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Department of Social Protection
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Hypertension

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1. Overview and Definition of Hypertension

1.1 Overview

Hypertensive disease is one of the groups of conditions which are known collectively as cardiovascular disease - the others being cerebrovascular disease, ischaemic heart disease, heart failure and rheumatic disease (World Health Organisation, 2009). In Ireland, as throughout the UK, Europe, the US and most of the developed world, cardiovascular disease is the leading cause of death, with around 30% of annual worldwide deaths resulting from these conditions (World Health Organisation, 2009).

Hypertension specifically accounts for 4.5% of global disease burden and 7.1 million premature deaths worldwide. The condition is equally prevalent in developed and developing countries. Whilst different countries have different capabilities for managing hypertensive individuals, globally the majority of individuals with hypertension either remain undiagnosed, or are inadequately controlled (World Health Organisation, 2003, World Health Organisation, 2009). Figures from the UK indicate that in England, 31 percent of men and 28 percent of women have HBP (140/90 mm Hg or higher) or are being treated for hypertension. However, approximately 58 percent of men and 46 percent of women who have hypertension are not currently being treated. Of those being treated, around half are inadequately controlled (British Heart Foundation, 2008).

Hypertension usually co-exists with a number of other cardiovascular risk factors, but it is estimated that hypertension specifically is responsible for about 62% of all cerebrovascular disease and almost half of all ischaemic heart disease (World Health Organisation, 2003).

1.2 Definition of Hypertension

Hypertension is defined as 'persistently raised arterial blood pressure'. This results in increased cardiac load to compensate for this resistance, which can result in myocardial hypertrophy. Hypertension by itself is not a disease (NCCC, 2006) but is a risk factor for developing other (potentially fatal) disease including the spectrum of cardiovascular conditions.

Hypertension can occur as ***primary hypertension*** (accounting for 95% of all cases) where no known cause is identified, and as ***secondary hypertension*** (remaining 5%) where an underlying disease is responsible for the hypertension. Disease processes which result in hypertension include renal, vascular and endocrine disorders; the effects of drugs or toxins and other conditions such as scleroderma, systemic lupus erythematosus or polyarteritis nodosa. Rarer causes include conditions such as aortal coarctation. Indications that hypertension may result from an underlying disease include age <40, rapid onset of hypertension or a sudden change in blood pressure elevation when an individual has been previously well controlled, or hypertension that is difficult or impossible to control using normal pharmacological therapies (BMJ Best Practice, 2009).

What counts as the range of 'normal' blood pressure may vary from individual and vary according to the reason the blood pressure is being monitored, but in general, there is a range of blood pressure seen in the population which may be considered as normal (Hawthorne et al, 1974). Blood pressure increases and decreases over the course of 24 hours in a pattern which is predictable, even in night workers. Blood pressure is at its most elevated when an individual first wakes but become more stable over the time that the individual is awake (during the daytime for day workers). Whilst an individual is sleeping blood pressures reduce by 10-20%. Although the average readings in an individual with hypertension may be higher than in an individual without hypertension, the pattern is still repeated.

The ranges of blood pressure which are used to guide clinical practice are listed in the table below (Williams et al, 2004; European Society of Hypertension and European Society of Cardiology, 2007). Many epidemiological studies use the cut off criteria of thresholds of 140 mmHg (systolic) and 90 mmHg (diastolic) (NHS Information centre for Health and Social Care, 2008).

Hypertension used to be classified in a scale of mild, moderate and severe; however these terms have now been replaced with Grade 1, 2 and 3 in order to avoid confusion with the quantification of total cardiovascular risk (European Society of Hypertension and European Society of Cardiology, 2007).

Category	Systolic blood pressure (mmHg)	Boolean	Diastolic blood pressure (mmHg)
Optimal	< 120	and	< 80
Normal	120–129	and	< 85
High normal	130–139	and/or*	85–89
Grade 1	140–159	and/or*	90–99
Grade 2	160–179	and/or*	100–109
Grade 3	>= 180	and/or*	>= 110
Isolated systolic hypertension†	>= 140	and	< 90

*When systolic and diastolic readings fall into different categories, use the higher pressure category to determine the class.

† Isolated systolic hypertension should be graded (1, 2,3) according to systolic blood pressure values in the ranges indicated, provided that diastolic values are ,90 mmHg.

Table 1: Classification of blood pressure measured in people without diabetes during a clinical consultation and recommended by the British Hypertension Society, European Society of Hypertension, and the European Society of Cardiology

Many guidelines until relatively recently concentrated on diastolic blood pressure as the variable which acted as an indicator of hypertension, and therefore the predictor of relative cardiovascular risk. Previous studies showed that the benefits of lowering blood pressure are significant and that there is a linear relationship between the level of blood pressure and cardiovascular risk (Stamler et al, 1993; He and Whealton, 1999; MacMahon, 1990). It is now understood that there is a

relationship between both diastolic and systolic blood pressures and cardiovascular risk. This is generally a less significant relationship for coronary heart disease than it is for stroke, but also acts with respect to heart failure, peripheral artery disease and end stage renal disease (European Society of Hypertension and European Society of Cardiology, 2007).

No evidence has been found to indicate that a physiologically low blood pressure is harmful (Hansson, 1988).

1.2.1 The Effect of Anxiety – 'White Coat Syndrome'

Hypertension is known to rise artificially in some individuals when they are in contact with medical professionals. 'White Coat' hypertension is caused by a stress reaction to a perceived threatening environment. The individual is likely to have a normal blood pressure if measured in an appropriate setting.

Some estimates suggest that 'white coat syndrome' can result in artificially raised blood pressure in as many as 20% of all individuals, suggesting that there are individuals who are being diagnosed and treated for hypertension who may only have a anxiety response at the point their blood pressure was measured (O'Brien, 2008). A Turkish study in 2006 of almost 500 consecutive patients found that 43% had blood pressure measurements which were artificially raised due to anxiety (Helvaci and Seyhanli, 2006).

The issue of potential treatment for individuals who are thought to have hypertension which is artificially raised in this way is controversial. It is suggested that home or ambulatory monitoring is undertaken in order to confirm suspected 'white coat syndrome'. Treatment should be commenced if there is evidence of target organ damage or the individual scores highly in a cardiovascular risk assessment. Lifestyle modification recommendations should be made regardless of whether treatment is commenced (ESC and ESH, 2003).

1.3 International Classification of Diseases; 10th Edition (ICD-10) Classification

The World Health Organisation, in the 10th Edition of the International Classification of Diseases (ICD-10) (World Health Organisation, 2007); applies the following diagnostic classification for hypertension:

- **I10** Essential (primary) hypertension (High blood pressure; Hypertension (arterial)(benign)(essential)(malignant)(primary)(systemic)
- **I11** Hypertensive heart disease
- **I12** Hypertensive renal disease such as arteriosclerosis of kidney, arteriosclerotic nephritis, hypertensive nephropathy, nephrosclerosis etc.
- **I13** Hypertensive heart and renal disease
- **I15** Secondary hypertension – renovascular hypertension, hypertension due

to other renal disorders, hypertension due to endocrine disorders etc.

This classification excludes hypertension related to the following:

- Hypertension complicating pregnancy, childbirth and the puerperium (O10-O11 , O13-O16)
- Hypertension involving coronary vessels (I20-I25)
- Neonatal hypertension (P29.2)
- Pulmonary hypertension (I27.0)

2. Epidemiology

In Ireland, as in the UK and most of Europe, the prevalence rate for hypertension is approximately 30% (Blood Pressure exceeding 140/90 mmHg).

Approximately 12.8 per cent of all worldwide deaths (7.1 million) and 4.5 per cent of all disability life years lost (64.3 million) in the year 2000 were due to poor control of BP levels (World Health Organisation, 2009).

The prevalence of hypertension increases with age, which is a significant issue in health population terms given an increasing aging population – figures indicate that in 2011 around 14% of the Irish population will be over the age of 65 with 25% of those over 80 (O'Brien, 2008) . The Health of the Nation survey in the UK found that:

- About 30% of people 45–54 years of age have blood pressure that is at least 140/90 mmHg.
- About 70% of people 75 years of age or older have blood pressure that is at least 140/90 mmHg

(NHS Information Centre for Health and Social Care).

The SLÁN 2007 Survey of Lifestyle, Attitudes and Nutrition in Ireland found that 60 per cent of respondents reported they had high blood pressure, of whom 57 per cent were not on medication and of those on medication, 70 per cent were not controlled to levels below 140/90 mmHg.

3. Aetiology

3.1 Aetiology

3.1.1 Primary Hypertension

Primary or essential hypertension accounts for the majority (95%) of all cases of hypertension, and is of unknown aetiology.

It has been suggested that there is a genetic influence in hypertension and that this may account for about 30% to 70% of the variation in blood pressure. Approximately 50% of individuals with high blood pressure have a family history of raised blood pressure or of early cardiac death (Beevers et al, 2007). There are also thought to be pre-natal influences on the development of hypertension. These involve low birth weight or abnormal foetal growth patterns, above average maternal hypertension and/or pregnancy induced hypertension but the mechanisms behind these influences are not fully understood (Beevers et al, 2007).

Lifestyle factors such as obesity, lack of physical activity, alcohol intake, and a high salt intake are also thought to play a part.

Psychosocial stress also plays a part in the development of hypertension. Studies have shown that in both men and women, work stress (encountered when an individual has a demanding occupation but with low control over the occupation – for example a factory production line worker) results in raised blood pressure both at work and outside work (Isles, 2004). The effect this has on hypertension is as strong as obesity. However, studies on individuals with highly demanding occupations but who do have control over work factors (for example solicitors) do not show the same effect with respect to hypertension.

Contributory factors for developing hypertension include:

- Obesity
- Excess alcohol consumption above recommended limits
- Excess salt intake
- Lack of physical exercise
- Environmental or work related stress.

3.1.2 Secondary Hypertension

Secondary Causes of Hypertension include:

- Vascular
  - Renal artery stenosis

  - Coarctation of the Aorta (radio-femoral delay or weak femoral pulses)
- Pregnancy
  - Pregnancy Induced Hypertension (eclampsia, pre-eclampsia)
- Drugs
  - Non-steroidal anti-inflammatory drugs
  - Oral contraceptives
  - Steroids
  - Some cold cures
- Renal disease
  - Chronic kidney disease
  - Obstructive uropathy
  - Polycystic kidney disease – hypertension often present before renal function abnormalities
- Endocrine disease
  - Phaeochromocytoma (paroxysmal symptoms)
  - Cushing's syndrome
  - Hypothyroidism
- Sleep disorders
  - Sleep apnoea (mechanism of relationship unclear)
- Prenatal Influences

4. Diagnosis

4.1 Clinical Features

Hypertension is typically asymptomatic, with many new cases identified as a result of presenting for assessment of an alternative condition, or through opportunistic screening. Many texts suggest that individuals who present with hypertension may report headaches, nausea, nosebleeds, visual disturbances or neurological symptoms; however the evidence suggests that such symptoms are not linked to hypertension (Beevers et al, 2007).

The physical examination is often normal.

The aim of assessment of an individual with hypertension is to exclude secondary causes of hypertension (which occur in approximately 5% of individuals) and to ascertain if there has been any target organ damage resulting from the hypertension.

Hypertension is usually diagnosed using a threshold measurement of a systolic blood pressure sustained above or equal to 140 mmHg, or a diastolic blood pressure sustained above or equal to 90 mmHg, or both. This should be measured over at least two occasions and using correct blood pressure technique. An overview of recommendations regarding measurement of blood pressure can be found in ***Appendix A.***

4.1.1 Diagnosis Period

Dependent on the elevation of the readings, it is common to diagnose hypertension over a period of time, rather than a single visit or assessment. This is necessary to exclude one-off artificially high readings and to ensure readings are not affected by external factors such as anxiety. There may be some occasions however where a blood pressure measurement is sufficiently elevated for immediate action to be indicated – see 'hypertensive emergencies' below.

The table below indicates suggested periods over which hypertension should be assessed.

Blood Pressure Range	**Without Cardiovascular Disease**	**With Cardiovascular Disease, Target Organ Damage, or Diabetes**
• 220/120 mmHg or higher • Acute cardiovascular complications • Signs of accelerated or malignant hypertension	Diagnose Immediately	
180/110 mmHg to 219/119 mmHg	Confirm over a two week period	
160/100 mmHg to 179/109 mmHg	Confirm over 4-12 weeks	Confirm over 3-4 weeks

140/90 mmHg to 159/99 mmHg	Confirm over 12-16 weeks	Confirm over 12 weeks

Table 2: Diagnosis Periods for Hypertension (note these classifications are provided for a guide only, and may change according to the individual's additional risk factors)

4.1.2 Estimation of Cardiovascular Risk

It is important to note that the diagnosis of hypertension should not be made in isolation of other cardiovascular risk factors. A full risk assessment should be undertaken. There are a number of tools and models which can be used to inform this estimation, but in general they estimate an individual's risk of cardiovascular disease over the next ten years using their gender, age, diabetic status, smoking status, total serum cholesterol (TC), high density lipoprotein cholesterol (HDL-C) and blood pressure.

On-line tools which aid in the estimation of cardiovascular risk can be accessed at the British Hypertension Society website at the following link: http://www.bhsoc.org/Cardiovascular_Risk_Charts_and_Calculators.stm (accessed November 2009).

There are some limits to these models however. The models are commonly based on epidemiological studies undertaken in the Framingham, Massachusetts with a mainly Caucasian population base, and have therefore not been validated on the ethnic minority populations found in the UK and Ireland. In addition, they may be poor indicators of cardiovascular morbidity and mortality in the younger population (North of England Guideline Development Group, 2006; Beevers et al, 2007).

The estimation of cardiovascular risk will inform treatment decisions. In the absence of any other cardiovascular risk factors, or any evidence of target organ damage, it may not be appropriate to treat hypertension unless significantly above normal limits. Where cardiovascular risk is present, treatment may be commenced at earlier intervals – see section 4.1.1.

4.1.3 Hypertensive Emergencies

There are a number of hypertensive conditions which should be treated as immediate medical emergencies. Secondary care referral is required, which will commonly require treatment in a high-dependency or intensive care unit with appropriate specialist input. Such conditions include:

- **Hypertensive encephalopathy**: This condition presents with severe hypertension accompanied by headache, vomiting, visual disturbance, mental status changes, seizure, and papilloedema. There may be additional cardiopulmonary symptoms including angina, myocardial infarction, or pulmonary oedema.

- **Hypertensive left ventricular failure**: This condition presents as cardiac failure with shortness of breath, pulmonary oedema, lethargy, paroxysmal nocturnal dyspnoea, and orthopnoea.

- **Acute aortic dissection**: This condition typically presents with acute, severe chest pain radiating to the back or jaw. Altered cognition, anxiety and syncope are also common. This condition may be suggested by a differential of >20mmHG in diastolic to systolic blood pressure. Treatment includes surgical repair, the use of stents or medical therapy alone.

Whilst not an emergency, **malignant hypertension** also causes target organ damage over a short period of time and should be treated as an urgent condition.

4.2 History

The clinical evaluation of a hypertensive patient aims to identify possible secondary causes, complications of hypertension, and other risk factors for cardiovascular disease.

The patient's history may identify additional risk factors such as smoking, family history of cardiovascular disease, or pre-existing cardiovascular disease.

The history may also influence the eventual choice of treatment. For example, beta-blockers would be contraindicated in a patient with asthma, but ACE inhibitors might be first choice in a diabetic patient.

4.3 Physical Examination

The physical examination is often normal, however; general examination may identify risk factors for cardiovascular disease or secondary causes of hypertension. (See Appendix B for further details.)

Physical examination should include:

- Appropriate measurement of blood pressure
- Examination of the optic fundi (this may not be an appropriate examination in the context of a disability setting – see chapter 8)
- Abdominal circumference measurement and BMI estimation
- Auscultation for carotid, abdominal and femoral bruits
- Palpation of the thyroid gland
- Examination of heart, lungs, abdomen (for enlarged kidneys, masses, distended bladder, or abnormal aortic pulsation)
- Palpation of lower extremity pluses
- Assessment of oedema
- Neurological assessment

(Chobanian et al, 2007; NHS Institute for Innovation and Improvement, 2009)

4.4 Investigations

Routine investigations should include urinalysis, serum urea and electrolytes, blood lipid profile (at least fasting and high density lipoprotein (HDL) cholesterol, but ideally a fasting lipid profile for determination of triglycerides), fasting glucose and full blood count. A urine test strip for blood and protein should also be performed. These are significant in their ability to detect many of the secondary causes of hypertension and important cardiovascular risk factors.

Other blood tests (e.g. for Thyroid Stimulating Hormone to exclude hypothyroidism) should be undertaken if a secondary cause for the hypertension is suggested by the medical history or physical examination. It is not usually necessary to undertake extensive testing to determine possible causes of secondary hypertension at this point unless blood pressure control is not achieved using normal pharmacological methods, or the results of the routine investigations suggest a secondary cause is the reason for the elevated blood pressure (Chobanian et al, 2003).

A 12-lead Electrocardiogram should be undertaken to determine:

- Left ventricular hypertrophy, and / or strain.
- Underlying ischaemic heart disease.
- A baseline for monitoring the effectiveness of treatment

A Chest X-ray is only indicted when there is a specific symptom such as breathlessness.

In complex or severe cases, or where target organ damage is suspected, renal ultrasound, echocardiography, serum hormone levels, urine catecholamines, renal angiography and immunological titres may be helpful in reaching a diagnosis.

4.5 Target Organ Damage

An important aspect of diagnosis is identification of any target organ damage which has resulted from the individual's hypertension.

- **Cardiovascular disease**: Presenting symptoms of cardiac failure may include shortness of breath, ankle oedema, angina etc. Physical examination may identify abnormal cardiac sounds. Investigations including 12 lead ECG or echocardiography may identify cardiovascular disease, heart failure, or left ventricular hypertrophy may also be reported. Examination may reveal abnormal cardiac sounds such as forceful apex beat, apex beat displaced laterally or accentuated aortic component of the 2nd heart sound and a 4th heart sound.
- **Cerebrovascular disease**: Presenting symptoms may include speech difficulties or visual disturbances. Any past history of symptoms which may

suggest a Transient Ischaemic Attack (TIA) or cerebrovascular accident (CVA) should be identified.

- **Renal** failure: May be asymptomatic, abnormal serum electrolyte levels, increased serum creatinine level, low estimated glomerular filtration rate, or proteinuria loss may suggest renal damage.

- **Retinopathy**: This is often asymptomatic, but may present with visual loss or headaches. Hypertensive retinopathy on fundoscopy is characterised by arteriolar narrowing, arteriovenous compression, retinal haemorrhages or exudates and/or papilloedema.

5. Differential Diagnosis and Comorbidity

5.1 Differential Diagnosis

Conditions which should be considered as a differential diagnosis to hypertension are listed below:

Common Conditions:

- Renal artery stenosis
- Chronic kidney disease
- Obstructive uropathy
- Obstructive sleep apnoea

Rarer Conditions

- Secondary Hypertension:
  - Coarctation of aorta
  - Pre-eclampsia
  - Glomerulonephritis
  - Nephrotic syndrome
  - Polycystic kidney disease
  - Phaeochromocytoma
  - Hyperaldosteronism
  - Cushing's disease/syndrome
  - Hyperthyroidism
  - Hypothyroidism
  - Hyperparathyroidism
  - Chronic alcohol misuse
  - Effects of medication or toxins
  - "White-coat hypertension"

5.2 Comorbidity

Comorbid conditions which can adversely affect hypertension include:

- Cardiovascular disease or other heart irregularities
- Diabetes
- Kidney disease
- Obesity
- Sedentary lifestyle

6. Treatment

Many individuals may be diagnosed with hypertension whilst presenting for another problem or condition rather than presenting with hypertension alone as this condition is often asymptomatic. Diagnosis is usually made over a period of time rather than on an isolated elevated blood pressure reading. Once firm diagnosis has been made, there are a number of options for management. These include regular review and monitoring without pharmacologic treatment, but with consideration to the implementation of lifestyle measures (e.g. weight loss), or commencement of antihypertensive drug treatment.

Regular review is an important aspect of the management of hypertension, regardless if antihypertensive drug treatment has been commenced. It has been shown that a regular review encompassing blood pressure measurement, review of symptoms and medication and the provision of advice and support regarding any lifestyle modifications which may be required helps to motivate the individual to undertake effective lifestyle changes. In addition, evidence from a large study undertaken in the UK shows that many individuals taking antihypertensive medications are concerned regarding the necessity, effectiveness and adverse side effects of their medication (Benson and Britten, 2003). This may lead the individual to not take their medication as prescribed.

In the United Kingdom, the National Institute for Clinical Excellence suggests that annual reviews are appropriate for individuals who have controlled hypertension. It is suggested that for those individuals who are either aged >75 or taking four or more medications, this period is shortened to 6 months (North of England Guideline Development Group, 2006).

6.1 Treatment Options for Hypertension

The primary goal of treatment is to reduce the long term risk from cardiovascular disease. To achieve this, other cardiovascular risk factors which may be present need to be addressed in addition to achieving control of hypertension.

6.1.1 Thresholds for Treatment

There is a variation in guidance in the literature as to when pharmacologic treatment should be initiated for hypertension. The National Institute for Clinical Excellence (Northern England Guideline Development Group, 2006) recommend that antihypertensive treatment should be offered if the individual has a sustained blood pressure which exceeds:

- Systolic >= 160 mmHg, or diastolic >= 100 mmHg, or both, or
- Systolic >= 140 mmHg, or diastolic >= 90 mmHg, or both, and established cardiovascular disease, target organ damage, or high risk of cardiovascular disease

However more recent literature suggests that the thresholds for treatment should be

considered in terms of total cardiovascular risk, rather than a decision based on blood pressure elevation alone. The following table is reproduced from the European Society for Cardiology and European Society for Hypertension guidelines (2007):

	Blood pressure (mmHg)				
Other risk factors OD or disease	Normal SBP 120–129 or DBP 80–84	High normal SBP 130–139 or DBP 85–89	Grade 1 HT SBP 140–159 or DBP 90–99	Grade 2 HT SBP 160–179 or DBP 100–109	Grade 3 HT SBP≥180 or DBP≥110
No other risk factors	No BP intervention	No BP intervention	Lifestyle changes for several months then drug treatment if BP uncontrolled	Lifestyle changes for several weeks then drug treatment if BP uncontrolled	Lifestyle changes + Immediate drug treatment
1–2 risk factors	Lifestyle changes	Lifestyle changes	Lifestyle changes for several weeks then drug treatment if BP uncontrolled	Lifestyle changes for several weeks then drug treatment if BP uncontrolled	Lifestyle changes + Immediate drug treatment
≥3 risk factors, MS or OD	Lifestyle changes	Lifestyle changes and consider drug treatment	Lifestyle changes + Drug treatment	Lifestyle changes + Drug treatment	Lifestyle changes + Immediate drug treatment
Diabetes	Lifestyle changes	Lifestyle changes + Drug treatment			
Established CV or renal disease	Lifestyle changes + Immediate drug treatment	Lifestyle changes + Immediate drug treatment	Lifestyle changes + Immediate drug treatment	Lifestyle changes + Immediate drug treatment	Lifestyle changes + Immediate drug treatment

Table 3: European Society for Cardiology and European Society for Hypertension recommendations on thresholds for treatment for hypertension

6.1.2 Targets for Treatment

Optimum blood pressure measurements for individuals receiving antihypertensive medication are (European Society for Cardiology and European Society for Hypertension, 2007):

- The target for treatment is a blood pressure of 140/90 mmHg or less if tolerated by the individual
- Diabetics and those with established cardiovascular disease need tight blood pressure control. In these cases, the target is 140/80 mmHg or less if possible.
- It should be anticipated that it may not be possible to control systolic blood pressure to <140mmHg in the elderly, diabetic or those with established cardiovascular disease

6.2 Non-Pharmacologic Treatment (Lifestyle Modifications)

There are a number of lifestyle modification recommendations which can help to

lower an individual's blood pressure. These modifications are the same as those recommended for reducing total cardiovascular risk, and are advised for individuals who have a high normal (and even normal) blood pressure if there are other cardiovascular risk factors present (European Society for Cardiology and European Society for Hypertension, 2007), as well as individuals who are commencing antihypertensive treatment.

The lifestyle measures which are recommended include:

- Smoking cessation
- Weight reduction (and weight stabilisation)
- Reduction of excessive alcohol intake
- Uptake in physical exercise
- Reduction of salt intake, use of a salt substitute
- Moderation of consumption of caffeine-rich products such as coffee
- Increase in fruit and vegetable intake and decrease in saturated and total fat intake

(European Society for Cardiology and European Society for Hypertension, 2007; NHS Institute for Innovation and Improvement, 2009).

6.3 Pharmacologic Treatment

Studies have shown that most patients require lifelong treatment with a combination of at least two antihypertensive drugs (Williams et al, 2004). A large number of studies have shown that the benefit in antihypertensive medication is provided by the reduction in blood pressure and therefore associated cardiovascular risk, rather than specific benefit from the type or class of medication itself. Different classes of medications have different side effect and contraindications and the decision as to which type or combination of types of medication is to be used for an individual is a matter for clinical judgement based on the individual's specific requirements, risk factors, comorbidities and the reaction and effectiveness of the medication (European Society for Cardiology and European Society for Hypertension, 2007).

In selecting a drug or drugs for antihypertensive therapy the following aspects should be considered:

- The reaction the individual has had to any previous antihypertensive medication, both with respect to the lowering of the blood pressure and with respect to any side effects the individual may have experienced. It should be noted that adverse side effects are the main reason for non-compliance in treatment.
- The effect that any proposed antihypertensive medication may have on any cardiovascular risk factors the individual may have

- The presence of any target organ damage, existing cardiovascular disease or other comorbid conditions such as diabetes, renal conditions etc. This is to aid in the selection of medications which are more appropriate where such factors exist

- Any drug interaction which may occur with medication the individual is taking either for this condition or for any other condition. This includes over the counter medication.

- Any potential healthcare system issues such as limited prescribing formulary, the cost of drugs, or the availability of drugs etc.

- Any issues or wishes the individual may have with respect to their medication. An individual may find that taking a medication which has a 24-hour effect and is therefore requires only one daily administration easier to remember than more frequently administered drugs for example.

- Other medications such as statin therapy and aspirin should be considered where appropriate.

This protocol is therefore not written with the intent of providing the level of detail necessary for determining treatment options for a specific individual but merely to provide an overview of the main treatment options available.

Antihypertensive drugs can be used in combination if:

- They are from different classes which have a different or complimentary mode of action

- Evidence supports the use of a combination of two specific drugs in that the combined effect is greater than the effect of one used singly

- The different actions of each combination acts to reduce the side effects of each drug alone

The following drug combinations have been shown to be beneficial in randomised efficacy trials:

- Thiazide diuretic and ACE inhibitor

- Thiazide diuretic and angiotensin receptor antagonist

- Calcium antagonist and ACE inhibitor

- Calcium antagonist and angiotensin receptor antagonist

- Calcium antagonist and thiazide diuretic

- Beta-blocker and calcium antagonist (dihydropiridine)

Combinations of drugs are often available manufactured as a single tablet.

It should be noted that the combination of a thiazide diuretic and a Beta-blocker is common in clinical practice but evidence is available that suggests this specific combination has unwarranted metabolic effects and should therefore be avoided in individuals where metabolic syndrome is suspected, or where there is a risk of diabetes occurring.

Consideration should be given to commencing therapy with a combination of drugs rather than with a single agent, rather than commencing a monotherapy alone. Although the addition of a second agent after a short period time allows assessment of the action in terms of effectiveness and tolerability of the first agent, since evidence suggests the majority of individuals will require a combination of agents, commencing a combination at the outset allows both agents to be commenced at a low dose which can then be increased as required. This applies for both the first and subsequent agents that are commenced.

Combination therapy should always be commenced where there are severely elevated blood pressures, or if an individual has a combination of factors that results in a high cardiovascular risk, target organ damage, diabetes or renal disease where a substantial blood pressure fall is desirable.

[European Society for Cardiology and European Society for Hypertension, 2007]

6.3.1 Alpha-Blockers

The alpha1-adrenoreceptor blockers inhibit the effects of noradrenaline at alpha1 receptors in arteries and veins. This allows vasodilatation and a fall in blood pressure. Examples include doxazosin and terazosin. These drugs are often used as the third agent when a combination of two drugs has failed to control blood pressure. They may be particularly appropriate for men who also suffer symptoms of prostatism. Their main side effect is postural hypotension. Like beta-blockers their role is when the addition of a fourth line of therapy is required.

However, in the 2006 pharmacological update to the National Institute for Health and Clinical Excellence (NICE) guideline 'Hypertension: Management of hypertension in adults in primary care' (National Collaborating Centre for Chronic Conditions, 2006) alpha blockers were not included as a medication suitable for initial treatment of hypertension, as they do not provide the cardiovascular protection that other hypertensive medications support. The use of an alpha blocker may be appropriate as a fourth combination should other combinations of medication not provide suitable hypertensive control (National Collaborating Centre for Chronic Conditions, 2006).

Alpha blockers are contraindicated if the individual suffers from urinary Incontinence.

6.3.2 Angiotensin Converting Enzyme (ACE) Inhibitors

The ACE inhibitors lower the blood pressure by blocking the conversion of angiotensin I to angiotensin II. They are particularly appropriate for diabetics as they have a renal protective effect. The choice of which angiotensin-converting enzyme

inhibitor is prescribed is usually a matter of local policy, or cost implications, however some drugs of this class have particular benefit towards certain comorbidities, for example, Ramipril reduces the rates of cardiovascular deaths and events, in addition to its effect on blood pressure (Warner et al, 2003). Debate remains as to whether this is a class effect, however it appears that the dose at which Ramipril produces this effect is more acceptable than the dose which may be required with alternative preparations.

In December 2004, ASCOT (Anglo-Scandinavian Cardiac Outcomes Trial) was stopped early by the study's steering committee due to significant benefits observed in the amlodipine (calcium antagonist) plus perindopril (ACE inhibitor) arm of the study compared to the atenolol (beta blocker) plus bendroflumethiazide (diuretic) arm.

There is increasing evidence that in most circumstances ACE inhibitors have advantages over a beta blocker, diuretic combination.

ACE inhibitors also affect the metabolism of bradykinin. This causes a cough in about 15% of patients. It is a class effect and necessitates a change to a different class of drug rather than an alternative ACE inhibitor.

ACE inhibitors can impair renal function especially in patients with bilateral renal artery stenosis or pre-existing renal vascular disease, so this should be monitored regularly.

ACE inhibitors are contraindicated in pregnancy as they may adversely affect foetal and neonatal blood pressure control and renal function.

6.3.3 Angiotensin II receptor antagonists (angiotensin receptor blockers ARB)

This relatively new class of drugs blocks the angiotensin II type I receptors, which is a later stage than the ACE inhibitors. Thus, they have all the beneficial effects of the ACE inhibitors (Pitt, et al, 1997) but do not induce the 'ACE inhibitor cough' side effect. In terms of efficacy, studies indicate that this class of drug is as effective as ACE inhibitors; however, cost may be a consideration (National Collaborating Centre for Chronic Conditions, 2006).They are now considered a useful alternative where ACE inhibitors are not tolerated, or are contraindicated (NHS Institute for Innovation and Improvement, 2009).

ARBs are contraindicated in pregnancy for the same reasons as ACE inhibitors.

6.3.4 Beta-Blockers

The beta-blockers inhibit the effect of catecholamines at beta-adrenoreceptors. Members of the class show differing affinities for beta1 (mainly cardiac, 'cardioselective') and beta2 (mainly vascular and bronchial) receptors. They are no longer a preferred initial therapy for hypertension alone and current recommendations are for their introduction if a combination of three other drugs has not achieved control.

The exceptions to this are in younger people with intolerance or contraindications to

ACE inhibitors and angiotensin II receptor antagonists and in women with child-bearing potential; or if the individual has pre-existing coronary heart disease.

Their main effect is to reduce sympathomimetc activity thereby slowing the pulse and reducing the force of cardiac contractions. They are particularly suitable for the treatment of hypertensive patients who have concomitant symptomatic angina or a previous myocardial infarct.

Atenolol is the most widely prescribed beta-blocker in the UK.

Side effects of beta blockers include cold extremities and lethargy. They are contraindicated in subjects with reversible obstructive airways disease and in those with 2nd or 3rd degree heart block.

6.3.5 Calcium Channel Blockers

These drugs inhibit the movement of calcium ions across cell membranes, and hence reduce intracellular calcium levels. In turn, this inhibits vascular smooth muscle contraction to produce vasodilatation, inhibits cardiac muscle contraction to reduce cardiac workload, and inhibits cardiac conducting tissues to slow the pulse.

- The dihydropyridine calcium channel blockers such as nifedipine and amlodipine are powerful vasodilators, but have little effect on the cardiac tissues.
- Verapamil has a strong effect on the atrioventricular node, giving it useful antiarrhythmic properties. (Verapamil and beta-blockers must not be prescribed together: they may induce heart block.)
- Diltiazem affects cardiac tissue to reduce heart rate and contractility, and vascular smooth muscle to cause vasodilatation.

The calcium channel blockers have been shown to be effective in several long-term studies (Stessen et al, 1997; Brown et al, 2000; Hansson et al, 2000), and are recommended by the National Institute of Clinical Excellence as a first line treatment (National Collaborating Centre for Chronic Conditions, 2006) as a systematic review of 10 trials found that they are the most effective antihypertensive drug at reducing overall cardiovascular risk. In terms of cost effectiveness, NICE also marginally recommended the use of Beta Blockers over Thiazide or Thiazide-like Diuretics.

Side effects of beta blockers can be troublesome. They include ankle oedema, flushing, constipation and headache.

6.3.6 Thiazide/Thiazide-like Diuretics

The thiazide diuretics have long term clinical trial evidence to confirm their effectiveness, are cheap, well tolerated, and can be taken once daily. Their effectiveness can be enhanced with the addition of an ACE inhibitor (see above).

Bendrofluazide is the most widely prescribed thiazide in the UK, and is the least costly of this class of drug (National Collaborating Centre for Chronic Conditions,

2006).

Other diuretics such as spironolactone or amiloride may be used as alternatives or additively but require additional monitoring of renal function and electrolytes.

6.3.7 Other Medications

Aspirin

In therapeutic doses aspirin by itself is not a hypotensive agent. However, trials have shown that aspirin can reduce cardiovascular events in hypertensive patients, although it is associated with an increased number of gastro-intestinal and cerebral haemorrhages. Aspirin is recommended for the primary prevention of cardiovascular disease in the following groups of individuals; however it should be noted it is not licensed for this use (NHS Institute for Innovation and Improvement, 2009):

- Existing cardiovascular disease, or
- Target organ damage from hypertension, or
- A 10-year cardiovascular risk of >20% or greater, and age >50 years.

6.4 Treatment Considerations

Because side effects are dose related, it is generally better to add a second drug, rather than increase the dose of a single agent to its maximum.

Poor control of blood pressure despite a triple combination of antihypertensive drugs is one of the indications for referral to a specialist clinic.

Other indications might include a suspected secondary cause, difficulties with tolerability of treatment, highly variable blood pressure, and the development of end-organ damage.

Some patients are symptomatic at time of diagnosis, or subsequently develop symptoms. The nature of these features may influence the choice of therapy.

Subjects with angina may benefit from a beta blocker and/or a calcium channel antagonist.

Those with a significant reduction in cardiac output are best treated with a diuretic and either an ACE inhibitor or an ARB.

7. Prognosis (Main Prognostic Factors)

Untreated hypertension is one of the leading contributors to premature death worldwide. The effects of hypertension are significant in terms of cardiovascular risk, a risk which rises further with each cardiovascular risk factor which is present in addition to hypertension (for example hyperlipidaemia, diabetes and smoking) (British Cardiac Society et al, 2005).

Prognosis in terms of cardiovascular morbidity can be estimated by assessing cardiovascular risk in conjunction with blood pressure measurements. There are a number of methods of undertaking this risk assessment, including the Joint British Societies' Cardiovascular Risk Assessor which can be downloaded from the following link (Accessed November 2009):

http://www.bhsoc.org/Cardiovascular_Risk_Charts_and_Calculators.stm

Hypertension can lead to the development or complications in a number of conditions in addition to cardiovascular disease. These include:

- Stroke – the most common condition associated with hypertension
- Retinopathy
- Peripheral vascular disease
- Aortic aneurysm
- Renal disease
- Heart failure

The increased risk to an individual in terms of stroke is greater than the increased risk to an individual in terms of cardiac disease; however, the latter is more prevalent.

The risk of stroke, myocardial infarction and peripheral vascular disease is 2-3 times higher in individuals with hypertension than the general population. The age mortality rates double for these conditions with every increase of 20mmHg in average systolic blood pressure (Lewington et al, 2002)

In general the higher the blood pressure measurement, the poorer the prognosis, however; effective management of hypertension can dramatically reduce associated risks. Trials have shown that effective control of hypertension can reduce the incidence of stroke by 40% and heart attacks by 16% (He and Whelton, 1999; Collins et al, 1990) Other epidemiological trials have shown greater effects - reductions in stroke of 56% and coronary heart disease of 37% with a 10mmHg fall in blood pressure (North of England Guideline Development Group, 2006)

8. Information Gathering at the In Person Assessment

The majority of hypertensives are asymptomatic, and do not have a functional disability.

In the UK it is recommended that fundal examination is not carried out when a claimant is being assessed for benefit purposes. The reasons for this are:

- **Dilatation of the pupils cannot be undertaken and therefore signs recorded may not be wholly accurate**
- **Non-dilatation of the pupils may result in serious additional pathology being missed and leave the examining practitioner open to litigation**
- **In the past some claimants have found the examination and the proximity to the examining practitioner required to carry out fundoscopy distasteful and this resulted in complaints being made against the practitioner.**

8.1 Assessing the claimant

Assessment should be made using all the information available. This includes information from the claimant's file, informal observations, medical history, 'average day, and examination.

8.1.1 The Medical History

- A key point to obtain from the history is whether the claimant is under the care of a Consultant.

The vast majority of hypertension cases will be under the care of their General Practitioner. Referral to a Consultant suggests that the hypertension is difficult to control, a secondary cause of hypertension is suspected or that the claimant is intolerant of standard treatments. This information indicates something about the current severity of the condition and the likelihood of disabling side effects.

- Many hypertensive subjects will have some side effects from their treatment. (Some common side effects are tabulated in Appendix C.) However, these will usually be of nuisance value – without causing functional disability.

8.1.2 Interpreting the Blood Pressure

A blood pressure measurement taken in the course of a disability examination is likely to be adversely affected by the circumstances. The measurement would not be useful for the formal diagnosis or assessment of hypertension, but it will provide some guidance as to the general level of the claimant's blood pressure. It is important that all the available information about the claimant's medical history,

treatment, and the examination findings are used together to build up a picture of their condition.

8.1.3 Unexpected or Severe Hypertension

Unexpected or severe hypertension in a claimant unaware that they have hypertension must be addressed.

They should be advised to consult their GP within the next week so that their blood pressure can be monitored in a less stressful situation.

If the situation appears urgent it may be appropriate to inform the claimant's GP by telephone in writing. It is important to seek the claimant's informed consent to notify their GP in this situation.

8.1.4 Possible consequences of Uncontrolled Hypertension

Uncontrolled hypertension may lead to: heart attack, heart failure, stroke, multi-infarct dementia, peripheral vascular disease, renal failure and retinopathy, and thus may be associated with poor effort tolerance, immobility, visual loss and loss of independence.

The functional disability will be that of the secondary condition.

In these cases, hypertension is not the most important condition to address. The focus of the assessment should be directed at the condition that is directly causing disability.

Hypertensive claimants whose blood pressure is at a level posing severe risk of causing end organ damage and remains poorly controlled despite evidence of compliance with maximum therapy or who are under the care of a hospital hypertension clinic may be considered as unfit for all work for a specified period within which the examining practitioner feels that successful control can be attained.

There should be medical evidence on file to support this.

A claimant recently referred to a hospital hypertension clinic might be expected to have their blood pressure controlled within 6 to 12 months. However, a claimant whose blood pressure remains poorly controlled despite long-term attendance at a hospital hypertension clinic is unlikely to make rapid progress, and it would be appropriate to recommend the period of incapacity for a longer time.

8.2 Psychological Effects

When a person is told that their blood pressure is high and they are at risk of cardiovascular complications, psychological problems may result. Emotions such as anxiety or denial may affect their ability to process, remember, or act upon the information they are given. This may hinder compliance with lifestyle advice and drug treatment.

Following a diagnosis of hypertension, some patients enter a heightened state of self-surveillance where they become aware of, and frightened by, normal physiological sensations.

'Dizziness', 'Headache' and 'Nose Bleed' are common symptoms that patients often associate with high blood pressure, although it has been shown that they are equally prevalent in moderately hypertensive and healthy populations (Baer, 2006; Beevers, 2007). Patients who have been told that they are hypertensive have a much higher incidence of headache than hypertensive patients who are unaware of their condition (Baer, 2006).

In some studies, labelling a person as hypertensive has led to increased absenteeism from work (Baer, 2006). Indeed, a small number of hypertensive claimants may adopt an Illness behaviour or bio-psychosocial pattern of disability.

9. Analysis of Effect on Functional Ability

The majority of hypertensives are asymptomatic. They do not have a functional disability.

Eligibility to the Department of Social and Family Affairs various Illness-related schemes and the Activation Programme, is determined primarily by the degree of Ability/Disability and its expected duration.

The degree of Ability/Disability assessed, using the Indicators in 9.1, can be depicted on the Ability/Disability Profile illustrated in 9.2.

Assessment should be made using all the information available. This includes information from the claimant's file, informal observation, medical history, average day and examination.

A blood pressure reading taken in the course of a disability assessment may be adversely affected by the circumstances. The measurement would not be useful for the formal diagnosis or assessment of hypertension but it may provide some guidance as to the general level of the claimant's blood pressure.

9.1 Indicators of Ability/Disability

Normal

- No history of hospital attendance
- Under GP care only
- Treatment with one or two antihypertensive drugs only
- No history suggestive of a secondary cause of hypertension

Mild

- Referral to a hospital consultant in the last 6-12 months but now discharged from attendance
- Treatment with one or two antihypertensive drugs only
- No history of a secondary cause of hypertension

Moderate

- Referral to a hospital consultant in the last 6-12 months
- On multiple antihypertensive drug treatment
- No history suggestive of secondary cause of hypertension

Severe

- Long term attendance at hospital clinic
- On maximum antihypertensive drug treatment

- May have a history of admission to hospital due to hypertension
- History of secondary cause of hypertension

Profound

- Long term attendance at hospital clinic
- On maximum antihypertensive drug treatment
- History of secondary cause of hypertension
- History of sequelae of uncontrolled hypertension such as MI, Heart Failure

  PVD, Renal Failure or multi infarct dementia

9.2 Ability/Disability Profile

Indicate the degree to which the Claimant's condition has affected their ability in ALL of the following areas.					
	Normal	Mild	Moderate	Severe	Profound
Mental health/Behaviour	☐	☐	☐	☐	☐
Learning/Intelligence	☐	☐	☐	☐	☐
Consciousness/Seizures	☐	☐	☐	☐	☐
Balance/Co-ordination	☐	☐	☐	☐	☐
Vision	☐	☐	☐	☐	☐
Hearing	☐	☐	☐	☐	☐
Speech	☐	☐	☐	☐	☐
Continence	☐	☐	☐	☐	☐
Reaching	☐	☐	☐	☐	☐
Manual dexterity	☐	☐	☐	☐	☐
Lifting/Carrying	☐	☐	☐	☐	☐
Bending/Kneeling/Squatting	☐	☐	☐	☐	☐
Sitting	☐	☐	☐	☐	☐
Standing	☐	☐	☐	☐	☐
Climbing stairs/Ladders	☐	☐	☐	☐	☐
Walking	☐	☐	☐	☐	☐

10. Summary of Scheme Criteria

Scheme eligibility criteria are maintained on the DSP website and are accessible from the following links:

- **Carer's Allowance**
  http://www.welfare.ie/EN/OperationalGuidelines/Pages/carers_all.aspx
- **Carer's Benefit**
  http://www.welfare.ie/EN/OperationalGuidelines/Pages/carers_ben.aspx
- **Disability Allowance**
  http://www.welfare.ie/EN/OperationalGuidelines/Pages/disall.aspx
- **Disablement Benefit**
  http://www.welfare.ie/EN/OperationalGuidelines/Pages/oib_disableb.aspx
- **Domiciliary Care Allowance**
  http://www.welfare.ie/EN/Schemes/IllnessDisabilityAndCaring/Carers/DomiciliaryCareAllowance/Pages/DomiciliaryCareAllowance.aspx
- **Illness Benefit**
  http://www.welfare.ie/EN/OperationalGuidelines/Pages/illben.aspx
- **Injury Benefit**
  http://www.welfare.ie/EN/OperationalGuidelines/Pages/oib_injuryb.aspx
- **Invalidity Pension**
  http://www.welfare.ie/EN/OperationalGuidelines/Pages/invalidity.aspx
- **Respite Care Grant**
  http://www.welfare.ie/EN/OperationalGuidelines/Pages/respitegrant.aspx

Appendix A - Recommended Technique for Measuring Blood Pressure

An interactive Tutorial on blood pressure measurement and other resources including posters and guides can be found at http://www.bhsoc.org/how_to_measure_blood_pressure.stm.

A.1. Manual Blood Pressure Recording

Equipment that has been calibrated correctly and validated for clinical use should be used. A list of devices which have been validated can be found on the British Hypertension Society Website (including instruments which are available outside the United Kingdom). Please refer to http://www.bhsoc.org/blood_pressure_list.stm for further information.

Ideally, a standardised environment should be provided, with the same equipment used to measure the individual's blood pressure on each successive occasion. The individual should be comfortably seated for at least 5 minutes. Their arm should be outstretched and comfortably supported at heart level during the measurement. Tight clothing should be removed.

- The blood pressure in both arms should be recorded, with the arm with the higher measurement used for subsequent recordings (Parker and Glasziou, 2009).
- The use of the correct cuff size is vital – prior to the first recording the individual's arm size should be measured and the correct cuff selected. The use of too small a cuff will artificially elevate the blood pressure recording (British Hypertension Society, 2009).

Person	Maximum Arm Circumference	Ideal Cuff Size
Small Child	17cm	4cm x 13cm
Children & Thin Adults	18-24 cm	10cm x 18cm
Most Adults	23-35 cm	12cm x 26cm
Large Adults	35-40 cm	12cm x 40cm
Additional sizes	Standard <53 Large >53	Adult Thigh Cuff (available in standard and large size)

Table 4: Recommended Blood Pressure Cuff Sizes (British Hypertension Society, 2009)

- Place the cuff so that the lower edge is 2-3 cm above the brachial artery pulsation. The bladder should lie over the brachial artery. The rubber tubes leading from the bladder should exit proximally so that the antecubital fossa

is easily accessible. (NB It was traditional to have the tubes exiting distally. The recommendation has changed).

- Palpate the brachial artery and inflate the cuff to about 30 mmHg above the point where the pulse disappears. Then place the diaphragm of the stethoscope over the brachial artery, and slowly deflate the cuff by 2-3 mmHg per pulse beat.

- The blood pressure should be read to the nearest 2mmHg. The measurements should be taken at:

  - The first appearance of Korotkoff sounds (phase I) - systolic blood pressure.

  - The disappearance of Korotkoff sounds (phase V) the diastolic blood pressure, or phase IV (muffling of sounds) if the phase V continues to zero (for example in pregnancy - but only if the phase V signs continue to zero (changed recommendation).

  - A second confirmatory reading should be obtained 5 minutes later if the first blood pressure measurement is 140/90 mmHg or greater.

  - Take the average of at least two readings (more recordings are needed if marked differences are found between initial measurements).

Detailed information on how to measure the blood pressure using manual or semi-automatic blood pressure-measuring devices can be obtained from the British Hypertension Society (BHS) website. See

(National Collaborating Centre for Chronic Conditions, 2006, NHS Institute for Innovation and Improvement, 2009).

A.2 Semi-Automated and Automated Blood Pressure Recording

Many clinical organisations now rely on semi-automatic blood pressure-measuring devices. The exact method of measurement depends on the sophistication of the device being used. An overview can be found at http://www.bhsoc.org/bp_monitors/BLOOD_PRESSURE_1784a.pdf.

A.3 Ambulatory Blood Pressure Monitoring

Ambulatory blood pressure monitoring (ABPM) is only used in certain situations; there is little clinical evidence to inform the determination of cardiovascular prognosis using ABPM. However, there are a number of reasons that the use of this form of monitoring may be appropriate. These include:

- If blood pressure recordings are extremely labile.

- If hypertension does not respond to appropriate pharmacotherapy

- If 'white coat' hypertension is suspected.
- If hypotensive symptoms are present in individuals who have elevated blood pressure recordings
- To identify hypertension during sleep (e.g. nocturnal hypertension for day workers).
- To determine the efficacy of drug treatment over a 24 hour period.

It should be noted that ABPM measurements, when averaged, are usually (but not always) lower than readings made by usual blood pressure recording methods. The difference is approximately 10–20 mmHg for systolic blood pressure and 5–10 mmHg for diastolic blood pressure

[National Collaborating Centre for Chronic Conditions, 2006]

A.3 Home Blood Pressure Monitoring

There has been a significant rise in the number of individuals who undertake home monitoring of their blood pressure using devices bought in high street chemists etc. This was previously thought to provide suspect or inaccurate results and was not recommended by the 2004 National Institute of Clinical Excellence Guidelines (North of England Guideline Development Group, 2004), who pointed out there was little clinical evidence available to support the use of home monitoring, or the interpretation of results.

However, in recent years many of the blood pressure devices which are sold for home use have been clinically validated by the British Hypertension Society (see their website for devices available for under £50 – many high street blood pressure machines are a version of one of these devices), and once treatment has been commenced, home monitoring has become an accepted alternative to monitoring in a clinical setting with respect to:

- Excluding ‘white coat syndrome’
- Allowing individuals to monitor the effects treatment
- Self-titration of hypertensive pharmacotherapies.

Guidelines from the European Society of Hypertension suggest that home blood pressure monitoring is acceptable as an aid to monitoring undertaken by a clinical professional (Parati, 2008).

It is suggested that if home blood pressure monitoring readings are used for treatment management decisions, clinical thresholds should be lowered as for ambulatory blood pressure monitoring (Williams, 2004).

Appendix B - Common and Important Side Effects of Antihypertensive Drugs

Class of Drug	Side Effects
Alpha-Blockers	Postural Hypotension Stress incontinence
ACE Inhibitors	Deterioration of Renal Function Hyperkalaemia Cough (approx 15%) Dizziness and headaches
Angiotensin II Receptor Antagonists (AIIRAs)	Deterioration of Renal Function Hyperkalaemia Dizziness and headaches Hypotension
Beta-Blockers	Dyspnoea Lethargy or Fatigue Impotence Cold Peripheries Sleep disturbance Masking of warning signs of hypoglycaemia Diabetes
Calcium Channel Blockers	Headache Flushing Ankle Swelling Constipation Bradycardia Gingival hyperplasia
Thiazide Diuretics	Gout Impaired glucose tolerance Excessive diureisis Hypokalaemia Diabetes

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