Drug: Clozapine is available as tablets (all brands) or oral solution (specific brands only). There are three brands available which are not interchangeable as each brand has its own registered patient database. In NHS Scotland there is a national contract for clozapine.

Indications:
- treatment-resistant schizophrenic patients (aged 16 years and older) and schizophrenic patients (aged 16 years and older) who have severe, untreatable neurological adverse reactions to other antipsychotic agents, including atypical antipsychotics.
- psychotic disorders occurring during the course of Parkinson's disease, in cases where standard treatment has failed.

Dose and frequency:
- treatment-resistant schizophrenic patients (aged 16 years and older) and schizophrenic patients (aged 16 years and older) who have severe, untreatable neurological adverse reactions to other antipsychotic agents, including atypical antipsychotics: usual therapeutic dose (oral) = 200 – 450mg/day in divided doses. Maximum dose (oral) = 900mg/day.
- psychotic disorders in Parkinson's disease: usual therapeutic dose (oral) = 25 – 37.5mg/day. Maximum dose (oral) = 100mg/day.

Clozapine is an atypical antipsychotic licensed for treatment resistant schizophrenia and treatment resistant psychosis in Parkinson's disease. Neutropenia/agranulocytosis is a serious adverse drug reaction that may occur with clozapine therapy. Although only 3 - 4% of patients may be affected, it is not possible to predict who will be affected. As a result, blood monitoring (full blood count with white cell differential) is mandatory and clozapine can only be dispensed against a valid blood result and in accordance with the product licence. In addition there is a requirement for the consultant psychiatrist, patient, pharmacist and dispensing pharmacy to be registered with the company.

The GP is responsible for ensuring that the general practice records clearly indicate that a patient is on clozapine therapy. All therapeutic indications for clozapine treatment would also be reasons for including the patient on the practice Mental Health Register. The consultant psychiatrist is ultimately responsible for the monitoring and follow-up arrangements of the individual patient. Where the general practitioner has been asked to undertake some of this monitoring the detailed arrangements should be documented in both psychiatric and general practice patient records.

Sections:

<table>
<thead>
<tr>
<th>Page No</th>
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<tbody>
<tr>
<td>Care which is the responsibility of the hospital consultant</td>
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<td>Care which is the responsibility of the registered hospital pharmacist</td>
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<td>Common drug interactions with clozapine</td>
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</table>
CARE WHICH IS THE RESPONSIBILITY OF THE HOSPITAL CONSULTANT

Exclude any co-morbidity or concomitant medication which would contraindicate the prescribing of clozapine.

Ensure patient receives appropriate counselling on clozapine therapy prior to initiation of treatment and record in the case notes. This should include discussion on:

- changes in smoking status and its effects on clozapine levels and side-effects.
- pregnancy intentions and contraceptive advice (women of reproductive age).

Ensure baseline monitoring is performed

- Full blood count with a white cell differential (mandatory), U&Es, LFTs, fasting blood glucose, fasting lipids, Troponin I, C-Reactive Protein, ECG, blood pressure, pulse, temperature, side-effects (Glasgow Antipsychotic Side-effect Scale for Clozapine - GASS for Clozapine), weight and BMI.

Register with Clozapine Monitoring Service

- Register with this service to prescribe clozapine.
- Register the patient and provide initial full blood count with white cell differential.

Complete Clozapine Clinic Referral Form (required at initiation of therapy)

Record baseline monitoring on the Clozapine Physical State Monitoring Form (Weeks 0 - 4)

Prescribe clozapine

- On confirmation of patient registration and satisfactory blood result initiate treatment as per Summary of Product Characteristics (SmPC).

Mandatory Monitoring

A full blood count with a white cell differential must be monitored:

- 2 - 3 days after commencement of treatment.
- Weekly for the first 18 weeks of treatment (assuming satisfactory results).
- Fortnightly between weeks 18 and 52 (assuming satisfactory results).
- Four weekly after 1 year of treatment (assuming satisfactory results).

Physical State Monitoring (during in-patient stay)

Monitoring for the first month will usually take place during the in-patient stay. Thereafter monitoring may be handed over to the GP.

- Blood pressure – Baseline, daily during titration, every 3 months for 1 year and then annually. Also following dose changes.
- Pulse – Baseline, daily during titration, at 3 months and then annually.
- Temperature – Baseline and daily during titration.
- Weight & BMI – Baseline, weekly during titration, 3 monthly for 1 year and then annually.
- U&Es – Baseline and then annually, or more frequently if clinically indicated.
- LFTs – Baseline and then annually, or more frequently if clinically indicated.
- Fasting blood glucose – Baseline, at 4 weeks, then 3 monthly from 3 months up to 1 year and then 6 monthly.
- Fasting lipids – Baseline then 3 monthly for 1 year and then 6 monthly.
- Troponin I – Baseline and then weekly for first 4 weeks.
- C-Reactive Protein – Baseline and then weekly for first 4 weeks.
- ECG – Baseline, then at 3 weeks, at 3 months and then annually.
- Side-effects – GASS for Clozapine or other recognised side-effect questionnaire for antipsychotic medication, with specific reference to constipation, at baseline, 4 weeks, 3 monthly from 3 months up to 1 year and then annually.
- Smoking status – Baseline, at 4 weeks, 3 monthly from 3 months up to 1 year and then annually.
- Pregnancy/contraceptive status (women of reproductive age) – Baseline, at 4 weeks, 3 monthly from 3 months up to 1 year and then annually.
- Clozapine plasma level – once at steady state target dose and then annually.

Liaison with GP

Liaise with GP to ensure responsibility for monitoring is agreed and documented in both psychiatric and GP patient records. Complete individual pharmaceutical care plan in consultation with hospital pharmacist and arrange for this to be sent to GP.
CARE WHICH IS THE RESPONSIBILITY OF THE REGISTERED HOSPITAL PHARMACIST

Provide a clozapine initiation pack to the consultant medical team.

Ensure compliance with mandatory blood monitoring for clozapine and respond to AMBER/RED alert status as appropriate. (See below for monitoring and action required).

ONGOING MANDATORY BLOOD MONITORING

- All mandatory blood results (FBC with white cell differential) must be entered onto the clozapine monitoring service database for validation. For samples sent directly to the clozapine monitoring laboratory this is done automatically. When a sample is analysed locally, at the Haematology Laboratory, ARI, it is the responsibility of the pharmacy staff, Royal Cornhill Hospital, to enter the result onto the database. If action is required out of hours it is the responsibility of the duty doctor (as per local protocol).

- Blood results processed by the Clozapine Monitoring Service are colour coded (see table below for on treatment reference ranges).

<table>
<thead>
<tr>
<th>RED</th>
<th>AMBER</th>
<th>GREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC &lt; 3.0 x 10^9/L</td>
<td>WBC = 3.0 – 3.5 x 10^9/L</td>
<td>WBC &gt; 3.5 x 10^9/L</td>
</tr>
<tr>
<td>Or Neutrophils &lt; 1.5 x 10^9/L</td>
<td>Or Neutrophils = 1.5 - 2.0 x 10^9/L</td>
<td>And Neutrophils &gt; 2 x 10^9/L</td>
</tr>
<tr>
<td>Or Platelets &lt; 50 x 10^9/L</td>
<td></td>
<td>And no decreases of &gt; 10% or repeatedly decreasing values in previous test(s)</td>
</tr>
</tbody>
</table>

- GREEN status – Clozapine dispensed.
- AMBER status - Pharmacy Department, Royal Cornhill Hospital will contact the Clozapine Clinic/GP Practice to arrange additional blood test to be done and patient must be reviewed for signs of infection which may be indicative of neutropenia. Clozapine will be dispensed with caution.
- RED status - Immediate discontinuation of clozapine is mandatory if a RED status is obtained and clozapine must be removed from the patient. The hospital pharmacy team will contact the consultant psychiatrist to discuss action to be taken, including removal of clozapine from the patient. It is the responsibility of the consultant psychiatrist to liaise with the Clozapine Monitoring Service and coordinate further action to be taken regarding the on-going care of the patient.
- Monitoring must continue throughout treatment and for at least 4 weeks after discontinuation.

Ensure clozapine ONLY dispensed against a valid blood result.

Advise phlebotomist, practice nurse or community nurse of changes in frequency of blood sampling and supply of clozapine. Make appropriate arrangements for patients going on holiday and also for public holidays.

Arrange transport of clozapine to GP practice. Make appropriate arrangements for patients going on holiday and also for public holidays.

Arrange for GP practice to be provided with blood sampling kits, where appropriate and clozapine support material on transfer of care.

Provide GP with pharmaceutical care plan (which includes this Shared Care Policy and Prescribing information for GPs in Aberdeenshire) for inclusion in patient’s notes.

Send letter to practice pharmacist notifying them of patient discharge to primary care.

Counsel patient on clozapine treatment and provide support material including a pharmaceutical care plan.
CARE WHICH IS THE RESPONSIBILITY OF THE GENERAL PRACTITIONER (ABERDEENSHIRE)

On discharge from hospital the following responsibilities are delegated to the GP:
Ensure the practice records clearly indicate that a patient is on clozapine therapy.
Ensure no medication is prescribed which is contraindicated with clozapine treatment.

Ongoing mandatory blood sampling
Undertake ongoing mandatory blood sampling (FBC with white cell differential) and send for analysis as per patient specific Clozapine Pharmaceutical Care Plan.

Additional AD-HOC blood monitoring
- If a patient presents with pyrexia, a sore throat, cold or other signs of infection which could be indicative of neutropenia an additional blood sample (full blood count with white cell differential) should be taken and sent locally for analysis.
- The GP is responsible for ensuring the blood result is checked and taking further action as appropriate (see ongoing mandatory monitoring above for further information).
- The Pharmacy Department, Royal Cornhill Hospital, should be advised so that the result can be entered on to the clozapine patient monitoring database.
- If advice/action is required out of hours the duty doctor, Royal Cornhill Hospital should be contacted.

Undertake ongoing physical state monitoring - refer to individual patient specific Clozapine Pharmaceutical Care Plan. As treatment is initiated in hospital, GPs will normally pick up monitoring at the 3 month point or later.
- Weight & BMI - 3 monthly for 1 year and then annually.
- Blood pressure - 3 monthly for 1 year and then annually. Also following dose changes.
- Pulse - At 3 months and then annually.
- U&Es – Annually or more frequently if clinically indicated.
- LFTs - Annually or more frequently if clinically indicated.
- Fasting blood glucose - 3 monthly for 1 year and then 6 monthly.
- Fasting lipids - 3 monthly for 1 year and then 6 monthly.
- ECG - At 3 months and then annually.
- Side-effects - 'GASS for Clozapine' or other recognised side-effect questionnaire for antipsychotic medication, with specific reference to constipation, 3 monthly for 1 year and then annually.
- Smoking status - 3 monthly for 1 year and then annually. Warn patient regarding effect of changes in smoking status on clozapine levels and side-effects.
- Pregnancy/contraceptive status (women of reproductive age) - 3 monthly for 1 year and then annually. Discuss pregnancy intentions. Offer advice/signposting on contraception.

*** Note: The GP is responsible for acting on any abnormal results and ensuring all relevant information is communicated to the consultant psychiatrist responsible for the patient’s care.***

Supply of clozapine to patient.
- Clozapine will be dispensed by the Pharmacy Department, Royal Cornhill Hospital only on receipt of a satisfactory blood result from the Clozapine Monitoring Service (i.e. GREEN or AMBER).
- Dispensed clozapine will be sent via hospital transport to the GP practice/Community Hospital for collection by the patient.
- Dispensed supplies will be for 1, 2 or 4 weeks supply, in line with the blood sampling frequency. Occasionally more frequent dispensing is required for patients with concordance difficulties.
- Clozapine supplies are normally due for collection on Thursdays. If the patient fails to attend every effort should be made to contact the patient to prompt them to attend to collect their clozapine.
- If a patient fails to collect their dispensed supply of clozapine on time and turns up at a later date the GP has a responsibility to check that the patient has been compliant with their treatment before supplying medication.

Note:*** A treatment break of more than 48 hours requires dose re-titration***
If this occurs the dispensed supply of clozapine should not be given to the patient and the consultant psychiatrist or a member of their medical team and the Pharmacy Department, Royal Cornhill Hospital should be contacted.
RESPONSIBILITIES OF THE PATIENT

- Collect dispensed supply of clozapine on time.
- Take clozapine regularly as directed by the doctor.
- Attend for blood test as requested by phlebotomist/GP practice.
- Report any adverse effects/illness to the doctor.
- Missed dose: If one dose is omitted or forgotten, the next dose should be taken at the normal time.
- If a treatment break of more than 48 hours occurs dose re-titration will be necessary.

PRESCRIBING INFORMATION

For specific product information consult the current summary of product characteristics (http://emc.medicines.org.uk/), the BNF/BNF for Children (http://www.bnf.org/bnf/) and www.choiceandmedication.org/nhs24/.

Contraindications
Hypersensitivity to active substance or any excipients.
Patients unable to undergo regular blood tests.
History of toxic or idiosyncratic granulocytopenia/agranulocytosis (with exception of granulocytopenia/agranulocytosis from previous chemotherapy).
History of clozapine-induced agranulocytosis.
Impaired bone marrow function.
Uncontrolled epilepsy.
Alcoholic and other toxic psychosis, drug intoxication, comatose conditions.
Circulatory collapse and/or CNS depression of any cause.
Severe renal or cardiac disorders (e.g. myocarditis).
Active liver disease associated with nausea, anorexia or jaundice; progressive liver disease, hepatic failure.
Paralytic ileus.
Concurrent treatment with drugs known to have substantial potential for causing agranulocytosis.
Concomitant use of depot antipsychotics.
Patients with rare hereditary problems of galactose intolerance, Lapp lactase deficiency or glucose-galactose malabsorption.

Co-prescribing antibiotics
Caution is required when co-prescribing antibiotics as some have a potential to depress neutrophil count and are best avoided (e.g. co-trimoxazole). Check individual drugs before prescribing.

Smoking cessation
The polycyclic aromatic hydrocarbons in cigarette smoke are inducers of hepatic enzymes which metabolise clozapine. Therefore sudden smoking cessation may result in a significant increase in clozapine plasma level with associated adverse effects, e.g. seizures. Nicotine replacement therapy (NRT) has no effect on this process. Smoking cessation should be conducted in a planned way in discussion with the consultant psychiatrist as clozapine dose may need to be adjusted. Handy fact sheet available at www.choiceandmedication.org/nhs24/.

Pregnancy
Discuss with consultant. There is only limited clinical data on exposed pregnancies.

Breast-feeding
Clozapine is excreted in breast milk and has an effect in the nursing infant; therefore, mothers receiving clozapine should not breast-feed.
CLOZAPINE - COMMON SIDE EFFECTS AND THEIR MANAGEMENT

Nausea
Nausea is a common side effect which usually does not require treatment.

Constipation
Constipation is very common (>1 in 10). It has been associated with varying degrees of impairment of intestinal peristalsis, ranging from constipation to intestinal obstruction, faecal impaction and paralytic ileus. On rare occasions these cases have been fatal. When a patient develops constipation it is important to make a full assessment to ascertain the contribution of clozapine treatment, identify any complications that may be present and to exclude the more serious causes of the constipation. Current drug therapy should be reviewed to identify any other medication, e.g. anticholinergics which may be contributing to constipation. Advice on diet, fluid intake and physical exercise should be given and if necessary consider the use of laxatives (osmotic +/- stimulant). Handy fact sheet available at www.choiceandmedication.org/nhs24/.

Hypersalivation
Hypersalivation is very common (>1 in 10). Although not serious it can be debilitating. The discomfort can be minimised by propping up pillows at night and using a towel to cover the top pillow. If severe the use of a low dose anticholinergic drug, e.g. hyoscine hydrobromide 300micrograms may be beneficial but patient should be monitored for signs of constipation. Handy fact sheet available at www.choiceandmedication.org/nhs24/.

Metabolic Syndrome
Clozapine is associated with a range of metabolic side-effects (weight gain, hyperglycaemia and dyslipidaemia) and there is close overlap with metabolic syndrome which contributes to a 5 - 6 fold increase in diabetes and a 3 – 6 fold increase in death from coronary heart disease. As up to 50% of clozapine patients develop symptoms associated with metabolic syndrome it is important to monitor metabolic risk factors regularly.

Weight Gain
Weight gain is common (>1 in 100 to <1 in 10). Dietary counselling and regular exercise is recommended.

Sedation
Sedation is common and may be minimised by giving clozapine in divided doses with a larger dose at bedtime.

Hypotension
Postural drop in blood pressure may occur with or without subjective dizziness. Patient should be advised to stand up slowly from lying or sitting position.

Hypertension
Hypertension may occur. Monitor closely and treat as appropriate.

Tachycardia
Tachycardia is very common in the early stages of treatment but is usually benign and typically resolves after 4 - 6 weeks. Since it is also a key symptom of myocardial disease it is essential that patients who have persistent tachycardia at rest, especially in the first two months of treatment, are closely observed for other signs of myocarditis and cardiomyopathy. These include palpitations, arrhythmias, symptoms mimicking myocardial infarction, chest pain and other unexplained symptoms of heart failure. Referral to a cardiologist is advised. Clozapine treatment should be stopped if tachycardia occurs in the context of chest pain or heart failure. The GP must liaise with the consultant psychiatrist. Idiopathic sinus tachycardia should not lead to clozapine discontinuation – a dose reduction may be effective. However if it persists a cardioselective beta-blocker (e.g. atenolol) may be tried.
Seizures
Seizures are a common dose related side effect. If a seizure does occur the clozapine dose should be withheld for 24 hours and the consultant psychiatrist contacted as the dose of clozapine should be reduced by 50% and the dose increased gradually until clinical response achieved. Current drug therapy should be reviewed to identify any other medication which may lower seizure threshold. Consideration should be given to recent changes in smoking habit as smoking cessation or reduction can increase clozapine plasma level. An EEG and referral to a neurologist should be considered. If a patient experiences a sequential seizure, pharmacological management is advised. Sodium valproate is a rational first choice (NB: carbamazepine is contraindicated due to its potential to cause neutropenia).

Fever
Fever or benign transient hyperthermia is a common side-effect typically occurring in the first 10 – 15 days. If signs of fever develop a full blood count with a white cell differential should always be performed to rule out the possibility of neutropenia. In addition it is critical to differentiate benign fever from dangerous conditions such as agranulocytosis, neuroleptic malignant syndrome or myocarditis. Infection should also be ruled out.

Neutropenia/Agranulocytosis
May occur at any time but more commonly during the first 18 weeks of treatment. Stop clozapine; inform consultant and admit to hospital.
## COMMON DRUG INTERACTIONS WITH CLOZAPINE

<table>
<thead>
<tr>
<th>Drug</th>
<th>Interactions</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone marrow suppressants (e.g. carbamazepine, chloramphenicol, sulphonamides (e.g. co-trimoxazole), pyrazolone analgesics (e.g. phenylbutazone), penicillamine, cytotoxics agents and long-acting depot injections of antipsychotics)</td>
<td>Increased risk and/or severity of bone marrow suppression.</td>
<td>Clozapine must not be used concomitantly with other agents having a well known potential to suppress bone marrow functions.</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Concomitant use may increase risk of circulatory collapse, which may lead to cardiac and/or respiratory arrest.</td>
<td>Whilst the occurrence is rare, caution is advised when using these drugs together. Reports suggest that respiratory depression and collapse are more likely to occur at the start of this combination or when clozapine is added to an established benzodiazepine regimen.</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Clozapine potentiates the action of these drugs through additive anticholinergic activity.</td>
<td>Observe for anticholinergic side effects, e.g. constipation, especially when using to control hypersalivation.</td>
</tr>
<tr>
<td>Antihypertensives</td>
<td>Clozapine can potentiate the hypotensive effects of these drugs.</td>
<td>Caution is advised if clozapine is used concomitantly with antihypertensive agents.</td>
</tr>
<tr>
<td>Alcohol/MAOIs/CNS Depressants (including narcotics and benzodiazepines)</td>
<td>Enhanced central effects. Additive CNS depression and cognitive and motor performance interference when used in combination with these drugs.</td>
<td>Caution is advised if clozapine is used concomitantly with other CNS additive agents.</td>
</tr>
<tr>
<td>Highly protein bound drugs (e.g. warfarin, digoxin)</td>
<td>Clozapine may cause an increased plasma concentration of these drugs due to displacement from plasma proteins.</td>
<td>Patients should be monitored for the occurrence of side-effects associated with these drugs and doses of the protein bound drug adjusted if necessary.</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>Addition of phenytoin to clozapine may cause a reduction in clozapine plasma concentration.</td>
<td>Patients should be monitored for worsening/recurrence of psychotic symptoms.</td>
</tr>
<tr>
<td>Lithium</td>
<td>Concomitant use can increase the risk of development of neuroleptic malignant syndrome (NMS).</td>
<td>Observe for signs and symptoms of NMS.</td>
</tr>
<tr>
<td>CYP1A2 inducing substances (e.g. omeprazole)</td>
<td>Concomitant use may reduce clozapine levels.</td>
<td>Potential for reduced efficacy should be considered.</td>
</tr>
<tr>
<td>CYP1A2 inhibiting substances (e.g. fluvoxamine, caffeine, ciprofloxacin), or hormonal contraceptives (CYP1A2, CYP3A4, CYP2C19)</td>
<td>Concomitant use may increase clozapine levels.</td>
<td>Potential for increased adverse effects. Care required if concomitant CYP1A2 or CYP3A4 inhibitors stopped as clozapine levels will be reduced. The effect of CYP2C19 inhibition is minimal.</td>
</tr>
</tbody>
</table>