluvastatin (see statins)							
Furosemide (see diuretics)							
Glitazones (see thiazolidinediones)							
Hydroxychloroquine							
FBC, U&E and LFTs[1] U&Es & LFTs [2] Ask patient about visual impairment (not corrected by glasses).[1],[2] Record near visual acuity using a standard reading chart (with reading glasses if worn)[1] [2]		Monitor visual acuity annually using the standard reading chart.[1], [2] Ask patient about any other visual symptoms annually.[2] If long term treatment is required (more than 5 years) individual arrangement should be agreed with local opthamologist[2]	If visual impairment or eye disease is present prior to treatment, assessment by an optometrist is advised and any abnormality should be referred to an ophthalmologist.[2] If visual acuity changes or patient develops blurred vision during treatment, refer to ophthalmologist, warn patient to stop treatment and seek initial prescriber's advice.[2]	Adjust dose if impaired renal or liver function[2] To avoid excessive dosage in obese patients the dose should be calculated on basis of lean body weight[2]	Anti-arrhythmics (amiodarone) Anti-bacterials (moxifloxacin) Antimalarials (artemether/lumefantrine Mefloquine) Cardiac glycosides (digoxin) Ciclosporin	1. BSR and BHPR guideline for disease-modifying anti-rheumatic drug therapy (DMARD) in consultation with the British Association of Dermatologists (2008). 2. BNF Issue 55.	
Hydroxycarbamide							

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
FBC, U&Es, LFTs[1,2]	FBC (incl differential WBC) at least once weekly for at least the first 6 weeks. Subsequently the interval between checks can be gradually extended provided there is no cause for concern[2]	The interval between FBC checks can be gradually extended from weekly provided there is no cause for concern. The interval should not exceed 3-monthly[2] Serum creatinine and LFTs should also be monitored[2]	If WBC < 2.5, or platelets < 100 therapy should be stopped and counts rechecked after 3 days[1]	Patients should be examined for evidence of malignancy every 6 months and females should be advised to attend (when called) for routine cervical smears[2]	Antipsychotics (clozapine) Antivirals (didanosine, stavudine)	1. Summary of Product Characteristics for Hydrea Caps 500mg (hydroxycarbamide). Date of revision of the text Dec 2005. 2. British Association Dermatologists – Clinical Guideline on management of psoriasis (2006)	
Hydroxyurea (see hydroxycarbamide)							
Irbesartan (see ACE Inhibitors and angiotensin II receptor antagonists)							
Ketoconazole							

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
LFTs[1,2,3]	LFTs at weeks 2 and 4 of treatment.[1,2,3]	LFTs monthly.[1,2,3]	Discontinue treatment if any LFTs are elevated above 3 times the normal limit.[1]	Oral ketoconazole should only be prescribed for dermatophytosis, Malassezia folliculitis and chronic candidosis that cannot be treated topically.[3] Patients should be told how to recognise signs of liver disorder and advised to seek prompt medical attention if symptoms such as anorexia, nausea, vomiting, fatigue, abdominal pain, jaundice or dark urine develop.[2]	Analgesics (buprenorphine) Anti-arrhythmics (disopyramide) Antibiotics (rifampicin, telithromycin) Anticoagulants (warfarin) Antidepressants (reboxetine) Anti-epileptics (phenytoin) Antihistamines (mizolastine) Antimalarials (artemether/lumefantrine) Antipsychotics (aripiprazole, pimozide, sertindole) Antivirals (maraviroc, nevirapine, ritonavir) Anxiolytics (midazolam) Calcium channel blockers (felodipine) Ciclosporin Cilostazol Cytotoxics (irinotecan) Diuretics (eplerenone) Domperidone Ergot alkaloids (ergotamine and methysergide) 5HT1 agonists (eletriptan) Ivabradine Lipid-regulating drugs (simvastatin) - MHRA advice[4] is that combinations of simvastatin and ketoconazole are contraindicated Sirolimus Tacrolimus Theophylline Vardenafil	1. SPC for Nizoral® 200mg Tablets (ketoconazole). Date of revision of the text January 2008. 2. BNF Issue 55. 3. Drug Safety Update. March 2008; Vol 1: Issue No. 8 4. 8 Drug Safety Update 2008, 1, No 6	.
Leflunomide							

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
FBC , U&Es (incl. creatinine) and LFTs, BP (should be < 140/90 on two consecutive readings 2 weeks apart) and body weight [1]	FBC & LFTs every month for the first 6 months.[1] BP and weight at each monitoring visit.[1] BNF recommends FBC (incl differential WBC and platelts) and LFTS every 2 weeks for first 6 months[2]	FBC, LFTs every two months if stable [1,2] but every month if taking another immunosuppressant or potentially hepatotoxic drug BP and weight should be checked at each monitoring visit.[1,]	Withhold until discussed with rheumatologist if: · WBC < 3.5 x 10^9/L Neutrophils < 2 x 10^9/L Platelets < 150 x 10^9/L A confirmed (within 72 hours) >3-fold rise in ALT or AST from upper limit of reference range – may need to consider washout.[1] If < 2-fold increase then monitor every two weeks, if >2-fold but <3-fold reduce dose and continue to monitor every 2 –weeks, if remains 2-3 fold then stop [1] BNF recommends use of washout procedure if liver dysfunction persists after dose reduction[2]	Withhold until discussed with rheumatologist if: rash or itch , hair loss, abnormal bruising or severe sore throat (check FBC) [1] Also seek specialist advice if patient develops hypertension, headache, GI-upset, breathlessness, or weight loss[1]	Live vaccines	1. BSR and BHPR guideline for disease-modifying anti-rheumatic drug therapy (DMARD) in consultation with the British Association of Dermatologists (2008). 2. BNF Issue 55.	
Lisinopril (see ACE Inhibitors and angiotensin II receptor antagonists)							
Losartan (see ACE Inhibitors and angiotensin II receptor antagonists)							
Lithium							
U&Es (DTB recommends particular attention to Na and , creatinine[4]) and TFTs[1,3,4] Cardiac function[3] (DTB suggests that ECG may be considered in patients with history of cardiac abnormality[4]) Lithium level if switching	NICE state that lithium should not be initiated routinely in primary care for the treatment of bipolar disorder[7] NICE recommend levels checked one week after starting and 1 week after every dose change to maintain level between 0.6 and 0.8mmol/L (a level of between 0.8 and 1.0mmol/L may be appropriate in patients who have relapsed previously or who have sub-threshold symptoms with functional impairment7). Levels should be monitored	**Thyroid monitoring** NICE recommend TFTs every 6 months[7], BNF recommends every 6-12 months[2] UK Guidelines suggest every 6-12 months during treatment[6] Best Practice review series recommends every 6 months during initial years of treatment decreasing to annually if stable[8] DTB advises every 12 months unless there is evidence of affective relapse or clinical features of hypothyroidism[4] **Renal function** NICE recommend renal function checked every 6	nGMS states the reference range for lithium as 0.4-1.0 mmol/l, however if local PCT levels differ this should be taken into account[5]. Serum lithium level range depends on whether taken once or twice daily and whether level measured at 12 or 24 hours[3] If level is outside nGMS local range – confirm with	Ideally serum levels should be taken 12 hours after the last dose of drug – in practice an interval of 10-14 hours is acceptable as long as the interval is the same at each measurement and the delay after the dose noted[4] NICE recommend that patients should be advised that erratic compliance or	ACE inhibitors and angiotensin II antagonists Analgesics (all NSAIDs) Anti-arrhythmics (amiodarone) Antidepressants (SSRIs) Antipsychotics (, sertindole,) Diuretics (acetazolamide, loop diuretics, thiazide and related diuretics, potassium sparing diuretics and aldosterone antagonists) Methyldopa	1. The South London and Maudsley NHS and Oxleas Trust 2005-6 Prescribing Guidelines 8th edition 2. BNF No 55 3 Priadel SPC (Oct 2006) 4. Using lithium safely DTB 1999, 37, 3 5. Revisions to the GMS Contract 2006/7 6. UK Guidelines for thyroid function tests by Assoc. Clinical Biochemistry, British Thyroid Assoc and British Thyroid Foundation (Jul 2006) 7. NICE Guideline on	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
from another brand/ preparation[3] In bipolar disorder NICE suggest that patients should have the following baseline monitoring: U&Es and serum creatinine TFTs, FBC (if clinically indicated), ECG (if clinically indicated), weight, height[7] Additionally as part an annual review of physical health patients with bipolar disorder NICE recommend that patients should have baseline lipid profile, plasma glucose levels and BP measured[7]	weekly until the levels are stable. SLAM recommend plasma drug levels every 5-7 days until level is between 0.6-1.0mmol/L[1,] Priadel SPC recommends level after 4-5 days (but never longer than one week) after starting therapy or changing dose[3] BNF recommends levels should be taken every week until dose has been stable for 4 weeks[2] NICE suggest that in bipolar disorder after 6 months the following monitoring should be carried out: TFTs, renal function (sooner if there is evidence of deterioration or patient starts drugs such as ACEIs, diuretics or NSAIDs) , FBC (only if clinically indicated), weight (if patien has gained weight rapidly),	months (more often if evidence of impairment)[7] BNF recommends every 6-12 months[2] Best Practice review series recommends every 12 months and in conjunction with any unexplained rise in lithium levels[8] **Plasma levels** Plasma drug levels every 3-6 months Increase frequency of monitoring if problems are suspected, the patient is elderly (over 65 years) or is co-prescribed an interacting drug[1,4] NICE and Best Practice series recommend monitoring levels every 3 months[7,8], BNF recommends that after dose has been stable for 4 weeks levels should be taken every 3 months[2] **Other monitoring** DTB recommends annual calcium checks[4] NICE recommend that weight should be monitored, especially in patients with rapid weight gain.[7] Additionally NICE recommend that all patients with bipolar disorder should have blood glucose, lipid profile (if over 40 years), BP and weight recorded as part of annual physical check up[7]	specialist that this is appropriate and document accordingly.[5]	rapid discontinuation may increase the risk of manic relapse. Monitor older adults carefully for symptoms of lithium toxicity because they may develop high serum levels of lithium at doses in the normal range, and lithium toxicity is possible at moderate serum levels7 BNF advises that patients should maintain adequate fluid intake and avoid dietary changes which reduce or increase sodium intake. Patients should be provided with a lithium treatment card[2] NICE recommend that patients are monitored for signs of neurotoxicity which can occur at therapeutic levels[7]		the management of bipolar disorder in adults, children and adolescents in primary and secondary care (Jul 2006) 8. Best practice in primary care pathology: review 5. J Clin Pathol 2006; 59: 1229-37	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
Mercaptopurine							
Mesalazine							
U&Es[1,2] BSG recommend renal function should be assessed prior to starting treatment[3]	U&Es every 3 months for the first year in elderly patients.[1,2] BSG also advise that patients with pre-existing renal impairment, taking other potentially nephrotoxic drugs or with co-morbid disease should have their renal function monitored during treatment[3]	After the first year, U&Es 6 monthly for the next 4 years and annually thereafter in elderly patients.[1,2] BSG support annual assessment of renal function as being sensible[3]		Patients should be advised to report any unexplained bleeding, bruising, sore throat, rash, mouth ulcers or fever that occurs during treatment. A blood count should be performed and the drug stopped immediately if there is suspicion of a blood dyscrasia.[1]		1. BNF Issue 55 2 Summary of Product Characteristics for Asacol® 400mg MR Tablets (mesalazine). (April 2003). **3**. BSG Guidelines for the management of inflammatory bowel disease in adults (2004) – Gut 2004, 53 Suppl V (1-16)	
Methotrexate:							
FBC, LFTs, U&Es, creatinine, chest X-ray (unless done in last 6 months), Pulmonary function tests should be considered in selected patients (eg abnormal shadowing on CXR)[1] BSG suggest FBC and LFTs when used to treat IBD[8]	**RHEUMATOLOGY** FBC, U&Es and LFTs every 2 weeks until dose and monitoring has been stable for 6 weeks thereafter monthly until the dose and disease is stable for 12 months.[1] **DERMATOLOGY** FBC, renal function and LFTs weekly and gradually increase interval until therapy stabilised[1,3,5,6] **GASTROENTEROLOGY** BSG suggest that FBC and LFTs should be checked once within 4 weeks of starting treatment when used to treat IBD and then every month[8]	**IN GENERAL** CSM, BNF and Prodigy recommend FBC, renal function and LFTs every 2-3 months once stabilised[3,4,5] Best Practice series recommends every 1-2 months[6] **RHEUMATOLOGY** FBC, U&Es and LFTs every month until the dose and disease is stable for 12 months – thereafter the monitoring may be reduced in frequency based on clinical judgement with due consideration for risk factors including age, comorbidity, renal impairment etc (when monthly monitoring should continue[1]. Additionally the NPSA suggest that CRP, ESR or PV may be monitored every 3 months [7] . BSR note that the role of type III procollagen (PIIINP) in the background of inflammatory arthritis remains unclear and is not recommended[1]	BSR[1] recommend that withhold treatment until discussion with consultant specialist if: WBC <3.5 x10^9/l, Neutrophils < 2 x10^9/l (or Prodigy advises lymphocytes <0.5 x10^9/l), platelets < 150 x10^9/l, (Prodigy also advises that treatment is stopped and expert advice sought if falling trend in WCC or platelets over 3 counts) A > 2-fold rise in AST, ALT (from upper limit of normal), Unexplained fall in albumin, Rash or oral ulceration occurs. New/ increasing dyspnoea or cough If MCV > 105fl investigate and if B12 or folate low start	Ask about abnormal bruising. and monitor for symptoms of pneumonitits at each visit.[2] Annual flu vaccine should be given, but live vaccines should be avoided.[1] In patients exposed to chickenpox or shingles, passive immunisation should be carried out using VZIG[1] Warn patients about risk of pneumonitis and advise them to seek medical attention if they develop symptoms such as dyspnoea, dry non-productive cough or fever.[2] Patents should be	Anaesthetics (nitrous oxide) Analgesics (aspirin and NSAIDS- *Note, however the BSR state that a clinically significant interaction between NSAID and methotrexate is rare.* Antibacterials (co-trimoxazole, trimethoprim), Antimalarials (pyrimethamine) Antipsychotics (clozapine) Ciclosporin Corticosteroids Cytotoxics (cisplatin) Probenecid Retinoids (acitretin)	1. BSR & BHPR Guideline for disease modifying anti-rheumatic drug therapy (DMARD) in consultation with the British Association of Dermatologists (2008) 2. Current problems in pharmacovigilance. Sept 2003 Vol 29 p 5 3.BNF Issue 55 4. Current Problems in Pharmacovigilence Sept 1997, Vol 23, 12 5. Prodigy Guidance – Monitoring people on disease-modifying drugs (DMARDs) (July 2005) 6 Best Practice in primary care pathology: review 10. J. Clin. Pathol 2007; 60: 1195-1204 7. NPSA. Methotrexate- patient held blood monitoring	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
		DERMATOLOGY FBC, U&Es, LFTs every 2-3 months once patient is stabilised[1] Best Practice series recommends that when used in patients with psoriasis monitoring of serum amino-terminal peptide of type III procollagen (PIIINP) (, a marker of hepatic fibrosis) every 2-3 months if it is available[6]. BAD also state that monitoring is recommended for early detection of liver disease[1] **GASTROENTEROLOGY** BSG suggest that FBC and LFTs should be checked every month when used to treat IBD [8]	appropriate supplementation If patient develops mild to moderate impairment of renal function. If abnormal bruising or severe sore throat occurs withhold until FBC available.[1]	advised to report all symptoms and signs suggestive of infection, especially sore throat [3,8] Patients should be advised to stay well within the national recommendations on alcohol intake[1] In the event of suspected methotrexate-induced pneumonitis, withdraw treatment and administer corticosteroids[1]. The NPSA advise that patients should be instructed to only take their methotrexate once a week on the same day each week and should be issued with a patient-held record card [9]		and dosage record book 8. BSG Guidelines for the management of inflammatory bowel disease in adults (2004) – Gut 2004, 53 Suppl V (1-16) 9. NPSA: Improving compliance with oral methotrexate guidelines	
Minocycline							

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
		If treatment continued for longer than 6 months: Monitor LFTs every 3 months.		If treatment continued for longer than 6 months: Monitor every 3 months for hepatotoxicity, pigmentation and for systemic lupus erythematosus (SLE).[1] Discontinue if the patient develops hepatotoxicity, pigmentation or SLE, or if pre-existing SLE gets worse.[1]	Anticoagulants (warfarin, phenindione) Ciclosporin Retinoids	1. BNF Issue 55.	
NSAIDs (including COX IIs) **All NSAIDs are contraindicated in severe heart failure. Celecoxib, etoricoxib and parecoxib are contraindicated in ischemic heart disease, cerebrovascular disease, peripheral arterial disease and moderate to severe heart failure. These drugs should also be used with caution in patients with a history of cardiac failure, left ventricular dysfunction, hypertension, oedema (for any other reason) and in patients with risk factors for developing heart disease. COX-2 inhibitors are associated with an increased incidence of thrombotic events and should not be used in preference to non-selective NSAIDs except when specifically indicated (for patients at particularly high risk of developing gastroduodenal ulceration or bleeding) *and* after assessing their CV risk. Non-selective NSAIDs may also be associated a small increased risk of thrombotic events particularly when used at high-doses and for long-term treatment {diclofenac 150mg daily and ibuprofen (2.4G daily) may be associated with a higher degree of risk than naproxen or low-dose ibuprofen (1.2g daily or less)[2]** **Non-selective NSAIDs are contra-indicated in patients with previous or active peptic ulceration and selective COX-2 inhibitors are contra-indicated in patients with active peptic ulceration.**							
		Renal function should be monitored in patients with renal, cardiac or hepatic impairment[2]		Advise patient to seek advice if they experience persistent stomach pains or discomfort[2] CSM advise that any degree of worsening of asthma may be related to the ingestion of NSAIDs either prescribed or purchased over the counter[1] The CHM as advised that	*(Interactions generally do not apply to topical NSAIDs, see BNF appendix 1 for more details)* Analgesics (concomitant NSAIDs or aspirin) Antibacterials (quinolones) Anticoagulants (coumarins, phenindione, heparins). Antidepressants (SSRI, venlafaxine) Antidiabetics (sulphonylureas). Antiepileptics (phenytoin). Antipsychotics (clozapine) Antivirals (ritonavir). Ciclosporin. Cytotoxics (methotrexate – see monitoring methotrexate entry above, erlotinib), Diuretics (triamterene) Lithium Pentoxifyliine (oxpentifylline) Probenecid Tacrolimus.	1. Cardiovascular safety of NSAIDs – review of evidence MHRA August 2005 2. BNF Issue 55	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
Olanzapine							
Plasma glucose (fasting if possible) BP FBC LFTs U&Es Prolactin Weight (include waist size and BMI if possible) Lipid profile (fasting if possible) ECG Creatine phosphokinase (CPK)[1] In bipolar disorder NICE recommend blood glucose, lipid profile, ECG (if clinically indicated), weight and height. Also as part of routine physical monitoring for all patients with bipolar disorder NICE additionally recommend TSH, LFTS, renal function, FBC, BP[3]	Frequent BP checks during dose titration phase[1] Plasma glucose after 1 month then every 4-6 months[1] Weight frequently for 3 months then every 3 months for first year[1] Blood lipids every 3 months for first year[1] ECG – after each dose change[1] Prolactin at 6 months[1] In bipolar disorder NICE recommend blood glucose at 1 and 3 months and more often if evidence of elevated levels, lipid profile at 3 months (more often if elevated), weight every 3 months for first year.[3]	Plasma glucose (ideally fasting) every 4-6 months [1] FBC every 12 months[1] LFTs every 12 months[1] U&Es every 12 months[1] Lipids every 12 months after 1st year[1] CPK if neuroleptic malignant syndrome (NMS) suspected[1] Prolactin levels every 12 months [1] Weight- every 12months after 1st year[1]. Increased clinical monitoring of glucose levels in patients with diabetes or at risk of developing diabetes mellitus[2] In bipolar disorder NICE recommend monitoring weight every 3 months for first year and more often if patient gains weight rapidly. Additionally as part of annual physical monitoring for patients with bipolar disorder NICE recommend TFTs (every 6 months if rapid-cycling but otherwise every 12 months), blood glucose, lipid profile (if over 40 years), BP, weight and height[3]	Stop therapy if neutrophils fall below $1.5x10^9/L$[1] Stop therapy if NMS suspected[1] Stop if LFTs indicate hepatitis (transaminases x3 normal) or functional damage (PT or albumin change)[1]	Levels reduced by smoking and carbamazepine[2] The clinical consequences are likely to be limited, but clinical monitoring is recommended and an increase of olanzapine dose may be considered if necessary[2] The CSM has advised that olanzapine and risperidone are associated with an increased risk of stroke in elderly patients with dementia[4]	*Note increased risk of toxicity with myelosuppresive drugs.* Anaesthetics (general) Antidepressants (fluvoxamine) Antiepileptics (carbamazapine, etosuximide, oxcarbazepine, phenytoin, primidone, valproate). Antimalarials (artemether/lumefantrine) Barbiturates Sibutramine	1.The South London and Maudsley NHS Trust, Oxleas NHS Trust 2005/6 Prescribing Guidelines 9th edition 2.Olanzapine SPC Jan 2008 3. NICE Guideline on the management of bipolar disorder in adults, children and adolescents in primary and secondary care (Jul 2006) 4. BNF Issue 55	
Perindopril (see ACE Inhibitors and angiotensin II receptor antagonists)							
D-Penicillamine							
FBC, urinalysis for	Urinalysis for protein/ blood and FBC every 2 weeks until	Urinalysis for protein/blood and FBC every month[1, 2, 3]	Withhold treatment until discussion with	Ask patient about presence of rash or	Clozapine	1 BSR & BHPR Guideline for disease	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
protein/ red cells, U&Es and creatinine[1]	on a stable dose[1] BNF recommends urinalysis for protein/ blood and FBC (including platelets) every 1 or 2 weeks for first 2 months and in the week after any dose increase[2.] Prodigy recommends until on a stable dose [3]		rheumatologist if [1,3] WBC < 3.5 or 4, Neutrophils < 2, Platelets < 150, (Prodigy additionally recommend withholding if there is a falling trend over 3 counts[3]) BNF recommends consideration of withdrawal if WCC < 2.5 or platelets < 120 or there are 3 successive falls in count.[2] If abnormal bruising or sore throat- withhold until FBC available[1] Proteinuria > +1 check MSSU – if positive treat appropriately. If negative and 2+ proteinuria persists withhold treatment and discuss with specialist1. (Prodigy recommend check for evidence of urine infection before consulting and quantify proteinuria with a 24-hour urine collection[3]) Proteinuria occurs in up to 30% of patients but may resolve despite continuation of treatment and treatment may be continued provided renal function tests remain normal, oedema is absent and 24 hour urinary excretion does not	oral ulceration. - Prodigy advises that if early macular-papular rash (1-2 months) withhold until rash clears – treatment may be re-introduced at a lower dose. However if later (6-18 months) and raised scaly circumscribed plaques drug should be stopped and specialists consulted. [3] Patients should be told to tell doctor immediately if sore throat, fever, infection, non-specific illness, unexpected bleeding and bruising, purpura, mouth ulcers, or rashes[2]		modifying anti-rheumatic drug therapy (DMARD) in consultation with the British Association of Dermatologists (2006) 2. BNF Issue 55 3. Prodigy Guidance – Monitoring people on disease-modifying drugs (DMARDs) (July 2005)	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
			exceed 2g[2]				
Pravastatin (see statins)							
Phenytoin: *Drug monitoring in patients with epilepsy should NOT be routinely performed unless to assess adherence or suspected toxicity or after adjustment of phenytoin dose[2, 4]*							
LFTs and FBC	Frequent FBC throughout treatment[1] but BNF states that evidence of practical value is unsatisfactory[3]	Frequent FBC throughout treatment[1] but BNF states that practical value is unsatisfactory[3] NICE[2] suggest FBC, U&Es, liver enzymes, Vitamin D levels, and other tests of bone metabolism every 2-5 years for adults taking enzyme-inducing drugs SIGN suggest that liver function and full blood count should not be monitored routinely [4] Serum folate at least 6 monthly[1]	Leucopenia, which is severe, progressive, or associated with clinical symptoms requires withdrawal (if necessary under cover of suitable alternative)[3] Folic acid supplements to be initiated where necessary. [1]	Therapeutic serum level 10-20µg/ml although some cases of tonic clonic seizures may be controlled with lower serum levels[1] Drug monitoring in patients with epilepsy should NOT be routinely performed unless to assess adherence or suspected toxicity or after adjustment of phenytoin dose[2, 4] However where monitoring is felt to be necessary, dosage should be adjusted according to serum levels where assay facilities exist. [1] Phenytoin is highly protein bound and where protein binding is reduced, as in uraemia, total phenytoin levels will be reduced accordingly. Under these circumstances therapeutic control may be achieved with total phenytoin levels below the normal range. Patients with impaired liver function, elderly patients or those	Analgesics (NSAIDs) Anti-arrhythmics (amiodarone, quinidine). Antibacterials (isoniazid, metronidazole, chloramphenicol, rifamycins, telithromycin, trimethoprim) Anticoagulants (coumarins) Antidepressants (fluoxetine, fluvoxamine, mianserin. SSRIs, St John's wort, tricyclics & tricyclic- related antidepressants). Antiepileptics (ethosuximide, topiramate). Antifungals (itraconazole, ketoconazole, miconazole, fluconazole, voriconazole)) Antimalarials (mefloquine, pyrimethamine) Antipsychotics Antivirals Calcium channel blockers (nifedipine, diltiazem) Ciclosporin Corticosteroids Cytotoxics (imatinib) Disulfram Diuretics (eplenerone) Oestrogens Progestogens Sulfinpyrazone Theophylline Ulcer healing drugs (cimetidine, esomeprazole, sucralfate).	1. Epanutin capsules SPC (revised May 2005) 2 NICE Clinical Guideline No 20 (The epilepsies: diagnosis and management of the epilepsies in adults in primary and secondary care) (2004) 3. BNF Issue 55 4. SIGN Guideline No 70- Diagnosis and management of epilepsy in adults (April 2003)	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
				who are gravely ill may show early signs of toxicity[1] Phenytoin may cause slight decrease in serum levels of total and free thyroxine, but levels of circulating TSH are not affected, therefore the latter can be used for diagnosis of hypothyroidism in a patient on phenytoin. [1] Phenytoin may affect blood sugar metabolism tests[1] (no additional data provided) Patients/carers should be told how to recognise signs of blood or skin disorders[3]			
Pioglitazone See thiazolidinediones (glitazones)							
Propylthiouracil							
TFTs[1,3] WBC[4]	Specialist Initiation only[1] UK Guidelines recommend TFTs every 1-3 months until stable[3]. TFTs after first 3 months of treatment[1]	UK Guidelines recommend annual monitoring once stable if being used as a long-term treatment option[3]	Repeat WBC if patient develops fever, mouth ulcers, sore throat or other symptoms of infection[4] Stop drug and recommend immediate specialist referral if leucocyte count falls to $<1.5x10^9/L$ or neutrophil count to $<0.5x10^9/L$[4]	Patients should be made aware that the development of certain adverse effects (fever, mouth ulcers, rashes, sore throat) may be an indication of agranulocytosis, a serious reaction to the drug, and they should contact their doctor immediately as treatment should be stopped. A full		1. Consensus statement for good practice and audit measures in management of hypothyroidism & hyperthyroidism BMJ 1996 Vol 313 pp539-544 2. SPC for propylthiouracil (July 2001) 3. UK Guidelines for thyroid function tests by Assoc. Clinical Biochemistry, British	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
				blood count should be performed if there is clinical evidence of infection. Likewise propylthiouracil should be used with extreme caution in patients receiving other drugs known to cause agranulocytosis. Use propylthiouracil with caution in patients more than 40 years old[2]		Thyroid Assoc and British Thyroid Foundation (Jul 2006) 4. Best practice in primary care pathology: review 4. J Clin Pathol 2006; 59: 893-902	
Ramipril (see ACE Inhibitors and angiotensin II antagonists)							
Rosiglitazone (see thiazolidinediones (glitazones)							
Rosuvastatin (see statins).							
Risperidone							
Plasma glucose (fasting if possible) BP FBC LFTs U&Es Prolactin Weight (include waist size and BMI if possible) Lipid profile (fasting if possible) ECG Creatine phosphokin-ase (CPK)[1] In bipolar disorder NICE recommend	Frequent BP checks during dose titration phase[1] Plasma glucose after 4-6 months[1] Weight frequently for 3 months [1] Blood lipids after 3 months ECG – after each dose change[1] Prolactin at 6 months[1] In bipolar disorder NICE recommend blood glucose at 3 months and more often if evidence of elevated levels, lipid profile at 3 months (more often if elevated), weight every 3 months for first year[2].	U&Es, FBC, LFTS, blood lipids (fasting if possible), weight, plasma glucose (fasting if possible), and prolactin every 12 months[1] CPK if neuroleptic malignant syndrome (NMS) suspected[1] In bipolar disorder NICE recommend prolactin if symptoms of raised prolactin develop, and weight every 3months for first year (more often if patient gains weight rapidly). Additionally as part of annual physical monitoring for patients with bipolar disorder NICE recommend TFTs (every 6 months if rapid-cycling but otherwise every 12 months), blood glucose, lipid profile (if over 40 years), BP, weight and height.[2]	Stop therapy if neutrophils fall below $1.5x10^9/L$[1] Stop therapy if NMS suspected[1] Stop if LFTs indicate hepatitis (transaminases x3 normal) or functional damage (PT or albumin change)[1]	The CSM has advised that olanzapine and risperidone are associated with an increased risk of stroke in elderly patients with dementia[3]	Anaesthetics (general) Antidepressants (fluoxetine) Antiepileptics (carbamazapine, etosuximide, oxcarbazepine, phenytoin, primidone, valproate). Antihistamines (terfenadine) Antimalarials (artemether/lumefantrine) Antivirals (ritonavir) Barbiturates Sibutramine	1.The South London and Maudsley NHS Trust, Oxleas NHS Trust 2005/6 Prescribing Guidelines 9th edition 2. NICE Guideline on the management of bipolar disorder in adults, children and adolescents in primary and secondary care (Jul 2006) 3. BNF Issue 55	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
blood glucose, prolactin, lipid profile, ECG (if clinically indicated), weight and height[3]. Also as part of routine physical monitoring for all patients with bipolar disorder NICE additionally recommend TSH, LFTS, renal function, FBC, BP, [2]							
Sibutramine							
BP and pulse rate.[1,2]	BP and pulse rate every 2 weeks for the first three months.[1,2]	BP and pulse rate monthly between month 4 and 6, and at maximum intervals of 3 months thereafter.[1,2]	Treatment should be discontinued if blood pressure exceeds 145/90mmHg or if systolic or diastolic blood pressure is raised by more than 10mmHg above baseline or if pulse rate is raised by 10bpm at 2 consecutive visits.[1,2]		Antidepressants (MAOIs, moclobemide, SSRIs, SSRI-related antidepressants, mirtazepine, noradrenaline re-uptake inhibitors, tricyclic-related antidepressants, tricyclics, tryptophan) Antipsychotics	1. Summary of Product Characteris-tics for Reductil® 10mg & 15mg (sibutramine) Accessed at emc.medicines.org.uk. Date of revision of the text 9th October 2007. 2. BNF Issue 55.	
Simvastatin (see statins)							
Sodium Valproate and valproate							
LFTs [1] Screen for potential bleeding complications Blood tests (blood cell count, including platelet count, bleeding time and	Should not be started in women of childbearing potential without specialist neurological advice.[3] NICE state that valproate should not be routinely initiated in primary care for the treatment of bipolar disorder[6] LFTs, FBC, weight (if patient gains weight rapidly) at 6	LFTs and PT periodically within first 6mths of treatment[1, 5]. Blood cell count, including platelet count, bleeding time and coagulation tests are recommended before surgery[4], and in cases of spontaneous bruising or bleeding[1]	If abnormal liver function or blood dyscrasia is detected the drug should be stopped immediately[6]	Spontaneous bruising or bleeding is an indication for the withdrawal of medication pending investigation[1] Should not be initiated in women of childbearing potential without	Antidepressants (SSRIs , tricylics and tricylic-related antidepressants) Antiepileptics (primidone) Antimalarials (mefloquine) Antipsychotics Ulcer-healing Drugs (cimetidine)	1. SPC for Epilim (Oct 06) 2. The South London and Maudsley NHS Trust, Oxleas NHS trust 2005/6 Prescribing Guidelines 9th edition. 3. Current problems in pharmacovigilance. Sept 2003 Vol 29 p 5	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
coagulation tests) are recommended prior to initiation of therapy[1] U&Es, LFTs & FBC if using as a mood stabiliser[2] In bipolar disorder NICE recommend weight, height, FBC and LFTs and as part of the annual physical; monitoring for patients with bipolar disorder baseline results for TFTs, renal function, blood glucose, lipid profile, BP, ECG (if clinically indicated), should be recorded[6]	months[6]	U&Es, LFTs & FBC 6 monthly if using as a mood stabiliser[2] Measure plasma amylase in patients with acute abdominal pain[1 5] In bipolar disorder NICE advise that routine measurement of valproate levels is not recommended unless there is evidence of ineffectiveness, poor adherence or toxicity[6] They also recommend LFTs and FBC after 6 months treatment and body weight shoul d be monitored in patients who gain weight rapidly[6] As part of annual physical monitoring for patients with bipolar disorder NICE additionally recommend: TFTs (every 6 months if rapid-cycling but otherwise every 12 months), blood glucose, lipid profile (if over 40 years), weight and height.		specialist advice and women already on treatment who are likely to become pregnant should also receive specialist advice both pre and during pregnancy. Folate supplementation should be started as soon as contraception is discontinued and if sodium valproate is taken whilst pregnant it should be used as monotherapy at the lowest effective dose. Preferably in divided doses and as the prolonged release preparation.[3] Patients/carers should be told how to recognise signs of blood or liver disorders and advised to seek immediate medical attention if symptoms develop[5, 6]. Similarly they should be told how to recognise the signs of pancreatitis and advised to seek immediate medical attention if symptoms such as abdominal pain, nausea and vomiting develop[5]		4 NICE Clinical Guideline No 20 (The epilepsies: diagnosis and management of the epilepsies in adults in primary and secondary care) 5 BNF Issue 54 6. NICE Guideline on the management of bipolar disorder in adults, children and adolescents in primary and secondary care (Jul 2006)	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
Spironolactone							
	In heart failure U&Es at 1, 4, 8 and 12 weeks.[1,2]	**In heart failure**: U&Es at 6, 9 and 12 months, and every 6 months thereafter.[1,2]	**In heart failure**: If potassium rises to between 5.5 and 5.9 millimoles per litre, or creatinine rises significantly above baseline (but less than 200 micromoles per litre*), reduce dose to 25 mg taken on alternate days, and monitor blood chemistry frequently to ensure that renal function is not worsening. If potassium rises to 6.0 millimoles per litre or above, or creatinine rises above 200 micromoles per litre*, stop spironolactone immediately and seek specialist advice.[1] * SIGN advice differs from NICE in that they advise thresholds of >220 and >310 for dose reduction and stopping respectively[2]	Should advise patients to avoid NSAIDs not prescribed by a physician and salt substitutes high in potassium[2] If diarrhoea/ vomiting occurs patients should stop spironolactone and contact their physician[2]	ACE inhibitors Angiotensin-II receptor antagonists Digoxin Ciclosporin Lithium Potassium salts and potassium-sparing diuretics Tacrolimus	1. NICE Guideline No 5. Chronic Heart Failure: National clinical guideline for diagnosis and management in primary and secondary care. July 2003 2. SIGN Guideline No 95: Management of heart failure (2007)	
Statins							
Baseline lipid profile[1,2,10] LFTs [1,2,3,4,5,6] (plus U&Es paying particular attention to creatinine if using rosuvastatin [4] SIGN	LFTs within 1-3 months of starting treatment then at 6 month intervals for one year unless indicated sooner[2] SIGN recommend LFTs 12 weeks after starting treatment and after each dose increase and then periodically thereafter, however routine monitoring of LFTs is not supported by the available evidence. They also note that the preferred biochemical test	Routine monitoring of CPK levels in asymptomatic patients is not warranted, however CPK levels should be measured in patients with unexplained muscle pain, weakness or cramps. [1,4, 5, 6] Assessment of renal function should be considered during routine follow up of patients treated with 40mg rosuvastatin[4]	Rosuvastatin contra-indicated if creatinine clearance <30ml/min Statin therapy should not be started/ discontinued if ALT or AST >3x upper limit of normal (ULN)[2, 4, 5, 6] Statins should be used with caution in those with a history of liver disease or with a	Patients should be advised to report unexplained muscle pain[2] Patients with hypothyroidism should receive adequate replacement therapy before assessing their requirement for	Anti-arrhythmics (amiodarone when used with simvastatin) MHRA advise is that patients taking amiodarone should not take more than 20mg simvastatin daily and patients taking concomitant atorvastatin should have their lipid levels monitored to ensure lowest necessary dose of atorvastatin8) Antibacterials (simvastatin with erythromycin, clarithromycin ot telithromycin	1. NICE Guideline for prophylaxis in patients who have experienced a myocardial infarction (2001) 2.BNF Issue 55 3.SPC for simvastatin (Zocor) (Jan 08) 4. SPC for Crestor (rosuvastatin) Nov 2007 5. SPC Lipitor (atorvastatin) Oct 2007	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
recommend baseline renal function[10] Thyroid function[2,9] (see additional notes) CPK levels recommended in patients with pre-disposing factors for rhabdomyolysis: (renal impairment, untreated hypothyroidism, personal or family history of muscular disorders, previous history of muscular toxicity with another statin or fibrate, alcohol abuse or aged > 70 years) [4, 5, 6, 7]	to ascertain significant liver injury is bilirubin. Rosuvastatin – LFT monitoring recommended 3 months after initiation[4,] 40mg dose should only be initiated under specialist supervision and is contraindicated in Asian patients[4] Simvastatin SPC advises that LFTs should be monitored when clinically indicated but patients titrated to the 80 – mg dose should receive an additional test prior to titration, 3 months after titration to the 80mg dose, and periodically thereafter (e.g., semi-annually) for the first year of treatment. Atorvastatin SPC advises LFTs monitored periodically[5] Fluvastatin SPC advises 12 weeks after initiation or dose increase and periodically thereafter.		high alcohol intake [2,3,4,5,6] SIGN suggest that if there is objective evidence of significant liver injury the statin should be discontinued and the aetiology established – if necessary the patient should be referred to a specialist.[10] Therapy should be not be started/ discontinued if CPK > 5x ULN or if muscular symptoms are severe and cause daily discomfort (even if CPK level ≤ 5x ULN. [4, 5, 6, 7] Test should be repeated after 5-7 days[4, 5, 6] If symptoms resolve and CPK returns to normal, can consider re-introduction of therapy or alternative statin at lowest dose with close monitoring. [4, 5, 6]	lipid-regulating treatment because correction may resolve the lipid abnormality and untreated hypothyroidism increases the risk of myositis[2] The British Thyroid Assoc. advise that in patients with subclinical hypothyroidism and TSH > 10mU/L there is an increasing evidence of progression to overt hypothyroidism and deterioration in hyperlipidaemia particularly in patients with elevated TPOab. There is evidence of improvement in lipid profile and symptoms when patients with modestly raised TSH were rendered euthyroid with thyroxine[9]	telithromycin-atorvastatin - avoid concomitant use, daptomycin – any statin) MHRA advice[8] is that combinations of simvastatin and erythromycin, clarithromycin or telithromycin are contraindicated and avoid in combining these agents with atorvastatin if possible. If there is a need to co-prescribe then patients taking clarithromycin should not exceed atorvastatin 20mg daily.8 Anticoagulants (coumarins – simvastatin or fluvastatin, rosuvastatin-phenindione or coumarins). MHRA advice is that patients taking warfarin/coumarins should have their INR measured before starting treatment with either simvastatin or atorvastatin and also regularly during treatment especially with dose changes. They also note that caution is particularly necessary with fluvastatin. Antifungals (simvastatin with itraconazole, ketoconazole posaconazole or miconazole itraconazole). Atorvastatin with itraconazole or posaconazole. MHRA advice[8] is that combinations of simvastatin and itraconazole and ketoconazole are contraindicated and for atorvastatin consider temporary suspension of statin if the antifungal is to be taken for a short period and do not exceed 40mg atorvastatin in patients taking itraconazole agents and exercise caution in combining these agents with atorvastatin Antivirals (simvastatin with amprenavir, atazanavir, indinavir, nelfinavir, ritonavir, saquinavir, or lopinavir-	6. SPC for Lipostat (pravastatin) Dec 2005 7. SPC for Lescol (fluvastatin) Jun 2007 8 Drug Safety Update 2008, 1, No 6 9. UK Guidelines for thyroid function tests by Assoc. Clinical Biochemistry, British Thyroid Assoc and British Thyroid Foundation (Jul 2006) 10. SIGN Guideline 97 – risk estimation and prevention of cardiovascular disease	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	At Initiation	Maintenance					
					MHRA advice[8] is that combinations of HIV protease inhibitors and simvastatin are contraindicated and should be avoided with atorvastatin if possible. If a combination of atorvastatin and a protease inhibitor is required lipid levels should be monitored closely to ensure that the lowest possible dose of atorvastatin is used. They also advise that HIV protease inhibitors strongly increase exposure to rosuvastatin (unknown mechanism) are not recommended for combination use. Calcium-Channel Blockers (verapamil–simvastatin) MHRA advice is that patients taking verapamil should not take more than 20mg of verapamil or 40mg of diltizem daily. For patients taking either verapmil or diltiazem and concomitant atorvastatin they advise that lipid levels should be monitored to ensure the lowest necessary dose of atorvastatin is used.: Ciclosporin MHRA advice[8] is to not exceed simvastatin 10mg or atorvastatin 10mg daily in patients taking ciclosporin They also note that caution is also needed with fluvastatin and that rosuvastatin is contraindicated. Danazol – MHRA advice is that patients taking danazol should not exceed 10mg simvastatin daily8 Lipid-regulating drugs (gemfibrozil, fibrates, nicotinic acid) MHRA advice is to not exceed simvastatin 10mg in patients taking fibrates (except fenofibrate) and to note that		

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
					there is an increased risk of myopathy with both simvastatin and atorvastatin. For rosuvastatin they advise that patients taking fibrates should be started on a 5mg dose and should not take more than 20mg daily. Grapefruit juice - MHRA advice[8] is to avoid grapefruit juice in patients taking simvastatin and limit intake to very small quantities (or avoid altogether) in patients taking atorvastatin[8]		
Sulfasalazine							
FBC, U&E and LFTs[1,4]	FBC and LFTs monthly for the first 3 months and 3-monthly thereafter[1] Repeat FBC and LFTs one month after each dose increase[1] FBC weekly for first 4 weeks then every 2 weeks for 2 months[2] ALT or AST every 4 weeks for first 3 months[2] Close monitoring of FBC (incl differential WBC and platelets) is necessary at monthly intervals during the first 3 months and LFTs should also be monitored at monthly intervals for first 3 months[3, 4]	FBC and LFTs every 3 months and if stable during first year, reduce to 6 monthly in second year and if both dose and results are stable in second year, no further FBC or LFT monitoring is required. [1]. U&E (particular attention to creatinine) every 6 months[1] U&Es (paying particular attention to creatinine) at regular intervals[3,4]	Withhold treatment until discussion with rheumatologist if: WBC < 3.5 x10^9/l , Neutrophils< 2 x10^9/l, Platelets < 150 x10^9/l A > 2-fold increase in AST, ALT (from upper limit of normal) Acute widespread rash or oral ulceration[1], [2] Prodigy additionally recommend seeking specialist advice if there is a falling trend in WCC or platelet count over 3 consecutive tests – even if in normal range[2] If abnormal bruising or sore throat withhold until FBC available MCV > 105fl: withhold and check	Since sulfasalazine may cause haemolytic anaemia, it should be used with caution in patients with G-6-PD deficiency[1],[4] Ask about rash, oral ulceration, abnormal bruising or sore throat at each visit[1] Patients receiving aminosalicylates should be advised to report any unexplained bleeding, bruising, purpura, sore throat, fever or malaise that occurs during treatment[3].		1. BSR & BHPR Guideline for disease modifying anti-rheumatic drug therapy (DMARD) in consultation with the British Association of Dermatologists (2008) 2. Prodigy Guidance – Monitoring people on disease-modifying drugs (DMARDs) (July 2005) 3. BNF Issue 55 4. SPC for Salazopyrin tablets (Aug 2006)	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
			B12, folate, TSH.. If normal refer to specialist, if folate low sulfasalazine can be restarted with appropriate supplementation and close monitoring. [1] The drug should be stopped immediately and a blood count should be performed if there is suspicion of a blood dyscrasia[3]				
Telmisartan (see ACE Inhibitors and angiotensin II antagonists)							
Theophylline							
U&Es (paying particular attention to potassium)[1] LFTs[2]	It is advisable to recheck the plasma level after dose adjustment (at least 3 days after dose adjustment)[3]	It is advisable to recheck the plasma level after dose adjustment and every 6-12 months[3]. Potassium levels: periodically in at risk patients[2,3] (see additional notes)	A lower dose may be required in patients with reduced hepatic function[2] Xanthines can potentiate hypokalaemia resulting from beta-2-agonist therapy steroids, diuretics and hypoxia. Particular caution is advised in severe asthma. It is recommended that serum potassium levels are monitored in such situations[2]. In most individuals a plasma theophylline of between 10-20mg/ litre is required for satisfactory bronchodilation although a plasma theophylline concentration of 10mg/litre (or less) may be effective. Adverse effects can occur within the	Patients receiving influenza vaccine may experience increased theophylline plasma levels[1]. The CSM has advised that potentially serious hypokalaemia may result from beta2 agonist therapy. Particular caution is required in severe asthma, because this effect may be potentiated by concomitant treatment with theophylline and its derivatives, corticosteroids, and diuretics, and by hypoxia. Plasma-potassium concentration should therefore be monitored in severe asthma[1]	Antibacterials (ciprofloxacin, norfloxacin and other quinolones, clarithromycin, erythromycin,). Antidepressants (fluvoxamine, St John's Wort). Antiepileptics (phenytoin) Antifungals (fluconazole, ketoconazole). Antivirals (ritonavir). Calcium-channel blockers. Ulcer-healing drugs (cimetidine).	1 BNF Issue 55 2 SPC for Neulin SA (Oct 2007) 3. SPC for Slo-Phyllin (Jan 2008)	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
			range 10-20mg/ litre and both the frequency and severity increase at concentrations above 20mg/ litre[1]				
Thiazolidinediones (Glitazones: -pioglitazone, rosiglitazone)							
Rosiglitazone and pioglitazone are contraindicated in patients with cardiac failure or a history of cardiac failure (NYHA stages I to IV) [1,2,3] Rosiglitazone is also contraindicated in patients with an acute coronary syndrome [2] The DTB also recommends that use should probably be avoided in women at high risk of fractures [4] LFTs[1,2,3] FBC[2,] (see action if abnormal results) U&Es [2,3] (see action if abnormal results) Weight [1,2]	LFTs should be monitored periodically based on clinical judgement[1,2] Weight should be closely monitored [1,2]	LFTs should be monitored periodically based on clinical judgement[1,2] LFTs must be checked if patient develops signs suggesting liver dysfunction [1, 2]. Weight should be closely monitored [1,2]	Therapy should not be initiated if baseline ALT > 2.5x upper limit of normal or if any other evidence of liver disease [1,2] If ALT levels increase to 3x upper limit of normal during treatment, recheck and if they remain >3x upper limit of normal, therapy should be discontinued. [1,2] If jaundice is observed therapy should be discontinued. [1,2] For rosiglitazone – it is noted that it should be used in caution in patients with a creatinine clearance < 30ml/min)[2] for pioglitazone no dose adjustment is needed for patients with a creatinine clearance > 4ml/min[1] For rosiglitazone it is noted that there is an increased risk of anaemia during treatment in patients with low Hb levels before initiating treatment[2]	Advise patients to seek immediate medical attention if symptoms such as nausea, vomiting, abdominal pain, fatigue and dark urine develop[3] Both drugs have been associated with decreased visual acuity due to worsening or new onset macular oedema. If patients report disturbances in visual acuity opthamological referral should be considered [1,2]		1 Actos (pioglitazone) SPC date of revision Aug 2007. 2.Avandia (rosiglitazone) SPC date of revision Mar 2008 3.BNF Issue 55 4.DTB 2008; 46 No 4, Glitazones in type 2 diabetes, an update.	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
Thyroxine							
TFTs Patients with hypothyroidism only need referral in the following circumstances: (age<16yrs, pregnant or post partum, evidence of pituitary disease, newborn infant)[1] ECG[2] UK Guidelines recommend TSH and FT4 as most important markers[3]	TSH should be checked 6 wks after initiation of thyroxine to see if dose adjustment required. (After 3-4 wks in the elderly, esp. if IHD present).[1] Conversely recent UK guidance recommends monitoring of both TSH and FT4 – and that generally monitoring should not occur within 2 months of a dose change as this is the minimum period required to achieve stable concentrations[3]	Recheck TFT annually once patient has been stabilised[1, 3]		Pre-treatment ECG is considered valuable as changes induced by hypothyroidism may be confused with evidence of ischaemia[2]	Anticoagulants (coumarins, phenindione).	1. Consensus statement for good practice and audit measures in management of hypothyroidism & hyperthyroidism BMJ 1996 Vol 313 pp539-544 2. BNF Issue 55 3. UK Guidelines for thyroid function tests by Assoc. Clinical Biochemistry, British Thyroid Assoc and British Thyroid Foundation (Jun 2006)	
Telmisartan (see ACE Inhibitors and angiotensin II antagonists)							
Vigabatrin							
Specialist only	Specialist initiation only by a neurologist[1]. Opthalmological consultation with visual field examination required before initiation[1]	Visual field testing (perimetry) by use of standardised static perimetry (Humphrey or Octopus) or kinetic perimetry (Goldmann) to be performed at baseline and at 6mth intervals.[1] Electroretinography may be useful in adults unable to co-operate with perimetry.[1] Note: more detailed information on monitoring use in children is available in the SPC and from the manufacturer[1] Serum creatinine periodically[1]	Refer all patients to a specialist if visual symptoms develop.[1, 2] Since vigabatrin is eliminated via the kidney, caution should be exercised in patients with a creatinine clearance of less than 60ml/min and in elderly patients. These patients should be monitored closely for undesirable effects such as sedation and confusion.[1]	About one third of patients treated with vigabatrin have suffered visual field defects. The CSM has advised that the onset of symptoms varies from 1 month to several years after starting. In most cases visual field defects have persisted despite discontinuation.[2] Patients should be warned to report any new visual symptoms that	Antidepressants Antimalarials (mefloquine).	1. SPC Sabril May 2007 2. BNF Issue 55	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	**At Initiation**	**Maintenance**					
				develop. Patients should be closely observed for adverse effects on neurological function. [1] Vigabatrin appears to inhibit both ALT and AST resulting in decreased measured plasma levels. [1] Chronic treatment may lead to a non significant decrease in haemoglobin levels[1]			
Warfarin							
Objective confirmation of diagnosis Blood sample for PT, APTT, platelet count and LFTs[1]	For rapid anticoagulation, daily INR for a minimum of 4 days until desired INR is achieved, then weekly until stable[1] INR should be determined daily or on alternate days in early days of treatment, then at longer intervals (depending on response)[2] A change in patient's clinical condition, particularly associated with liver disease, intercurrent illness, or drug regimen may necessitate more frequent testing[1]	A maximum of 12 weekly monitoring is considered acceptable in stable patients (see additional notes) [1] If an interacting drug is given for more than 5 days check INR one week after start of new drug and adjust dose as necessary. [1] Remember to revise dosing again if new drug is stopped. If a potentiating drug is given for less than 5 days consider minor dose adjustment or omission of 1 dose of warfarin. [1]	Action taken depends on the INR (risk of bleeding increases greatly once INR > 5 and whether there is minor or major bleeding. [1] However if INR > 8 oral anticoagulants should be stopped and advice sought on management. [1]	Refer to Appendix 1 BNF when prescribing any new drug to patient taking warfarin. Prescribers should ensure that they are compliant with NPSA recommendations on actions that can make anticoagulant therapy safer2	Alcohol Anabolic steroids Analgesics (aspirin, NSAIDs, dextropropoxyphene). Anti-arrhythmics (amiodarone, propafenone,) Antibacterials (chloramphenicol, ciprofloxacin, clarithromycin, erythromycin, metronidazole, nalidixic acid, neomycin {when given for local action on the gut}), norfloxacin, ofloxacin, rifamycins, sulphonamides, tetracyclines, aztreonam, cephalosporins, macrolides, tetracyclines). Antidepressants (SSRIs, tricyclics, venlafaxine, St Johns Wort) Antidiabetics (sulphonylureas) Antiepileptics (carbamazepine, primidone, phenytoin) Antifungals (griseofulvin, fluconazole, itraconazole, ketoconazole , miconazole, voriconazole).	1. Br J Haematol 1998, 101, 374-87 + BCSH update 2005 2. NPSA Actions that can make anticoagulant therapy safer (Mar 2007)	

Safety Monitoring Parameter (see glossary for details)			Action required if abnormal results	Additional notes	Potentially Hazardous Drug Interactions as listed in the BNF 55 (Mar 2008)	Reference Source	Link to Shared Care Guidelines
Baseline	At Initiation	Maintenance					
					Antivirals (nevirapine, ritonavir). Barbiturates Clopidogrel Corticosteroids Cranberry juice Cytotoxics (azathioprine, etoposide, erlotinib, sorafenib, fluorouracil, ifosfamide, mercaptopurine, mitotane). Dipyridamole Disulfram Dopaminergics (entacapone) Enteral Foods (if vitamin k present in feeds) Hormone antagonists (toremifene. danazol, flutamide, tamoxifen). Levamisole Lipid lowering drugs (colestyramine, rosuvastatin-, fluvastatin, fibrates Oestrogens Progestogens Retinoids (acitretin) Sulfinpyrazone Sympathomimetics (methlphenidate) Testosterone Testolactone Thyroid hormones Ulcer-healing drugs (sucralfate, cimetidine, omeprazole, esomeprazole) Vitamin K		

- Interactions classified as potentially hazardous by the BNF (Issue 55 Mar 2008), it is advised that in such cases combined administration of the drugs should be avoided (or only undertaken with caution and appropriate monitoring). Please check the BNF for more detail where a possible interaction is noted. Interactions involving parenteral products have not been included, as they are unlikely to be administered in primary care.
- South London and Maudsley and Oxleas (SLAM) Guidance is highlighted in blue
- Disclaimer: The information provided within this document is intended to support health care decisions but should be used in conjunction with clinical knowledge and discretion and local policies. Whilst care has been taken to ensure that the information contained within this document is accurately presented, the authors accept no responsibility for any errors, omissions, or consequences that occur from application of the information contained within