

**UNIVERSITY OF BIRMINGHAM AND UNIVERSITY OF YORK
HEALTH ECONOMICS CONSORTIUM
(NICE EXTERNAL CONTRACTOR)**

Health economic report on piloted indicator(s)

Pilot QOF indicator: The percentage of patients 79 years and under with coronary heart disease in whom the last blood pressure reading (measured in the preceding 12 months) is 140/90mmHg or less

Potential output: Recommendations for NICE Menu

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Introduction

This briefing paper presents a cost effectiveness analysis for a potential indicator from pilot 7 of the NICE Quality and Outcomes Framework (QOF) indicator development programme:

The percentage of patients 79 years and under with coronary heart disease in whom the last blood pressure reading (measured in the preceding 12 months) is 140/90mmHg or less¹

The economic analysis is based on evidence of delivery costs and evidence of benefits expressed as quality-adjusted life years (QALYs). Additionally, the economic analysis takes account of potential QOF payments based on a range of available QOF points and a range of levels of achievement.

The possible range of QOF points for this analysis was agreed with the economic subgroup of the NICE QOF Advisory Committee prior to the analysis being undertaken.

A net benefit approach is used whereby an indicator is considered cost effective when net benefit is greater than zero for any given level of achievement and available QOF points:

$$\text{Net benefit} = \text{monetised benefit} - \text{delivery cost} - \text{QOF payment.}$$

For this indicator, the net benefit analysis is applied with a lifetime horizon at baseline.

The objective is to evaluate whether the proposed indicator represents a cost effective use of NHS resources. This report provides the QOF Advisory Committee with information on whether the indicator is economically justifiable, and will inform the Committee's decision making on recommendations about the indicator.

¹ The wording of the indicator during piloting was "The percentage of patients under 80 with coronary heart disease in whom the last blood pressure reading (measured in the preceding 15 months) is 140/90 or less". The change in the indicator wording was agreed at the NICE QOF Advisory Committee and does not affect the results of the cost effectiveness analysis.

Economic Rationale for the Indicator

People with blood pressure persistently over 140/90mmHg are defined as being hypertensive. Above a blood pressure of 115/70mmHg the risk of cardiovascular events doubles for every 20/10mmHg rise in blood pressure, as well as risking other poor health outcomes such as kidney disease and cognitive decline [1].

Pharmaceutical treatment to lower blood pressure in hypertensive patients has been found to be highly cost effective given the low cost of anti-hypertensive drugs and high cost of health outcomes that they can avert. Any of the main classes of drugs to treat hypertension have been found to be both cost saving and to be more effective (generating more QALYs), than no intervention [1].

No NICE guidelines exist explicitly on the management of CHD although guidance exists on angina and myocardial infarction, both of which state that patients with these conditions should have their blood pressure managed in line with the published hypertension guidelines [1]. In the absence of evidence to the contrary and for the purpose of adopting a conservative estimate of the delivery costs for the indicator, it has been assumed that all people with CHD also have hypertension.

NICE guidelines are explicit that there is no robust evidence that monitoring blood pressure to reduce it to a target – such as 140/90 - in hypertensive patients is cost effective [2]. However, this is largely due to a lack of evidence rather than evidence that the intervention does not work. For the purposes of modelling it has been assumed that the indicator is designed to lower blood pressure and that by definition hypertensive patients with BP less than 140/90 must have had high blood pressure successfully lowered. The evidence underpinning the NICE guidelines is that lowering blood pressure in hypertensive patients is highly cost effective with an implicit conclusion that this is the case even if the patient remains clinically hypertensive.

The Committee recommended staged/linked indicators for this disease area. This indicator forms one of a pair and will require implementation alongside current QOF indicator CHD002. Negotiators need to be clear on the rationale for this and ensure retention and implementation of these indicators together.

Summary of assumptions

- It is assumed that all people with CHD also have hypertension, for the purpose of a conservative estimate;
- The indicator is designed to lower blood pressure;
- Hypertensive patients with BP less than 140/90mmHg must have had high blood pressure successfully lowered.

Evidence on Delivery Cost of the Indicator

As the NICE guidance on angina and myocardial infarction suggest patients should be treated in line with the hypertension guidelines this has been used as the basis for costing the intervention associated with the indicator.

The NICE guidelines on hypertension recommend both lifestyle modification and pharmaceutical interventions to lower blood pressure in hypertensive patients [2]. The guidelines point out evidence for the effectiveness of lifestyle modification, such as increasing exercise. The costs of such advice and support are generally minimal, although help to stop smoking could involve smoking cessation aids that could have a cost. At the base case it has therefore been assumed that advice can be given as part of a GP consultation that lasts 17.2 minutes at a cost of £63 [3]. The total costs used in the model have been increased by £500 per patient to reflect the costs of other interventions such as smoking cessation drug therapy, which has been costed at £1,000 per successful quitter [4]. The £500 cost uses the assumption that 50% of people with hypertension smoke and that all of them will use pharmaceutical support to quit. This is likely to be a significant overestimate of the actual costs of delivering lifestyle interventions but will generate conservative estimates from the model. The estimate is intended to provide a proxy cost for the indicator to reflect the costs of lifestyle modification required for people with stroke and hypertension. It is used flexibly in the economic modelling through the use of sensitivity analysis.

Economic modelling underpinning the NICE hypertension guidance reported that for men aged 65, with a greater than 20% chance of cardiovascular disease (CVD) over 10 years, all pharmaceutical treatments saved healthcare resource and increased

the number of QALYs. This finding was found to be reasonably robust as the risk of CVD and age changed, for both men and women. Given the heterogeneity of the hypertensive population, to produce a conservative estimate it has been assumed that there is no cost saving from pharmaceutical treatment.

However, this modelling is for patients that do not already have CHD or CVD. For patients with existing CHD no modelling was identified that demonstrated potential cost savings. As such it has been assumed that there are no cost savings from treating patients with CHD with anti-hypertensive medication and the drug costs (a maximum of £25 per year per patient for generic drugs of all classes) is added to the overall costs per patient [2].

Baseline costs

- The baseline costs are based on the NICE hypertension guideline and it has been assumed that this applied to people with hypertension and CHD;
- The incremental cost of providing lifestyle modification advice and support and pharmaceutical treatment at baseline is £588 per patient.

Evidence on the Benefits of the Indicator

There is evidence that lifestyle modification including reduction in alcohol consumption, salt intake and smoking, and increases in exercise all reduce blood pressure in patients with hypertension [2]. This reduction in blood pressure would reduce the risk of CVD events and therefore would also increase QALYs. However, no evidence was found by NICE, linking lifestyle modification to QALY gains, as part of their evidence gathering for the hypertension guidelines. For the purposes of modelling it has therefore been assumed that no QALY gains are generated from lifestyle modification. This is a conservative assumption, especially as costs to provide advice and support for lifestyle modification have been assumed in the modelling.

QALY gains from the use of anti-hypertensive medications are drawn from modelling in the NICE hypertension guidelines [1]. QALY gains vary between drugs in the model. As a conservative estimate we have therefore assumed that the lowest lifetime QALY gain is used (0.32 for beta-blockers). However, this is based on lifetime compliance with treatment. The NICE guidelines noted that compliance can be as low as 20%, for all hypertensive patients. A separate study published study on adherence of hypertensive medication compliance in those with CHD found compliance rates in these patients to be 40% [5].

This increase in compliance needs to be weighted against lower quality of life in patients with existing CHD compared to those without CHD, coupled with likely lower life expectancy. For simplicity, and to maintain a conservative estimate, it has therefore been assumed that any gain in utility from increased compliance is offset in patients with CHD over non-CHD patients by lower current quality of life and life expectancy. The QALY gain was therefore assumed to be the same for hypertensive patients with CHD and those without CHD.

This gives a QALY gain for people with CHD and hypertension taking medication for the condition of 0.064 ($0.32 \times 20\%$). Due to the uncertainty around potential QALY gains sensitivity analysis was used to explore how the results differed as QALY gains were varied by 50% more and 50% less than the baseline.

The baseline can be seen as a conservative estimate as the indicator itself is designed to ensure that patients' blood pressure is lowered, which would encourage GPs to ensure compliance with medication. It is also conservative because the assumed QALY gain is based on any reduction in blood pressure as a result of treatment rather than a specific reduction below a level of 140/90.

Baseline benefits

- To maintain a conservative approach it has been assumed that there are no benefits gained from lifestyle interventions and the lowest reported QALY gain for the benefits from pharmaceutical intervention has been used in modelling;
- People with CHD have a lower quality of life and life expectancy than those without CHD. Therefore, while they may have increased levels of compliance with anti-hypertensive medication this has been assumed to be offset by poorer quality of life in modelling;
- The incremental lifetime baseline QALY gain for treatment of CHD patients to a BP of 140/90 with drug therapy is 0.064.

Eligible Population

The eligible population is all patients aged under 80 with coronary heart disease. The British Heart Foundation reported a survey from 2006 that found that 6.3% of those over 16 and under 75 have CHD [6]. Whilst not explicitly for those under 80, this rate was applied to population statistics from the ONS that estimate 76.5% of the UK population is aged between 16 and 79 [7]. Combining these two statistics suggests that 4.8% of an average practice population will be under 80 and have CHD.

Baseline Level of Achievement

Pilot 7 data showed the indicator was achieved for 76.93% of eligible patients at the beginning of the pilot, falling to 62.03% at its conclusion. This fall is surprising and whilst will be discussed elsewhere the points awarded and whether they are sufficient to incentivise GP activity should be considered in light of this. A baseline level of achievement of 76.93% has been assumed for this indicator.

Population

In the base case, the economic analysis was based on the total population registered with practices in England, that is, 8,316 practices with a mean practice size of 6,386 [8].

Table 1: Practice information for UK countries, 2011

Country	Number of practices	Number of patients
England	8,316	6,386
Scotland	1,002	5,245
Wales	483	6,344
Northern Ireland	353	5,119

NB: This practice information has been updated since the appendices were drafted. The changes are marginal and do not affect the conclusions in the report.

QOF Payments

Each QOF point is assumed to result in a payment of £156.92. This is the average value per point in England during 2013/14 (source; NHS Employers).

Societal Value of a QALY

The expected increase in QALYs was costed at both £20,000 and £25,000 per QALY. This is based on the bottom and the middle of the range £20,000 to £30,000, below which NICE generally considers something to be cost effective.

QOF Points

The economic analysis considers the cost-effectiveness of incentivising the proposed activity over a range of QOF points.

In the base case analysis, 15 points were allocated to the proposed indicator. This reflects the 17 points allocated to the previous similar CHD hypertension indicator (CHD6) and the fact that there is potential to achieve other points for the same patient due to the points on offer for hypertension, peripheral arterial disease and stroke indicators. Sensitivity analysis explored the agreed lower and upper bounds of 10 and 20 points respectively.

Thresholds

The pilot 7 GP practices showed baseline performance of between 65 and 90% and this range was adopted for the thresholds.

Results (assuming a value per QALY of £25,000)

Under the baseline assumptions of incremental delivery cost (£588), incremental benefit (0.064 QALYs with a value of £25,000 per QALY) and eligible population (4.8%), the net benefit analysis suggests that the indicator is highly cost effective, with QOF payments up to the upper bound of 20 points justifiable on economic grounds (Appendix A). The benefits of treating people with CHD and hypertension with medication outweigh the cost of delivering this care and the cost of QOF achievement payments. This finding holds provided that achievement rises from the hypertension pilot baseline figure of 76.9% to 77.0% at 15 points.

The indicator only ceases to be justifiable at baseline and 90% achievement on economic grounds at 254 points or when the value per QALY falls to £10,118. This is relevant given the potential for multiple points being awarded across the hypertension indicators proposed for achieving the BP target for a single patient.

Findings are highly insensitive to a 50% increase in costs (Appendix B), a 50% reduction in QALYs generated from anti-hypertensive medication (Appendix C) or a 50% reduction in the eligible population (Appendix D).

The indicator could no longer be recommended at 15 points with 90% achievement if:

- The cost of the intervention were to rise 162% to £1,540 for each patient with CHD;
- The QALYs generated from hypertensive medication were to fall by 59% to 0.026 QALYs per treated patient;
- The eligible population was to fall by 93% to 0.3%.

If the assumptions underpinning this analysis hold, then due to the potential size of the eligible population and the relatively low cost of the intervention compared to

potential quality of life gains, there is a strong economic case for the indicator at a baseline of 15 points and up to the maximum QOF points appropriate for this indicator, i.e. 20 points.

Results (assuming a value per QALY of £20,000)

Under the baseline assumptions of incremental delivery cost (£588), incremental benefit (0.064 QALYs with a value of £20,000 per QALY) and eligible population (4.8%), the net benefit analysis suggests that the indicator is highly cost effective, with QOF payments up to the upper bound of 20 points justifiable on economic grounds (Appendix A). The benefits of treating people with CHD and hypertension with medication outweigh the cost of delivering this care and the cost of QOF achievement payments. This finding holds provided that achievement rises from the hypertension pilot baseline figure of 76.9% to 77.5% at 15 points.

The indicator only ceases to be justifiable at baseline and 90% achievement on economic grounds at 174 points or when the value per QALY falls to £10,118. This is relevant given the potential for multiple points being awarded across the hypertension indicators proposed for achieving the BP target for a single patient.

Findings are highly insensitive to a 50% increase in costs (Appendix B) or a 50% reduction in the eligible population (Appendix D). The findings at 15 points are somewhat sensitive to a 50% reduction in QALYs generated from anti-hypertensive medication (Appendix C) with the indicator no longer being recommended at 15 points but still being cost effective at 13 points.

The indicator could no longer be recommended at 15 points with 90% achievement if:

- The cost of the intervention were to rise 107% to £1,220 for each patient with CHD;
- The QALYs generated from hypertensive medication were to fall by 49% to 0.0323 QALYs per treated patient;
- The eligible population was to fall by 92% to 0.4%.

If the assumptions underpinning this analysis hold, then due to the potential size of the eligible population and the relatively low cost of the intervention compared to potential quality of life gains, there is a strong economic case for the indicator at a baseline of 15 points and up to the maximum QOF points appropriate for this indicator, i.e. 20 points.

Discussion

Under the conservative baseline assumptions and the even more conservative sensitivity analysis it appears unambiguous that this indicator is highly cost effective.

However, this finding must be understood in the context that the modelling is based upon the NICE hypertension economic model that was for patients without CHD.

The transferability of this model to this indicator is dependent on a number of assumptions:

- Hypertensive medications are as effective for those with patients CHD as for those without CHD at reducing blood pressure;
- The health benefits from reducing blood pressure in patients with CHD is comparable to those without CHD;
- QALY gains from health benefits from drug treatment for hypertension are comparable for patients with and without CHD;
- Everyone with CHD also has hypertension and that anyone with low blood pressure has had it reduced through interventions.

The last of these assumptions was accounted for in modelling by assuming that although compliance with medication is reported to be twice as high in patients with CHD as those without CHD (meaning a potential doubling of the potential QALY benefit to patients with CHD), this was negated by reduced life expectancy and underlying utility of patients with CHD.

It must also be noted that treating hypertension to a target has not been modelled as no data were available to do this. However, we are confident that the approach we have taken indicates that the indicator is highly cost effective, on the basis that

treatment of high blood pressure is relatively cheap (now that generic drugs are available) and the potential health benefits are so great. It is cost-effective to use medication and smoking cessation interventions to achieve better blood pressure outcomes for this population.

Finally, although there could be double counting of points across hypertension indicators on the same patients the large number of points that can be awarded to achieve target blood pressure suggests that this double counting does not stop the indicator being cost effective.

References

- [1] National Clinical Guideline Centre. The clinical management of primary hypertension in adults. London: Royal College of Physicians, 2011
- [2] National Institute for Health and Clinical Excellence. Hypertension: Clinical management of primary hypertension in adults. 2011
- [3] Unit Costs of Health & Social Care 2011. Personal Social Services Research Unit (PSSRU). Compiled by Lesley Curtis. University of Kent.
- [4] Woolacott NF, Jones L, Forbes CA et al. The clinical effectiveness and cost effectiveness of bupropion and nicotine replacement therapy for smoking cessation: a systematic review and economic evaluation. Health Technol Assess 2002
- [5] Newby LK, Lapointe NMA, Chen AY, Kramer JM et al; Long-term adherence to evidence based secondary prevention therapies in coronary artery disease. Circulation. 2006; 113:203-212
- [6] Townsend N, Wickramasinghe K, Bhatnagar P, Smolina K, Nichols M, Leal J, Luengo-Fernandez R, Rayner M (2012). Coronary heart disease statistics 2012 edition
- [7] See <http://www.neighbourhood.statistics.gov.uk/HTMLDocs/dvc1/UKPyramid.htm>
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- [8] General Practice Trends in the UK. NHS Information Centre. Published 23 January 2013.

Appendix D: Net Benefit Base Case Analysis Assuming 50% Reduction in Eligible Population (£25k/QALY)

Pilot 7 - CHD and Hypertension Under 80: Net Benefit Analysis

Value per point achieved	£156.92	Societal value of a QALY	£25,000
Number of practices	8,228		
Mean practice population	6,297		
Minimum threshold	65%	Baseline achievement	
Maximum threshold	90%	Eligible population (mean % of practice population)	2.4%
		Baseline achievement (mean % of eligible patients)	76.9%
		Cost-effectiveness estimates	
		Incremental cost (£ per patient)	£588
		Incremental effect (QALYs per patient)	0.064

Points	10	11	12	13	14	15	16	17	18	19	20
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National totals															
Expected Achievement	QOF payments (£000s)											Change in treatment cost (£)	Change in QALYs		
	30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0			£0	£0
35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£306,578,296	-33369
40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£270,019,950	-29390
45%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£233,461,603	-25411
50%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£196,903,256	-21432
55%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£160,344,909	-17453
60%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£123,786,562	-13473
65%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£87,228,215	-9494
70%	£2,582	£2,841	£3,099	£3,357	£3,615	£3,873	£4,132	£4,390	£4,648	£4,906	£5,165	£5,424	£5,682	-£50,669,869	-5515
75%	£5,165	£5,681	£6,197	£6,714	£7,230	£7,747	£8,263	£8,780	£9,296	£9,813	£10,329	£10,846	£11,362	-£14,111,522	-1536
80%	£7,747	£8,522	£9,296	£10,071	£10,846	£11,620	£12,395	£13,170	£13,944	£14,719	£15,494	£16,268	£17,043	£22,446,825	2443
85%	£10,329	£11,362	£12,395	£13,428	£14,461	£15,494	£16,527	£17,559	£18,592	£19,625	£20,658	£21,691	£22,724	£59,005,172	6422
90%	£12,911	£14,203	£15,494	£16,785	£18,076	£19,367	£20,658	£21,949	£23,240	£24,532	£25,823	£27,114	£28,405	£95,563,519	10401
95%	£12,911	£14,203	£15,494	£16,785	£18,076	£19,367	£20,658	£21,949	£23,240	£24,532	£25,823	£27,114	£28,405	£132,121,865	14381
100%	£12,911	£14,203	£15,494	£16,785	£18,076	£19,367	£20,658	£21,949	£23,240	£24,532	£25,823	£27,114	£28,405	£168,680,212	18360

Net Benefit (£000s)															
30%	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569	-£590,569
35%	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648	-£527,648
40%	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728	-£464,728
45%	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808	-£401,808
50%	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888	-£338,888
55%	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968	-£275,968
60%	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048	-£213,048
65%	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127	-£150,127
70%	-£89,790	-£90,048	-£90,306	-£90,564	-£90,823	-£91,081	-£91,339	-£91,597	-£91,855	-£92,114	-£92,372	-£92,630	-£92,888	-£92,372	-£92,372
75%	-£29,452	-£29,968	-£30,485	-£31,001	-£31,518	-£32,034	-£32,550	-£33,067	-£33,583	-£34,100	-£34,616	-£35,133	-£35,649	-£34,616	-£34,616
80%	£30,886	£30,111	£29,337	£28,562	£27,787	£27,013	£26,238	£25,463	£24,689	£23,914	£23,139	£22,364	£21,589	£23,139	£23,139
85%	£91,224	£90,191	£89,158	£88,125	£87,092	£86,059	£85,027	£83,994	£82,961	£81,928	£80,895	£79,862	£78,829	£80,895	£80,895
90%	£151,562	£150,271	£148,980	£147,688	£146,397	£145,106	£143,815	£142,524	£141,233	£139,942	£138,651	£137,360	£136,069	£138,651	£138,651
95%	£214,482	£213,191	£211,900	£210,609	£209,317	£208,026	£206,735	£205,444	£204,153	£202,862	£201,571	£200,280	£198,989	£201,571	£201,571
100%	£277,402	£276,111	£274,820	£273,529	£272,238	£270,946	£269,655	£268,364	£267,073	£265,782	£264,491	£263,200	£261,909	£264,491	£264,491

Where the net benefit produces a non-negative outcome then it is **cost effective** for the NHS to adopt the indicator.

When this is the case, the cells are highlighted with a yellow background.

