Parkinson’s: Key information for hospital pharmacists
There are 127,000 people living with Parkinson’s in the UK\(^1\). There’s no cure for Parkinson’s, but medication can substantially improve symptoms.

Medication routines can be complex and because Parkinson’s is a progressive condition, these routines are regularly reviewed by specialists and adjusted to maintain their benefits.

If not enough attention is paid to Parkinson’s medication, symptoms can become poorly controlled and people’s condition can deteriorate.

This can happen even within a short period of time if appropriate review is not completed and the routine is not properly maintained – during a hospital admission, for example.

In 2012/13, people with Parkinson’s were admitted to hospital 98,195 times in England\(^2\). Hospital admissions may be due to Parkinson’s, but it may also be due to other health problems that may or may not be related to a person’s Parkinson’s.

An admission may be planned, but it may also be as an emergency. In England, people over 65 with Parkinson’s are three times more likely to have an unplanned admission to hospital than over 65s without the condition\(^2\). Therefore it is likely that you will see a person with Parkinson’s in your hospital.

At Parkinson’s UK, we’re eager to work with pharmacists and their teams in hospitals to draw attention to the importance of effective medicines management in Parkinson’s.

You can play a vital role in ensuring people with Parkinson’s achieve good control of their symptoms with their medications and so have the best possible outcome from a hospital admission.
What is Parkinson’s?

Parkinson’s is a progressive neurological condition. It’s more common in the older population, but some have been seen to develop symptoms before the age of 40.

The cause is unknown, but the pathophysiology is the degeneration of dopamine-producing cells in the substantia nigra. Dopamine is a neurotransmitter and linked to a range of neural pathways in the brain. The loss of nerve cells producing dopamine affect these neural pathways and cause the symptoms of Parkinson’s to appear. The symptoms most often associated with Parkinson’s are slowness of movement (bradykinesia), rigidity and rest tremor. Most drug treatments aim to ease these motor symptoms.

However Parkinson’s is also associated with many non-motor symptoms which people often say cause them more distress in their everyday life than their motor symptoms. Non-motor symptoms are treated separately but it is essential that care is taken to make sure any medications prescribed are compatible with existing prescriptions and the most appropriate medications are used for presenting symptoms.
Most people with Parkinson’s use medication to control their symptoms. The most commonly used medicines are shown in Appendix 1 on page 20.

They compensate for the loss of the dopamine-producing neurons by:

- increasing the levels of dopamine in the brain (levodopa group)
- stimulating post-synaptic receptors that would normally be activated by dopamine (dopamine agonist group)
- blocking the action of enzymes and neurotransmitters that break down dopamine

Parkinson’s affects everyone differently in terms of how symptoms present and the speed and nature of its progression.
As shown in Appendix 1 (page 20), the options for treatment are wide-ranging, so medication routines may vary significantly between different people with Parkinson’s.

In addition, routines will usually need adjusting as the person’s symptoms change over time and the condition progresses.

Therefore it is important that people with Parkinson’s are regularly reviewed by a specialist (who may be a consultant neurologist, geriatrician, Parkinson’s nurse or specialist pharmacist) to ensure they are getting the right treatment for them.

The key issue with Parkinson’s medication is **timing**. Medication needs to be taken at specific times so that symptoms are controlled and can be maintained without deterioration.

Not getting medication on time can mean the difference between someone being able to function independently and someone becoming reliant on others for simple everyday activities such as walking and eating – within a hospital setting, this could mean that staff are required to give more assistance. Swallowing may also be affected which could lead to problems taking further doses.

In extreme cases, missed doses may lead to the potentially fatal neuroleptic-like malignant syndrome.

Because of the complexity associated with Parkinson’s medication, ensuring an individual is able to maintain their prescribed medication routine in terms of the right preparation, dosage and timing is a challenge.

However there is much that you can do as a hospital pharmacist to ensure that routines are maintained and people with Parkinson’s get the most out of an admission into hospital.
Your role as a hospital pharmacist

1 Support maintenance of prescribed medication routes

Medication routines prescribed for Parkinson’s can vary between individuals in the types of preparation, the dosages given and the time at which they are taken.

It may have taken some time to establish a routine that best suits a person and it is vital this is maintained so symptoms are controlled effectively. But this can be difficult in hospitals because:

- information about medication routines might not be readily accessible (particularly with an emergency admission or if the person is transferred between departments)
- the medications that a person with Parkinson’s is taking might not be easily available
- the medication routines may not fit easily with hospital procedures, such as timings of traditional drug rounds or theatre schedules for surgery
Disruption to someone’s medication routine can have significant implications both for the person with Parkinson’s and the level of support they require from ward staff. Parkinson’s UK launched the Get It On Time campaign to raise awareness of how vital it is that people with Parkinson’s receive their medication on time in hospitals and in care homes. You can find out more about the campaign at parkinsons.org.uk/getitontime

In 2012/13 people with Parkinson’s spent a total of 128,513 excess days in hospital at a cost of more than £20 million². While it is difficult to determine to what extent this was due to poor medicines management, it demonstrates that managing admissions of people with Parkinson’s is already a challenge in hospitals. This issue was also highlighted in the Rapid Response Alert published by the National Patient Safety Agency in 2010 on reducing harm from omitted and delayed medicines in hospital. The report identified people with Parkinson’s being at risk when their medicines are not well managed³. Measures should be taken to ensure that people with Parkinsons ALWAYS get the correct medication at the correct time to minimise the consequences of missed or late doses.

You may find the following useful:

- Liaise with medical and nursing colleagues to make sure they have a comprehensive list of a person’s medication (with information about preparations, dosages and timings). This can help accurate prescribing and administration for everyone involved in managing the person’s medication. People with Parkinson’s and their carers are usually aware of how important their medication is in managing their condition and may have this information with them. Make sure you ask them about this as well as looking at any formal documentation there is on the person. Because of the importance of medications in managing Parkinson’s, medicines reconciliation should be a priority for this group.
of patients. This includes admissions that occur outside normal working hours, so it’s important that out-of-hours procedures support prompt review by pharmacists.

• Make sure a wide range of Parkinson’s medication is stocked or that you are aware of how and where to get supplies so that it is readily available to help maintain individual routines. People with Parkinson’s are encouraged to bring a small supply of their medication in its original packaging to hospital with them so that it can be used during an admission, however this may not be available if they are admitted in an emergency. Parkinson’s medications should be on the trust’s critical medicines list so that supplies can be accessed at any time.

• Use branded preparations where prescribed and don’t substitute with generic versions. These may vary in both the level of active ingredients and the effect of non-active components on the absorption of active ingredients. The differences between formulations are small and controlled through regulation, but they still might be clinically significant in terms of symptom control. If this does occur – because of local availability of medications, for example – explain to the person and/or their carer why a different preparation has been dispensed to help reduce any anxiety or confusion.

• Assess patients to see if they are able to self-administer medication and support them to do so if they are clinically able. A person’s capability to do this may change during an admission, such as in the immediate post-operative stage, so it is important that information about their self-administration status is accurately updated on all documentation and communicated to all relevant staff. However the aim should always be to encourage people with Parkinson’s to be as independent with their medications as possible.
• Print out timings on the pharmacy label or add them to any blister packs issued to help ensure ward staff can support people with Parkinson’s to get their medication on time.

• Ensure that other hospital staff caring for a person with Parkinson’s understand the importance of keeping to the prescribed medication routine and adjust activities accordingly. For example, ward staff will need to ensure that a person with Parkinson’s gets their medication on time even if this does not fit in with the usual timings of drug rounds or if this coincides with other ward activities, such as mealtimes. Surgery or clinical tests will also need to be planned around the timings of someone’s medication routine. Ideally, someone should be put at the start of operating lists to optimise their medication. It should be noted that people
with Parkinson’s can still take prescribed oral medication with small amounts of clear fluids up to two hours before elective surgery\(^6\). In addition, anaesthetists may wish to consider regional anaesthesia rather than general anaesthetic as this would allow continuation of the usual medication routine. As patients may transfer between areas of the hospital during their admission, it may be necessary for you to advise a range of staff in different wards or departments. Parkinson’s UK have various resources that might help you explain the importance of timing of medication to other staff – these include:

- **Caring for your patient with Parkinson’s** (booklet for ward staff)
- **Medicines management for patients with Parkinson’s** (DVD for ward staff)
- **Emergency management of patients with Parkinson’s** (pocket guide for those who may manage a person with Parkinson’s within an emergency setting)

All of these are available to view and order from parkinsons.org.uk/publications

- Investigate if a person with Parkinson’s is having difficulty taking their usual oral medication and manage it accordingly. Common issues include:
  - Swallowing problems – management may include considering posture for an effective swallow (ie sitting upright with chin neutral), review by a speech and language therapist, use of thickened fluids or soft food to facilitate swallow or use of liquid or dispersible versions of drug preparations (N.B. never crush or split modified release preparations (labelled CR, MR, XL or PR))
  - Nausea/vomiting or altered level of consciousness/confusion/agitation/hallucinations. In these incidences, it is important to first check for any previous history or underlying cause (including infection or dehydration) and treat accordingly. However if medication is used, it
is important to only use preparations that do not worsen Parkinson’s symptoms (See ‘Make sure other medications do not make Parkinson’s symptoms worse’ on page 14)

- If a person is still not able to take their next prescribed oral dose, it may be necessary to consider administration via a naso-gastric, naso-jejunal or PEG tube, or via rotigotine patches (See Appendix 2 on page 24)

Some people with Parkinson’s may also be using non-oral medications or have had surgery to help them control their symptoms. More details about these can be found in Appendix 3 on page 28. Maintaining a consistent medication routine will help people with Parkinson’s get the most out of their medication whilst they are in hospital.

Understand the wide-ranging impact of Parkinson’s and its medications

People with Parkinson’s can experience a wide range of non-motor symptoms. This is because dopamine plays a role in neural pathways involved in cognition, arousal, motivation and reward.

Common symptoms include pain, fatigue, mental health issues (such as depression and anxiety), autonomic dysfunction, sleep problems and bladder and bowel problems including constipation (this is particularly problematic in Parkinson’s as this can affect the absorption of medications which in turn can worsen symptoms). It is important to treat these symptoms appropriately taking particular care not to use medications that can worsen motor symptoms (See ‘Make sure other medications do not make Parkinson’s symptoms worse’ on page 14). It may be helpful to consider non-pharmacological interventions including advice about sleep hygiene and referral to other professionals, such as dietitians, to manage these symptoms effectively.

People using levodopa to manage their Parkinson’s may notice that over time their medication is not as effective as it once was. When symptoms are well controlled with
levodopa, people with Parkinson’s are experiencing an ‘on’ period. As the body metabolises the drug, symptoms become less well-controlled and the person may have an ‘off’ period. If this happens, many people start to find their movements becoming stiffer – some may even become completely unable to move. These motor fluctuations are best managed by taking medication at regular intervals. As the condition progresses, people may well have increasing fluctuations between ‘on’ and ‘off’ periods and so medication is needed more frequently. But increasing the amount of levodopa may also increase the likelihood of the person developing dyskinesias. These are involuntary, uncontrolled jerky movements that can affect any part of the body. Significant changes in Parkinson’s medication routines should be conducted by a specialist, but possible strategies you can try with a person with Parkinson’s in hospital include:

- using smaller doses more frequently to reduce the ‘peaks and troughs’ of levodopa and the incidence of dyskinesias (whilst making sure that any reduced dose is still achieving symptom control)
- where symptom control is problematic, it may be advisable for people not to take their medication with meals as protein may inhibit levodopa absorption
- managing any underlying issues that might affect levodopa absorption, such as constipation or timings of any prescribed iron supplements. Because of the potential formation of chelates in the gastrointestinal tract, it is advised that 2–3 hours is left between iron and levodopa preparations.

Parkinson’s medications do have potential side-effects you should be aware of. These may include nausea, vomiting, drowsiness and low blood pressure, which can lead to dizziness and fainting. With some Parkinson’s drugs, particularly dopamine agonists and in a small number of cases, levodopa, some people experience problems with impulsive and compulsive
behaviour. Examples of this behaviour may include gambling, compulsive spending, binge eating or hypersexuality. These behaviours can have a huge impact on people’s lives. If, during an admission, impulsive and compulsive behaviour is observed or reported, it is important that medications are not suddenly stopped as this may make other symptoms worse. Instead, people with Parkinson’s and their family or carers should be encouraged to speak to their specialists about getting their medication reviewed at the earliest opportunity.

Helpful resources about impulsive and compulsive behaviour can be found at parkinsons.org.uk/icbsupport

Other potential complications which may be seen when a person with Parkinson’s is admitted to hospital or ‘red flag’ signs that would mean someone should be reviewed by a specialist are discussed in Appendix 4 on page 29. Other considerations when managing a person with Parkinson’s include:

- Parkinson’s can lead to difficulties in communication such as quietening of the voice, slurring of speech and reduced facial expressions and body language. Therefore it is important to ensure the environment supports your patient to communicate as well as they can.
- Parkinson’s can cause swallowing difficulties so it is advisable to ask patients if they are having any difficulty taking their medication.
- Adherence to medication routines can be affected if the side-effects or any issues with taking the medication (such as its taste or size) outweigh their benefits from the point of view of the person. So asking your patient how their Parkinson’s medication is affecting their ability to function is key to understanding how successful their current routine is in improving their quality of life.

Make sure other medications do not make Parkinson’s symptoms worse\textsuperscript{7,8}
People with Parkinson’s who are in hospital may have additional issues that may or may not be caused by their Parkinson’s. While managing these effectively is clearly a priority, it is also important to make sure that medication given to manage these problems does not make their Parkinson’s worse.

Any drug that blocks dopamine receptors could make the symptoms of Parkinson’s worse or even mimic Parkinson’s symptoms without the condition being present. When introducing any new medications for patients with Parkinson’s, it’s important to think through the mechanisms of action. Some drugs should be used with caution and the person closely monitored in case their Parkinson’s symptoms get worse. In other cases, some drugs should be avoided.

For nausea and vomiting, avoid:

- metoclopramide (Maxalon)
- prochlorperazine (Stemetil)

Domperidone (Motilium) is the anti-emetic of choice to prevent and treat nausea and vomiting. A European review in 2014 found a small increased risk of
serious cardiac side effects with domperidone and so advised that it is contraindicated in people with known cardiac conditions. But the advice also highlighted the need to take into account the overall safety profile of domperidone with the clinical need for its use with particular reference to Parkinson’s. If an injectable or alternate anti-emetic is required, cyclizine (Valoid) may be considered post-operatively. Ondansetron can also be used although a common side-effect is constipation – in addition, it is contraindicated if the person is using apomorphine because of the risk of hypotension.

For hallucinations/confusion, avoid:

- chlorpromazine (Largactil)
- fluphenazine (Modecate)
- perphenazine (Fentazin)
- trifluoperazine (Stelazine)
- flupenthixol (Fluanxol/Depixol)
- haloperidol (Serenace/Haldol)

Refer to a specialist for review and management.

For coughs and colds, avoid:

- preparations containing sympathomimetics (such as pseudoephedrine and ephedrine) with MAO-B inhibitors

Vigilance is particularly required with use of:

- antihistamines, especially cinnarizine (Stugeron/Arlevert), which if used long-term, can mimic Parkinson’s symptoms
- antidepressants
- antipsychotics
- antihypertensives, such as diltiazem (Adizem/Angitil/Calcicard/Dilcardia/Dilzem/Solzem/Tildiem/Viazem/Zemtard) and other calcium channel blockers. Note that these should also be monitored by the GP clinical system

More information about potential interactions with Parkinson’s medications can be found in Appendix 1 of the British National Formulary. The NICE Clinical Knowledge Summaries service also has information about which drugs to avoid with Parkinson’s.
Support people to take control post discharge

If there have been any changes to a person’s medication routine while they have been in hospital, make sure you inform the person with Parkinson’s and their carers what changes have been made, why they were needed and if they should look out for any specific side-effects. In addition, it is very important that clear information about medication on discharge is sent to the person’s GP to prevent any medication errors following an admission.

As people with Parkinson’s often have close links with their community pharmacy, supplying clear information about any changes would also be useful to your colleagues in this setting.

Because of the complexity of Parkinson’s medication, a medicines review could help make sure a person’s medication routine continues to work for them.

A national target area for the Medicines Use Review (MUR) scheme in England is patients who have recently been discharged
from hospital and have had their medication routine changed. Communicating with the person’s community pharmacist to schedule in a medicines review following their admission is an excellent way of strengthening your connections with community-based care.

Parkinson’s is a lifelong condition for which there is currently no cure. However by accessing relevant information and support, there’s no reason why people who have Parkinson’s cannot enjoy a fulfilling and enjoyable life.

Parkinson’s UK provides a range of services for both people affected by Parkinson’s and those around them. These include a confidential helpline (0808 800 0303) and a range of publications which can be ordered from parkinsons.org.uk/publications.

Parkinson’s UK also offers support locally across the UK. Parkinson’s Local Advisers can offer one-to-one information and emotional support to people with Parkinson’s, their families and carers. In addition, the network of local groups enables people with Parkinson’s and their carers to meet others and get involved in activities to enable them to take control.

The Parkinson’s UK website has information about local support teams and our local groups at parkinsons.org.uk/localtoyou.

Find out more about Parkinson’s

The medical specialist managing your patient with Parkinson’s may be a neurologist or a geriatrician. They may have contact with a specialist Parkinson’s nurse or a specialist pharmacist.

Knowing who these local experts are and their contact details will be useful should you need to seek specialist advice.

Parkinson’s UK not only provides information and support to people affected with Parkinson’s, it also provides specific support to professionals.
The UK Parkinson’s Excellence Network allows you to keep up-to-date with the latest news, events and learning opportunities, such as courses and Q&A sessions with renowned experts, information resources and service improvement tools to enable you to provide the best possible care for people affected by Parkinson’s. More details can be found at parkinsons.org.uk/excellencenetwork

Education is also provided in partnership with other organisations. For example, a session has been developed with the Centre for Pharmacy Postgraduate Education about Parkinson’s and its medication as part of their ‘learning at lunch’ series. For more details, go to www.cppe.ac.uk

There are pharmacy networks with a special interest in Parkinson’s and/or neurology, such as the United Kingdom Clinical Pharmacy Association Neurosciences group. More details can be found at www.ukcpa.net

There are also national guidelines about the management of Parkinson’s that may be useful in your practice. These can be found at nice.org.uk (note that the NICE guidelines are currently under review and are due to be published in October 2016) and sign.ac.uk (Scotland)
Appendices

Appendix 1

Drug treatments for Parkinson’s

Note that some people might require different preparations of the same drug, e.g. standard release levodopa medication during the day and a modified release version at night. Please note that other branded versions may be available through your local formulary.

<table>
<thead>
<tr>
<th>LEVODOPA</th>
<th>100ml per cassette containing 2000mg levodopa and 500mg carbidopa monohydrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbidopa and levodopa (Co-careldopa)</td>
<td>25mg/100mg 12.5mg/50mg 25mg/250mg 10mg/100mg CR” 50mg/200mg Half-CR” 25mg/100mg</td>
</tr>
<tr>
<td>DUODOPA (Intestinal gel)</td>
<td>abbvie</td>
</tr>
<tr>
<td>Levodopa and carbidopa (Co-careldopa)</td>
<td>50mg 75mg 100mg 125mg 150mg 175mg 200mg</td>
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<tr>
<td>SINEMET</td>
<td>MSD</td>
</tr>
<tr>
<td>Levodopa, carbidopa and entacapone</td>
<td>100/25mg 200/50mg</td>
</tr>
<tr>
<td>STALEVO</td>
<td>Orion Pharma</td>
</tr>
<tr>
<td>Carbidopa and levodopa (Co-careldopa)</td>
<td>25/100mg 50/200mg</td>
</tr>
<tr>
<td>LECADO</td>
<td>Sandoz</td>
</tr>
<tr>
<td>Carbidopa and levodopa (Co-careldopa)</td>
<td>25/100mg 50/200mg</td>
</tr>
<tr>
<td>CARAMET</td>
<td>TEVA</td>
</tr>
</tbody>
</table>

Co-careldopa also available in generic form. If you would like more information about Madopar, please contact Roche at 01707 366000
### Catechol-O-Methyl Transferase Inhibitors (COMT inhibitors)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Manufacturer</th>
<th>Formulation</th>
<th>Dosage</th>
</tr>
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<tbody>
<tr>
<td>Entacapone</td>
<td>ORION PHARMA</td>
<td>Tablets</td>
<td>200mg</td>
</tr>
<tr>
<td>Tolcapone</td>
<td>MEDA</td>
<td>Tablets</td>
<td>100mg</td>
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NB rarely prescribed (see Appendix 4)

### Dopamine Agonists

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<th>Manufacturer</th>
<th>Formulation</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apomorphine</td>
<td>Britannia</td>
<td>APO-go PEN (Intermittent injection)</td>
<td>3ml (10mg/ml)</td>
</tr>
<tr>
<td>Apomorphine</td>
<td>Britannia</td>
<td>APO-go PFS (Pre-filled syringe)</td>
<td>10ml (5mg/ml)</td>
</tr>
<tr>
<td>Apomorphine</td>
<td>Britannia</td>
<td>APO-go (Ampoules)</td>
<td>5ml amp (10mg/ml)</td>
</tr>
<tr>
<td>Ropinirole</td>
<td>GSK</td>
<td>REQUIP</td>
<td>0.25mg</td>
</tr>
<tr>
<td>Ropinirole</td>
<td>GSK</td>
<td>REQUIP XL (Prolonged release)</td>
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</tr>
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<td></td>
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</tr>
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<tr>
<td></td>
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<td></td>
<td>5mg</td>
</tr>
<tr>
<td>Rotigotine</td>
<td>UCB</td>
<td>NEUPRO (Patches)</td>
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<tr>
<td></td>
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### DOPAMINE AGONISTS CONTINUED

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<tr>
<th>Drug Name</th>
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<tbody>
<tr>
<td>Pramipexole</td>
<td>Boehringer Ingelheim</td>
<td>0.088mg base/0.125mg salt 0.35mg base/0.5mg salt 0.18mg base/0.25mg salt 0.7mg base/1mg salt 0.52mg base/0.75mg salt</td>
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<td>Pramipexole</td>
<td>Boehringer Ingelheim</td>
<td>0.26mg base/0.375mg salt 2.1mg base/3.0mg salt 0.52mg base/0.75mg salt 2.62mg base/3.75mg salt 1.05mg base/1.5mg salt 3.15mg base/4.5mg salt</td>
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<tr>
<td>Pramipexole</td>
<td>Boehringer Ingelheim</td>
<td>1.05mg base/1.5mg salt 3.15mg base/4.5mg salt</td>
</tr>
<tr>
<td>Bromocriptine</td>
<td>MEDA</td>
<td>1mg 2.5mg 5mg 10mg</td>
</tr>
<tr>
<td>Cabergoline</td>
<td>Pfizer</td>
<td>1mg 2mg</td>
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<tr>
<td>Cabergoline</td>
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<td>1mg 2mg</td>
</tr>
<tr>
<td>Pergolide</td>
<td>TEVA</td>
<td>50mcg 250mcg 1000mcg</td>
</tr>
<tr>
<td>Apomorphine</td>
<td></td>
<td>NB rarely prescribed (see Appendix 4)</td>
</tr>
<tr>
<td>Ropinirole</td>
<td></td>
<td>NB rarely prescribed (see Appendix 4)</td>
</tr>
<tr>
<td>pergolide</td>
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<tr>
<td>Cabergoline</td>
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<td>Bromocriptine</td>
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</tr>
<tr>
<td>Pramipexole</td>
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</tr>
</tbody>
</table>

Apomorphine, ropinirole, pergolide, cabergoline, bromocriptine and pramipexole also available in generic form. Be extra vigilant about dispensing the correct strength of pramipexole (note that the dose is expressed in terms of the salt and the base).

### ANTICHOLINERGICS

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<tr>
<td>Procyclidine</td>
<td>Rosemont</td>
<td>2.5mg/5ml 5mg/5ml 50mg/5ml</td>
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<tr>
<td>hydrochloride</td>
<td>Rosemont</td>
<td>2.5mg/5ml 5mg/5ml 50mg/5ml</td>
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<tr>
<td>Orphenadrine</td>
<td>Rosemont</td>
<td>2.5mg/5ml 5mg/5ml 50mg/5ml</td>
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<tr>
<td>hydrochloride (Generic)</td>
<td>Rosemont</td>
<td>2.5mg/5ml 5mg/5ml 50mg/5ml</td>
</tr>
</tbody>
</table>

Also Procyclidine (Kemadrin). Procyclidine hydrochloride and trihexyphenidyl are available in generic syrup and tablet form.

Care needed when prescribed because of potential side effect of memory loss¹⁰
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<tr>
<th>MONOAMINE OXIDASE B INHIBITORS (MAO-B inhibitors)</th>
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<tr>
<td>Rasagiline</td>
<td><strong>AZILECT</strong></td>
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<tr>
<td>Selegiline</td>
<td><strong>ELDEPRYL</strong></td>
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<td><strong>ZELAPAR</strong></td>
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Selegiline also available in generic form.

<table>
<thead>
<tr>
<th>GLUTAMATE ANTAGONIST</th>
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<tr>
<td>Amantadine</td>
<td><strong>SYMMETREL</strong> (Capsules or syrup)</td>
<td>100mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50mg/5ml</td>
</tr>
</tbody>
</table>

- Please note the images of the tablets and capsules are not representative of their actual size.
- This does not give an exhaustive list of products used to treat Parkinson's.

¹details current for August 2015.

**CR** (controlled release) drugs are complete doses. Tablets and capsules should not be broken or split.
Appendix 2

Administration of Parkinson’s medications via non-oral mechanisms

Priority is maintenance of dopaminergic medication

Administration via naso-gastric, naso-jejunal or PEG tube:

• Assess for any contraindications.
• Insert as per local protocol.

The objective is to continue short term management of Parkinson’s with the most appropriate therapy (prioritising dopaminergic medication) given the level of access a patient has. You should consult with a specialist about alternative methods if long term non-oral administration of medication required.

• The table below identifies common licensed proprietary use of each medication. Consult your local guidelines for further advice.
• For medication given in liquid form, flush tube afterwards to ensure complete administration and to prevent blockages.
• Return to usual medication routine (and routes of administration) as soon as clinically possible.

<table>
<thead>
<tr>
<th>Levodopa (main site of absorption is the jejunum – naso-gastric recommended)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Co-beneldopa (Madopar)</strong></td>
</tr>
<tr>
<td>Use dispersible versions. For CR doses, because of reduced bioavailability, convert to dispersible equivalent by multiplying total daily levodopa dose by 0.7 and rounding to nearest available dispersible preparation⁶ – monitor as dose frequency may need to be altered accordingly.</td>
</tr>
<tr>
<td><strong>Co-careldopa (Sinemet/Lecado/Caramet)</strong></td>
</tr>
<tr>
<td><strong>Co-careldopa and entacapone (Stalevo)</strong></td>
</tr>
<tr>
<td><strong>Dopamine agonists</strong></td>
</tr>
<tr>
<td><strong>MAO-B/COMT inhibitors</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Glutamate Antagonist</strong></td>
</tr>
<tr>
<td><strong>Anticholinergics NB Note information in Appendix 1 on page 22.</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Guide for estimating equivalent levodopa dosages for rotigotine patches.\textsuperscript{12}

1. Calculate Adjusted Levodopa Equivalent Daily Dose (LEDD):
\[(A) + (B)] \times 0.55 = \text{_____mg}\]

\(\text{(A) Total adjusted daily levodopa dose}\)

Total daily levodopa dose in mg (excluding benserazide or carbidopa)
[eg Madopar 125mg QDS = 4\times 100 = 400mg/24h]
\(\times 0.7\) (if MR/CR preparation)
or
\(\times 1.3\) (if on COMT inhibitor)
or
\(\times 0.91\) (if MR/CR preparation and on COMT inhibitor)
\(= \text{_____mg}\)

\(\text{(B) Total adjusted daily dopamine agonist estimate levodopa equivalent dose}\)

Total daily dopamine agonist in mg
\(\times 100\) (if on pramipexole/cabergoline/pergolide)
\(\times 20\) (if on ropinirole/rotigotine)
\(\times 10\) (if on apomorphine/bromocriptine)
\(= \text{_____mg}\)

(the above figures refer to each medication's levodopa equivalent factor)

NB (A) or (B) = 0 if not taking that type of medication

2. Calculate dosage for rotigotine patch = Adjusted LEDD / 20 = \text{_____mg}

- Round to nearest 2mg (to max of 16mg) and prescribe as 24-hour patch.
- DO NOT cut patches – available as 2mg/4mg/6mg/8mg patches (can use more than one patch). Also available as 1mg/3mg but not licensed for use in Parkinson's.
• CAUTION – this calculation is for guidance only and is not a substitution for assessment of patient need – treat each person individually and adjust doses accordingly:

  o if increased stiffness/slowness observed, increase dose and review daily
  o if increased confusion/hallucinations observed, decrease dose and review daily
  o If adjusted LEDD >350mg, use rotigotine 16mg and consult with specialist regarding administration of apomorphine.
Appendix 3
Non-oral treatments for Parkinson’s

Apomorphine (APO-go)
Apomorphine is a dopamine agonist administrated via an intermittent sub-cutaneous injection or a continuous subcutaneous infusion via a pump – it is **not** morphine-based, is **not** an analgesic and is **not** a controlled drug.

Patients who are established on apomorphine need to be continued at the prescribed dose and frequency (injection) or rate (pump) – do not change the pump settings unless requested to do so.

For further support, call the APO–go helpline on 0844 880 1327 or contact the specialist (eg Parkinson’s nurse or specialist pharmacist).

Duodopa infusion
This is co-careldopa (levodopa and carbidopa) in gel form delivered into the jejunum via a PEJ tube.

Patients who are established on a duodopa routine need to be continued at the prescribed rate providing gastric emptying is not delayed and the PEJ tube is patent. If not, discontinue and commence on rotigotine patches).

Deep brain stimulation (DBS)¹³
This involves stimulation of target sites within the brain (either in the thalamus, the globus pallidus or the subthalamic nucleus) through electrodes connected to a neurostimulator placed under the skin around the chest or stomach area. Patients who are established on DBS need to be maintained on the same routine.

For further support, contact the neurological department that implanted the system (the patient should carry a patient ID card listing contact details and model number of the DBS system).
Appendix 4

Complications with Parkinson’s

• Delirium (acute confusion due to drugs or infection)
• Chest infection, especially aspiration pneumonia
• Urinary tract infections
• Postural hypotension and falls – check meds and BP lying/sitting then standing
• Neuroleptic-like malignant syndrome

Red flags that means a patient needs to be referred to a Parkinson’s specialist:

• Fibrotic reactions with ergot-derived dopamine agonists (including bromocriptine, pergolide and cabergoline) where prescribed. For example dyspnoea, persistent cough, chest pain, cardiac failure, abdominal pain or tenderness (these patients should be having regular echocardiography and chest X-rays)
• Signs of liver disorder with tolcapone (if used), such as nausea, vomiting, fatigue, abdominal pain, dark urine, pruritus (these patients should be having regular liver function tests)
• Increased falling especially early in condition
• Hallucinations/dementia/depression/cognitive decline especially early in condition
References

1. Parkinson’s Disease Society (2009) Parkinson’s prevalence in the United Kingdom


risks-of-cardiac-side-effects [Accessed 20 July 2015]


15. Wales Centre for Pharmacy Professional Education (2013) Quick practice guide for targeted MURs: Parkinson’s Disease

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• Jenny Wright, Parkinson’s nurse, Nottingham University Hospitals NHS Trust.
The UK Parkinson’s Excellence Network is the driving force for improving Parkinson’s care, connecting and equipping professionals to provide the services people affected by the condition want to see.

The tools, education and data it provides are crucial for better services and professional development.

The network links key professionals and people affected by Parkinson’s, bringing new opportunities to learn from each other and work together for change.

Visit parkinsons.org.uk/excellencenetwork