Long-term outcomes after a structured hypertension education programme for patients with diabetes and hypertension

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Abstract

A structured hypertension treatment and education programme (HTEP) was developed in the Düsseldorf area in the 1990s for patients with diabetes mellitus and hypertension and was found to be effective in a randomised controlled trial. The German Association of Diabetes Education and Counselling Professions (VDBD) implemented the HTEP all over Germany in order to optimise the care of patients with diabetes and hypertension. The objectives of the HTEP are to enable patients to gain knowledge of hypertension, to participate actively in their treatment to improve blood pressure (BP) and metabolic control and to self-measure their BP.

The implementation consisted of two stages. The first stage comprised the training of 312 diabetes counsellors (DCs). During the second stage 473 patients with type 1 or type 2 diabetes and hypertension in 35 diabetes centres throughout Germany received the HTEP including instructions in BP self-measurement. The HTEP consists of four units each one with a duration of 90 minutes covering the topics: hypertension, BP self-monitoring according to the standards of the German Hypertension League, antihypertensive medication including effects and side effects, recommendations to moderate exercise, weight reduction, dietary advice with reference to reduction of salt and alcohol and normalising the intake of protein. These patients participated in a prospective non-experimental study with a follow up of three years investigating the long-term outcomes of the HTEP in uncontrolled settings. The DCs assessed the accuracy of patients' self-monitoring by parallel measurement. Assessments included questionnaires evaluating patients' understanding of hypertension and metabolic control.

The mean BP monitored by the DC fell from 150/85mmHg to 147/80mmHg ($p<0.0001$). The accuracy of self-measurements increased from 76% to 86% ($p<0.005$) and mean self-measurement readings decreased from 142/81mmHg to 139/78mmHg. HbA_{1c} fell significantly from 7.9±1.6% to 7.3±1.1% (mean ± SD, $p<0.001$) and total cholesterol was lowered from 241±67.1mg/dl to 200±40.4mg/dl ($p<0.001$). Patients' knowledge of hypertension increased from 62% before the intervention to 72% after three years' follow up. Patients over 70 years showed less knowledge than younger patients ($p<0.005$).

It was concluded that the HTEP is effective in improving BP, metabolic control and knowledge of hypertension. It enables patients to measure their BP precisely and regularly. Copyright © 2005 FEND.

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Key words

diabetes mellitus; hypertension; patient education; blood pressure self-measurement

Introduction

According to several studies[1–6] optimal blood pressure (BP) and metabolic control are extremely important for the prevention and progression of long-term complications in patients with type 1 or type 2 diabetes mellitus. In addition to medication, international evidence-based guidelines recommend patient education, weight reduction, regular moderate exercise, dietary advice, reduction of salt and protein, alcohol restriction, smoking cessation, and BP monitoring, as well as assessments of metabolic control and microalbuminuria for effective treatment of patients with diabetes and hypertension.[7–15]

A structured hypertension treatment and education programme (HTEP) for patients with diabetes was developed in Germany in the 1990s and shown to be effective.[16,17] The HTEP is in line with national and international guidelines and includes additional patient instruction for BP self-measurement. The HTEP was initially offered to patients in the Düsseldorf area. The rest of Germany was covered when the German Association of Diabetes Education and Counselling Professions (VDBD) implemented the HTEP nationally with the aim of optimising the care of patients with diabetes and hypertension. The objectives of the HTEP are to

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enable patients to gain knowledge of hypertension, to participate actively in their treatment, to improve BP control and to self-monitor their BP.

Methods and patients

The HTEP was implemented within the RR Adjusting Selfcontrol Contra Hypertension (RRASCH) Project of the VDBD – a two stage process. In stage one, 312 diabetes counsellors (DCs) – nurses and dietitians who had undergone further training – were trained in HTEP and received specific instructions and guidelines for implementing the programme in 50 diabetes centres (hospitals and practices). The next stage, the RRASCH Study, was the consecutive recruitment of 473 patients with type 1 or type 2 diabetes and hypertension in 35 diabetes centres throughout Germany in order to implement the HTEP. The dependence on the number of DCs in the study centres as well as the size of the diabetes centres did not allow the recruitment of similar numbers of patients in each centre. During the RRASCH Study the outcomes of disease-related knowledge of hypertension, metabolic control, and BP self-monitoring were assessed before the HTEP, immediately following the programme and then annually within the three-year follow-up period (Figure 1).

Since the HTEP had already been found to be effective in a randomised controlled trial, a study design without a control group was chosen. For ethical reasons it was not intended to withhold patients' effective treatment and, due to the multimorbidity of the participants, a controlled waiting list seemed to be inappropriate. The study design fits well into the 'framework for design and evaluation of complex interventions' suggested by Campbell *et al.*[18] This framework consists of five phases: (1) exploring a theory; (2) modelling the components of the intervention; (3) exploratory trial; (4) randomised controlled trial; and (5) long-term implementation of the intervention in uncontrolled settings. The RRASCH Study represents the last phase of Campbell's framework investigating the long-term outcomes of the HTEP in uncontrolled settings.

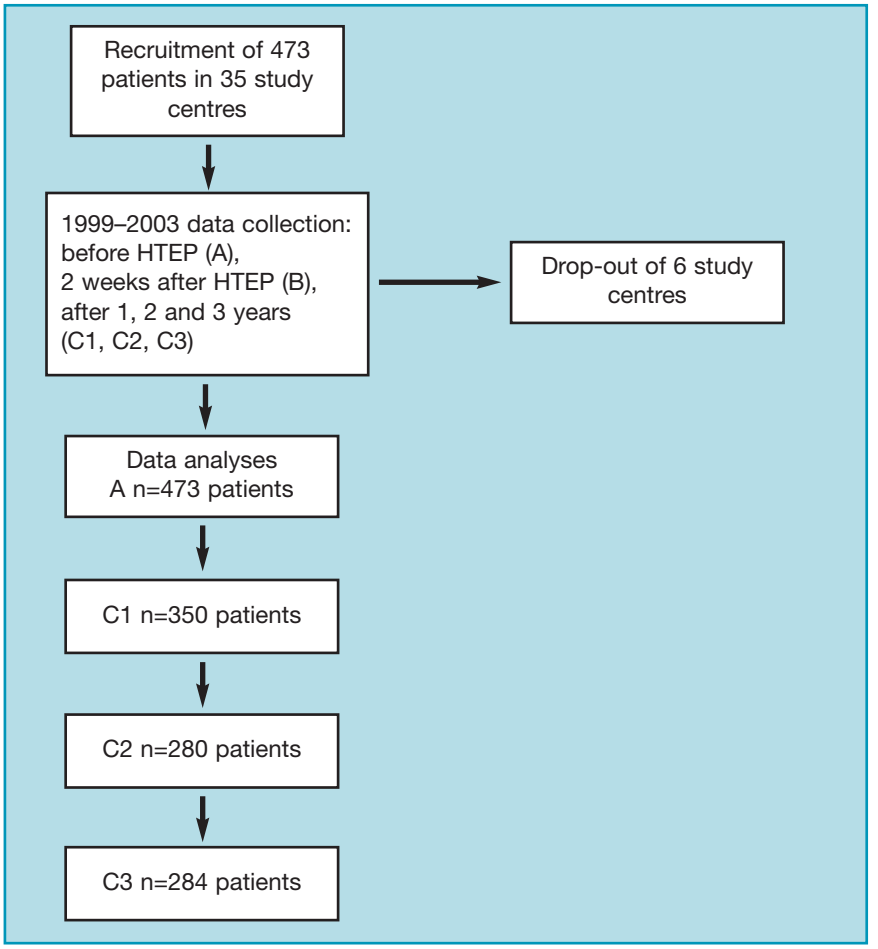

Figure 1. The RRASCH Study: hypertension treatment and education programme (HTEP) flowchart

In all, 473 patients were recruited in 35 of 50 initially selected diabetes centres all over Germany (hospitals [47%] and practices [53%] in urban and rural areas). Six centres dropped out of the study. Inclusion criteria incorporated the following: adults diagnosed with diabetes (type 1 and 2) and hypertension (BP >140/80mmHg). At baseline the sample consisted of approximately 50% women and 50% men with a mean age of 59 years. Patients' characteristics are shown in Table 1. Seventy-eight patients (16.5%) had already experienced a cardiovascular event and 21% showed increased serum creatinine levels. All patients provided written informed consent. The protocol was in accordance with the recommendations of the International Conference on Harmonization – Good Clinical Practice (ICH–GCP)[19] and approved by the ethics committee of the Heinrich Heine University, Düsseldorf.

The RRASCH Study: protocol

We undertook a non-experimental prospective study with a three-year follow up. All patients received the

Parameter	Type 1 diabetes (n=87)	Type 2 diabetes (n=386)
Women, n (%)	41 (47)	196 (51)
Age (years)	48.2±11.4	60.3±9.8
Duration of diagnosed diabetes (years)	22.4±14.4	10.0±9.2
Duration of diagnosed hypertension (years)	8.3±8.7	10.5±10.2
HbA_{1c}, %	7.6±1.5	8.0±1.6
Body mass index (kg/m^2)	27.0±6.1	30.8±5.0
Data are mean ± SD		

Table 1. Patient characteristics

HTEP during or after diabetes education. The HTEP was conducted in hospitals and out-patient clinics (53%) in groups of two to 10 participants. The HTEP consisted of four units, each one of a duration of 90–120 minutes with intervals of no more than two weeks between the units. The HTEP addressed the following topics: hypertension and complications, BP self-monitoring, antihypertensive medication including adjustment of medication in case of deviation from target BP values, weight reduction, salt and protein reduced diet, smoking cessation and alcohol restriction. All components of the programme were provided by the DC except the unit dealing with antihypertensive medication which was undertaken by the diabetologist. The DCs used the same curriculum and identical materials. The same type of device was used by the patients at home as well as in diabetes service centres. Since the HTEP was not reimbursed by the health insurance companies most of the education was done by the health care professionals during their free time.

Office BP was measured according to the recommendations of Perloff *et al.* and the WHO.[20,21] Patients' BP was assessed using a sphygmomanometer with integrated stethoscope. All devices had been validated by the Bureau of Standards (as legally requested in Germany for all BP measurement devices). At the beginning of the study these devices were the standard in Germany; digital devices were too expensive and therefore not available. Measurements were taken after 10 minutes' rest in a sitting position and repeated three times at five-minute intervals. Office BP readings represented the average of the second and third readings and were documented in 2mmHg increments.

The DC instructed all patients in correct BP self-measurement including exact cuff positioning. Patients were asked to measure BP at home every morning and every evening before taking their antihypertensive medication. Patients received written information about BP self-measurement and were advised to document readings in a patient diary. During follow-up visits the DC stressed the importance of patients measuring their BP themselves and documented the patients' readings as the average of the last 10 home readings. Parallel assessments of patient self-measurement and office measurement were performed during the follow-up visits to assess the patient's technique.

Data were collected during the five visits included in the three-year follow up as follows.

- A = One day before HTEP.
- B = One to two days after HTEP.
- C1 = 11–13 months after HTEP.
- C2 = 22–26 months after HTEP.
- C3 = 36–38 months after HTEP.

During visits (A–C3) patients filled out a standardised 17-item questionnaire addressing correct self-measurement, knowledge of diabetes, effects and side effects of antihypertensive medication, lifestyle modification, and dietary advice to assess their knowledge of hypertension. Further assessments included: office BP, patient self-measurement of BP, weight, smoking, diet, HbA_{1c}, lipids, serum creatinine, microalbuminuria, and cardiovascular events.

Data analyses were performed with Statistical Package for Social Science 12.0 (SPSS). Results are reported as means ± SD. Inferential statistics included non-parametric tests of differences with the chi-squared test and comparison of independent variables with the Student's t-test. The correlation coefficient was calculated using the Pearson method. A p level of <0.05 was considered statistically significant. Analyses of data from 300 patients were projected in order to have enough statistical power.

Results

Three years after implementing the HTEP, complete data from assessments (A–C3) of 284 (60%) patients were analysed. Four patients did complete follow-up C3 but not C2, therefore the number of patients increased from C2 to C3. Forty-eight patients dropped out because six diabetes service centres withdrew due to lack of staff, time and support from the medical profession. Forty-five patients withdrew due to long-term complications (stroke, heart attack, dialysis), 10 patients died, 21 were no longer interested, and 54 gave no reason for stopping. Patient drop-out referred to all study centres and no

special centre effect was seen during the study. Analysis showed that more patients with type 2 diabetes (45%) dropped out than patients with type 1 (p<0.001). Patients who dropped out did not differ significantly from other participants except with respect to duration of diabetes and morbidity. Patients stopping participation were more likely to have a shorter duration of diabetes (mean 10.6 *vs* 13.9 years; p<0.003) and to suffer from long-term complications than patients who completed follow up (Table 2).

Variables	Complete follow-up (n=284)	Drop-out (n=189)	p value
Age, years	57.9±10.4	58.4±12.0	0.643
Duration of diagnosed diabetes, years	13.9±12.2	10.6±10.2	0.003
Duration of diagnosed hypertension, years	9.7±9.4	10.6±10.7	0.404
BMI, kg/m^2	29.8±5.6	30.4±5.2	0.227
HbA_{1c}, %	7.8±1.6	8.0±1.6	0.206
Serum creatinine, mg/dl	0.96±0.33	1.01±0.37	0.182
Systolic BP, mmHg	150.3±19.9	151.4±20.8	0.551
Diastolic BP, mmHg	84.5±10.8	85.3±11.5	0.452
Data are mean ± SD			

Table 2. Characteristics of patients who dropped out compared with those who completed the study

Diabetes mellitus	A	B	C1	C2	C3
Type 1	n=87	n=83	n=76	n=73	n=66
Systolic	146.5±18.7	140.6±16.8	138.0±17.4	140.4±19.7	141.3±20.7
Diastolic	86.1±10.9	82.2±9,8	79.7± 9.6	78.7±10.4	78.3±12.0
Type 2	n=371	n=370	n=281	n=231	n=205
Systolic	151.6±20.5	146.0±17.6	149.7±19.5	150.8±20.1	148.9±19.0
Diastolic	84.6±11.1	82.5±9.5	82.9±10.7	82.0±10.1	81.5±11.3
Types 1 & 2	n=449	n=453	n=357	n=304	n=271
Systolic	150.8±20.3	145.0±17.6	147.2±19.6	148.3±20.4	147.0±19.7
Diastolic	84.9±11.1	82.5±9.5	82.2±10.6	81.2±10.3	80.7±11.5
Data are mean ± SD					

Table 3. Blood pressure measured by the diabetes counsellor

Blood pressure

The mean BP monitored by the DC was reduced from 150/85mmHg to 147/80mmHg (95% CI 1.35–3.3 systolic; 1.9–4.8 diastolic; p<0.0001). In type 2 patients BP decreased from 151 to 149mmHg systolic and from 85 to 82mmHg diastolic. Patients with type 1 diabetes showed BP reductions before and after three years' intervention from 146 to 141mmHg systolic and from 86 to 78mmHg diastolic (Table 3).

Blood pressure self-measurement

BP self-measurement accuracy increased from 76% to 86% during the three years after the education programme took place (p<0.005). Patients improved accuracy of BP self-measurement and only 36 (14%) failed to measure their BP correctly – mainly using the wrong position for arm (48%) and/or cuff (39%).

Three years after the education programme patients still measured BP nine times in seven days.

Seventy-five percent of doctors checked the patients' diaries, 15% had to be reminded by the patients and 10% of doctors never checked the patients' readings. The mean self-measurement readings decreased from 141.8/81.1mmHg immediately after the HTEP to 139.6/77.7mmHg after three years (Table 4).

Metabolic control

Metabolic control improved significantly. HbA_{1c} at baseline decreased from 7.9±1.6% to 7.3±1.1% (mean ± SD, p<0.001). Lipid values improved significantly with total cholesterol reduced from 241±67.1mg/dl to 200±40.4mg/dl (p<0.001); Figure 2.

Knowledge about hypertension

One year after participation in the HTEP, 78% of patients answered questions on hypertension correctly. After three years, 72% of the answers were still correct. Patients >70 years had significantly lower levels of knowledge than younger ones (p<0.001 to p<0.022, Figure 3). However, with respect to the change of knowledge over three years there was almost no difference between older and younger patients.

Patients' responses to deviation in blood pressure readings

Analyses of the questionnaires showed that only 2.2% of patients adjusted prescribed medication themselves. Adjusting medication independently will be a long process because the doctor has to be asked and patients need support to be sufficiently confident. Ninety-eight percent of the patients conferred with their doctor when BP

Diabetes mellitus		B	C1	C2	C3
Type 1	Systolic	135.±14.8	132.9±12.9	132.0±11.8	132.3±12.7
	Diastolic	79.2±10.0	78,7±8.5	76.5±8.1	76.2±9.8
Type 2	Systolic	143.3±14.8	142.3±14.7	142.6±12.1	141.8±13.5
	Diastolic	81.5±9.4	79.6±9.4	78.9±9.3	78.1±9.4
Types 1 & 2	Systolic	141.8±15.1	140.2±14.8	140.2±12.8	139.6±13.9
	Diastolic	81.1±9.6	79.4±9.2	78.3±9.1	77.7±9.5
Data are mean ± SD					

Table 4. Blood pressure self-measurement

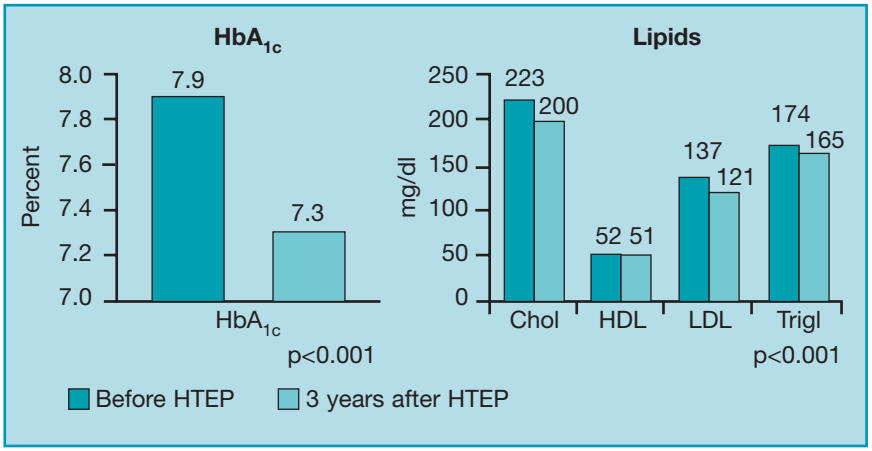

Figure 2. Metabolic control before and three years after HTEP

readings differed from target values (Table 4).

Discussion

The aim of the HTEP was to improve BP and metabolic control as well as to enhance diabetic patients' knowledge of hypertension and to enable them accurately to self-monitor BP.

The defined target levels in Germany at the beginning of the RRASCH Study were <140/90mmHg.[21] With a mean BP reduction from 150/85mmHg to 147/80mmHg patients achieved the diastolic but not the systolic target levels. The interesting effect of diastolic reduction, which is usually more difficult to achieve, might be the result of emphasising the importance of diastolic BP reduction during the programme and might have made the patients more aware of taking medication. Systolic BP readings were still lower than in the tightly treated group of the UK Prospective Diabetes Study (UKPDS).[2] Patients in the UKPDS received antihypertensive medication under controlled conditions whereas our participants were treated by their GP who prescribed the medication.

Our patients showed comparable or even better results than those of other randomised controlled trials in Great Britain and Finland[22,23] and are in line with the outcome of a meta-analysis done by Boulware *et al.*[24] In contrast, patients of other randomised controlled trials achieved significantly higher systolic BP reduction.[25–27] The reasons for the better results might be due to follow up after six months,[25] shorter intervals between visits and individual counselling (monthly to every three months).[26] The higher BP reduction of patients with type 1 diabetes can probably be explained by the development of secondary hypertension in those patients. BP levels in type 1 diabetes are normally initially lower and can be better controlled than essential hypertension in patients with type 2 diabetes.[2–6]

Instructing patients in BP self-measurement was successful. Three years later, the HTEP patients measured their BP regularly and precisely. During the follow-up visits and discussions with the DCs, patients stated that they were so involved in their diabetes that measuring blood glucose and injecting insulin took first priority. This could be the reason why patients only measured their BP nine times in seven days on average instead of the recommended twice daily.

The patients' self-measurement readings decreased from 142/81mmHg to 139/78mmHg. The white coat effect is evident as described by Weisser *et al.*[28] and Staessen *et al.*[29] who defined target levels of home BP readings between 124/80 and 135/87mmHg. Thus, the patients in our study reached the diastolic but not the systolic target levels. Patient self-measurement of BP is necessary to identify deviations from clinical BP measurement as suggested by Bobrie *et al.*[30] The results may be limited because they are based on patients' statements; however, the DCs confirmed the high accuracy of patient self-measurements during follow up. Only some of the patients felt sufficiently confident to adjust their medication according to their BP readings, which may be due to complex drug treatment.

Metabolic control improved significantly; the reduction in HbA_{1c} and lipids is comparable to the outcomes of the Steno-2 Study.[26] The

patients in the RRASCH Study achieved the HbA_{1c} target level of <7.5% which has been defined since the results of the Diabetes Control and Complications Trial/UKPDS[1,2] in Germany.

Retaining high-level knowledge of hypertension after the HTEP may be a result of annual follow-up visits where problems were discussed and many questions were answered by the DCs. Analyses showed that the level of disease-related knowledge remained lower in patients over 70 than in younger patients, although older patients gained slightly more knowledge.

This study has several limitations which need to be discussed. The non-experimental design lacks randomisation and a control group. However, the RRASCH Study focused on the long-term outcomes that HTEP produced in uncontrolled settings. The European Union Council[31] recommends that randomised controlled trials should not have priority to be considered in guidelines because they do not reflect everyday life.

The high drop-out rate of 189 patients (39.9%) is a further limitation. The drop-out of six study centres was the result of the German Health Care Legislation aiming at the reduction of increasing costs. Patient drop-out during follow up may be due to the longitudinal design and the high co-morbidity of participants suffering from additional severe diseases. At baseline, 21% of the patients had increased serum creatinine levels and 16.5% had experienced a cardiovascular event in the past which reflects the reality in diabetes patient education in Germany. Already developed angiopathies are not reversible and the progression of long-term complications cannot be delayed merely by education and effective treatment.

People change over time and it is difficult to determine which effects occurred due to the intervention. Patients answered questions retrospectively and the self-selection of patients could be subject to bias because the participants might have been more motivated than other patients.

In summary, our results confirm the successful implementation of the HTEP all over Germany in uncontrolled settings. The long-term outcomes show the HTEP's success in improving BP and metabolic control. The HTEP actively involved patients in the treatment and enabled them to self-monitor BP precisely and regularly. Patient BP self-measurement is necessary to identify deviations from clinical BP measurement as suggested by Bobrie *et al.*[30]

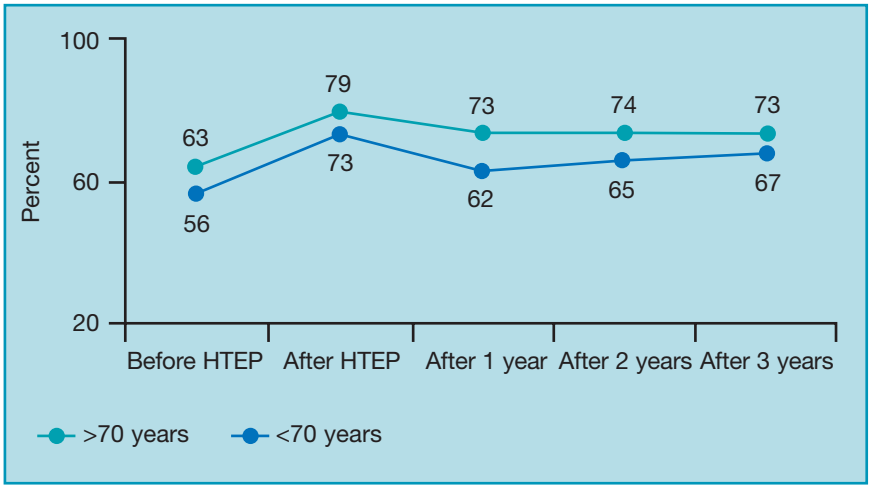

Figure 3. Knowledge development – comparison between patients over 70 and less than 70 years of age

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References

1. The DCCT Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993; **329:** 977–986.
2. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes. UKPDS 38. *BMJ* 1998; **317:** 703–713.
3. Hansson L, Zanchetti A, Carruthers SG, *et al;* for the HOT Study Group. Effects of intensive blood-pressure lowering and low dose aspirin in patients with hypertension: principal results from the Hypertension Optimal Treatment (HOT) randomised trial. *Lancet* 1998; **351:** 1755–1762.
4. The ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group. Major cardiovascular events in hypertensive patients randomised to doxazosin *vs* chlorthalidone. The Antihypertensive and Lipid-Lowering Treatment to Prevent

Heart Attack Trial (ALLHAT). *JAMA* 2000; **283:** 1967–1975.
5. Heart Outcomes Prevention Evaluation (HOPE) study investigators. Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: results of the HOPE study and MICRO-HOPE substudy. *Lancet* 2000; **355:** 253–259.
6. Wittchen HU, Krause P, Höfler M, *et al.* Arterielle Hypertonie, Diabetes mellitus und assoziierte Erkrankungen in der Allgemeinarztpraxis. *Fortschritte der Medizin* 2003; **121**(Originalien Sonderheft I/2003): 19–27.
7. American Diabetes Association. Hypertension management in adults with diabetes. *Diabetes Care* 2004; **27**(Suppl 1): 65–67.
8. American Diabetes Association. Nutrition principles and recommendations in diabetes. *Diabetes Care* 2004; **27**(Suppl 1): 36–46.
9. Campbell NRC, Burgess E, Choi BCK, *et al.* Methods and an overview of the Canadian recommendations. *CMAJ* 1999; **160**(Suppl 9): S1–S6.
10. Chobanian AV, Bakris GL, Black HR, *et al;* and the National High Blood Pressure Education Program Coordinating Committee. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertens* 2003; **42:** 1206–1252.
11. Hemmelgarn BR, Zarnke KB, Campbell NRC, *et al;* for the Canadian Hypertension Education Program, Evidence-Based Recommendations Task Force. The 2004 Canadian Hypertension Education Program recommendations for the management of hypertension: Part I – Blood pressure measurement, diagnosis and assessment of risk. *Can J Cardiol* 2004; **20**(1): 31–40.
12. Khan NA, McAlister FA, Campbell NRC, *et al;* for the Canadian Hypertension Education Program. The 2004 Canadian recommendations for the management of hypertension: Part II – Therapy. *Can J Cardiol* 2004; **20**(1): 41–54.
13. Touyz RM, Campbell N, Logan A, *et al;* for the Canadian Hypertension Education Program. The 2004 Canadian recommendations for the management of hypertension: Part III – Lifestyle modifications to prevent and control hypertension. *Can J Cardiol* 2004; **20**(1): 55–59.
14. Working Party of the International Diabetes Federation (European Region). Hypertension in people with Type 2 diabetes: knowledge-based diabetes-specific guidelines. *Diabetic Med* 2003; **20:** 972–987.
15. Deutsche Hochdruckliga (2001). Leitlinien für die Prävention, Erkennung, Diagnostik und Therapie der arteriellen Hypertonie der Deutschen Hochdruckliga und der Deutschen Hypertoniegesellschaft. http://www.uniduesseldorf.de/AWMF/II/ihypto01. htm [4 April 2002]
16. Sawicki P, Mühlhauser I, Didjurgeit U, *et al.* Evaluation of a structured treatment and teaching programme on hypertension in general practice. *Clin Exper Hypertens* 1993; **15:** 125–142.
17. Mühlhauser I, Berger M. Patient education – evaluation of a complex intervention. *Diabetologia* 2002; **45:** 1723–1733.
18. Campbell M, Fitzpatrick R, Haines A, *et al.* Framework for design and evaluation of complex interventions to improve health. *BMJ* 2000; **321:** 694–696.
19. International Conference on Harmonization – Good Clinical Practice (ICH–GCP). http://ncehr-cnerh.org/english/gcp/[Feb 1997]
20. Perloff D, Grim C, Flack J, *et al.* Human blood pressure determination by sphygmomanometry. *Circulation* 1993; **88:** 2460–2467.
21. 1999 World Health Organization–International Society of Hypertension Guidelines for the Management of Hypertension. Guidelines Subcommittee. *J Hypertens* 1999; **17**(2): 151–183.
22. New JP, Mason JM, Freemantle N, *et al.* Specialist nurse-led intervention to treat and control hypertension and hyperlipidemia in diabetes (SPLINT). *Diabetes Care* 2003; **26**(8): 2250–2255.
23. Mattila R, Malivaara A, Kastatinen M, *et al.* Effectiveness of multidisciplinary lifestyle intervention for hypertension: A randomized controlled trial. *J Hum Hypertens* 2003; **17:** 199–205.
24. Boulware LE, Daumit GL, Frick KD, *et al.* An evidence-based review of patient-centred behavioral interventions for hypertension. *Am J Prev Med* 2001; **21**(3): 221–232.
25. Denver E, Barnard M, Woolfson RG, *et al.* Management of uncontrolled hypertension in a nurse-led clinic compared with conventional care for patients with type 2 diabetes. *Diabetes Care* 2003; **26**(8): 2256–2260.
26. Gaede P, Vedel P, Larsen N, *et al.* Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. *N Engl J Med* 2003; **348:** 383–393.
27. Rachmani R, Levi Z, Slavachevski MA, *et al.* Teaching patients to monitor their risk factors retards the progression of vascular complications in high-risk patients with type 2 diabetes mellitus – a randomized prospective study. *Diabetic Med* 2002; **19:** 385–392.
28. Weisser B, Mengden T, Düsing R, *et al.* Normal values of blood pressure self-measurement in view of the 1999 World Health Organization – International Society of Hypertension Guidelines. *Am J Hypertens* 2000; **13:** 940–943.
29. Staessen JA, Thijs L; and the participants of the First International Consensus Conference on Blood Pressure Self-Measurement. Development of diagnostic thresholds for automated self-measurement of blood pressure in adults. *Blood Pressure* 2000; **5:** 101–109.
30. Bobrie G, Chatellier G, Genes N, *et al.* Cardiovascular prognosis of 'masked hypertension' detected by blood pressure self-measurement in elderly treated hypertensive patients. *JAMA* 2004; **291:** 1342–1349.
31. Europarat. Entwicklung einer Methodik für die Ausarbeitung von Leitlinien für optimale medizinische Praxis. *Zeitschrift für ärztliche Fortbildung und Qualitätssicherung* 2002; **96**(Suppl III): 1–60. Empfehlung Rec (2001) 13 des Europarates und Erläuterndes Memorandum.