Appendix 1

Effect of guideline revisions by the Swiss Society of Hypertension on blood pressure control in hypertensive patients from primary care

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Supplementary tables

Table S1: Study characteristics of completers (n = 481) and non-completers (n = 522) at baseline.						
Characteristics	**Completers**		**Non-completers**		**Statistic**	**p-value**
	n	**%**	**n**	**%**		
n (total = 1003)	481	47.96	522	52.04		
Demographic data						
Sex male	264.00	54.89	294.00	56.32	0.16	0.694
Age (years) (mean, SD)	65.86	12.98	63.19	13.23	-3.23	0.001
Blood pressure variables						
SBP (mm Hg) (mean, SD)	143.29	15.85	147.43	18.46	3.80	0.000
DBP (mm Hg) (mean, SD)	83.68	10.67	86.45	11.50	3.95	0.000
Blood pressure target achievement	184.00	38.25	160.00	30.65	6.09	0.014
Laboratory values						
Total cholesterol (mmol/l) (mean, SD)	5.31	1.14	5.19	1.11	-1.47	0.142
Total cholesterol >4.9 mmol/l	270.00	62.65	268.00	60.36	0.39	0.532
Non-HDL cholesterol (mmol/l)	3.91	1.11	3.86	1.07	-0.57	0.567
LDL (mmol/l) (mean, SD)	3.12	1.00	3.12	1.02	-0.09	0.930
HDL (mmol/l) (mean, SD)	1.42	0.46	1.34	0.40	-2.47	0.014
Triglycerides (mmol/l) (mean, SD)	1.84	1.15	1.75	0.96	-1.15	0.252
Fasting plasma glucose (mmol/l) (mean, SD)	5.94	1.45	5.94	1.63	-0.03	0.974
eGFR (ml/min/1.73 m²) (mean, SD)	73.48	30.32	82.15	34.16	2.67	0.008
Clinical features						
BMI (kg/m²) (mean, SD)	27.52	4.88	28.60	5.11	3.44	0.001
Dyslipidaemia	337.00	77.83	333.00	74.50	1.17	0.280
LVH	36.00	8.91	64.00	16.58	9.82	0.002
DM	131.00	27.23	136.00	26.05	0.12	0.725
Renal dysfunction	75.00	36.76	82.00	36.12	0.00	0.970
DM and/or renal dysfunction	183.00	38.05	184.00	35.25	0.73	0.394
Positive family history	99.00	42.86	123.00	40.46	0.22	0.639

Years with hypertension diagnosis (mean, SD)	10.71	8.46	9.80	7.95	-1.41	0.160
Established CV disease	104.00	21.62	105.00	20.15	0.24	0.622
Therapy						
No antihypertensive therapy	19.00	4.06	33.00	6.41	2.25	0.134
Antihypertensive therapy type (no therapy = 1, mono = 2, duo = 3, triple = 4, quadruple = 5) (median, IQR)	3.00	2.00	3.00	2.00	0.24	0.627
Lipid lowering therapy	127.00	26.40	172.00	32.95	4.82	0.028
Insulin therapy	16.00	3.33	26.00	4.98	1.32	0.251
Oral antidiabetic therapy	77.00	16.01	90.00	17.24	0.19	0.661
Lifestyle factors						
Smoking	77.00	16.01	86.00	16.51	0.02	0.898
Alcohol (none = 1, occasionally = 2, frequent = 3, excessive = 4) (median, IQR)	2.00	0.00	2.00	0.00	0.62	0.432
Physical activity (little = 1, medium = 2, high = 3) (median, IQR)	2.00	1.00	2.00	1.00	3.83	0.050

BMI = body mass index; CV = cardiovascular; DBP = diastolic blood pressure; DM = diabetes mellitus; eGFR = estimated glomerular filtration rate; HDL = high-density lipoprotein; IQR = interquartile range; LDL = low-density lipoprotein; LVH = left ventricular hypertrophy; Missing = percent of missing values at baseline; NA = not available; SBP = systolic blood pressure; SD = standard deviation
Completers had at least two follow-up examinations. Non-completers had fewer than two follow-up examinations. Statistic was either t-value for continuous variables, chi-square value for binary variables or Kruskal-Wallis rank sum test for ordinal variables (number of antihypertensive medication, physical activity, alcohol).

Table S2: Multivariable logistic regression describing the association between demographic/health-related characteristics and loss to follow-up after baseline (0 = completer, 1 = lost to follow-up).

Term	Estimate	Standard error	Statistic	df	p-value
(Intercept)	-0.34	0.26	-1.32	718.72	0.188
Sex (male)	-0.04	0.03	-1.16	916.59	0.247
Age (per 10 years)	-0.03	0.02	-1.77	844.47	0.077
SBP (per 10 mm Hg)	0.03	0.01	2.75	709.35	0.006
DBP (per 10 mm Hg)	0.02	0.02	1.26	734.69	0.207
Total cholesterol (mmol/l)	-0.02	0.01	-1.40	799.49	0.161
Fasting plasma glucose (per 5 mmol/l)	0.02	0.07	0.31	206.86	0.756
BMI (per 5 kg/m^2)	0.06	0.02	3.80	847.54	0.000
LVH	0.17	0.06	2.83	22.70	0.010
DM	-0.06	0.05	-1.20	500.19	0.231
Time with hypertension diagnosis (per 10 years)	-0.05	0.02	-2.42	212.97	0.016
Established CV disease	-0.02	0.04	-0.35	910.96	0.728
Number of antihypertensive medication	0.00	0.02	0.22	514.89	0.824
Lipid lowering therapy	0.08	0.03	2.81	970.90	0.005
Smoking	0.00	0.04	0.06	830.78	0.950
Alcohol	0.02	0.03	0.90	850.88	0.367
Physical activity	0.08	0.02	3.43	255.56	0.001

SBP = systolic blood pressure, DBP = diastolic blood pressure, CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus

Table S3: Pooled multivariable linear mixed-effect regression results describing the association between systolic blood pressure and demographic/health related variables across patients with complicated hypertension (n = 367).

Predictors of systolic BP	Estimate	95%CI	95%CI	p.value
(Intercept)	51.01	31.05	70.97	0.000
Follow-up visit	-1.41	-2.60	-0.23	0.019
Year of examination (2009 and after vs. before 2009)	-5.40	-8.08	-2.73	0.000
Sex (male vs. Female)	-3.62	-6.85	-0.39	0.028
Age (per 10 years)	2.84	1.48	4.20	0.000
Diastolic BP (per 10 mm Hg)	9.61	8.59	10.64	0.000
Cholesterol	0.15	-1.00	1.29	0.798
Fasting plasma glucose (mmol/l)	-0.10	-0.59	0.40	0.706
BMI (per 5 kg/m^2)	-0.57	-1.88	0.74	0.393
LVH	1.57	-1.82	4.96	0.355
DM	1.72	-1.68	5.12	0.320
Years with hypertension diagnosis (per 10 years)	0.64	-1.43	2.71	0.519
Established CV disease	-0.61	-3.50	2.29	0.680
Number of antihypertensive medication	0.56	-0.73	1.85	0.390
Lipid lowering therapy	1.14	-1.43	3.71	0.384
Smoking	1.19	-2.52	4.90	0.529
Alcohol	0.01	-2.09	2.11	0.991
Physical activity	0.82	-0.92	2.56	0.352
Weight reduction	-2.46	-5.27	0.35	0.086
Increased physical activity	0.76	-2.23	3.76	0.616
Smoking cessation	-0.11	-5.43	5.22	0.969
Alcohol reduction	2.77	-2.75	8.30	0.325
BP = blood pressure, CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus				

Table S4: Pooled multivariable linear mixed-effect regression results describing the association between systolic blood pressure and demographic/health related variables across patients with uncomplicated hypertension (n = 636).

Predictors of systolic BP	Estimate	95%CI	95%CI	p-value
(Intercept)	51.85	37.50	66.19	0.000
Follow-up visit	-1.54	-2.32	-0.75	0.000
Year of examination (2009 and after vs before 2009)	-1.54	-3.11	0.03	0.054
Sex (male vs. female)	-0.71	-2.53	1.10	0.440
Age (per 10 years)	2.70	1.94	3.46	0.000
Diastolic BP (per 10 mm Hg)	8.84	8.14	9.54	0.000
Cholesterol	0.20	-0.80	1.20	0.676
Fasting plasma glucose (mmol/l)	-0.19	-1.25	0.87	0.721
BMI (per 5 kg/m^2)	0.32	-0.60	1.25	0.493
LVH	1.11	-2.53	4.76	0.511
Years with hypertension diagnosis (per 10 years)	0.69	-0.59	1.97	0.276
Established CV disease	-0.41	-2.87	2.05	0.744
Number of antihypertensive medications	0.08	-0.75	0.91	0.848
Lipid lowering therapy	-0.27	-2.21	1.67	0.783
Smoking	0.92	-1.43	3.26	0.442
Alcohol	-0.24	-1.62	1.14	0.734
Physical activity	-0.22	-1.65	1.21	0.746
Weight reduction	-2.45	-4.32	-0.58	0.010
Increased physical activity	2.71	0.76	4.66	0.006
Smoking cessation	2.13	-1.31	5.58	0.225
Alcohol reduction	-0.43	-4.36	3.49	0.829
BP = blood pressure, CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy				

Table S5: Pooled multivariable linear mixed-effect regression results describing the association between diastolic blood pressure and demographic/health related variables across patients with complicated hypertension (n = 367).

Predictors of diastolic BP	Estimate	95%CI	95%CI	p-value
(Intercept)	62.93	52.69	73.18	0.000
Follow-up visit	-0.73	-1.39	-0.06	0.034
Year of examination (2009 and after v. before 2009)	0.26	-1.25	1.77	0.735
Sex (male v. Female)	2.46	0.64	4.28	0.008
Age (per 10 years)	-3.43	-4.16	-2.70	0.000
Systolic BP (per 10 mm Hg)	3.03	2.70	3.35	0.000
Cholesterol	0.67	0.05	1.30	0.035
Fasting plasma glucose (mmol/l)	0.04	-0.24	0.32	0.774
BMI (per 5 kg/m^2)	0.28	-0.45	1.01	0.445
LVH	0.80	-1.80	3.41	0.512
DM	-0.59	-2.47	1.30	0.541
Years with hypertension diagnosis (per 10 years)	-0.30	-1.35	0.76	0.564
Established CV disease	-0.49	-2.11	1.12	0.548
Number of antihypertensive medication	-0.48	-1.22	0.25	0.196
Lipid lowering therapy	0.14	-1.29	1.58	0.844
Smoking	-1.69	-3.75	0.37	0.108
Alcohol	-1.13	-2.30	0.04	0.059
Physical activity	-0.82	-1.74	0.10	0.081
Weight reduction	0.83	-0.75	2.42	0.303
Increased physical activity	-1.58	-3.26	0.10	0.066
Smoking cessation	2.58	-0.42	5.57	0.091
Alcohol reduction	-2.40	-5.50	0.69	0.128

BP = blood pressure, CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus

Table S6: Pooled multivariable linear mixed-effect regression results describing the association between diastolic blood pressure and demographic/health-related variables across patients with uncomplicated hypertension (n =636).

Predictors of diastolic BP	Estimate	95%CI	95%CI	p-value
(Intercept)	54.68	46.28	63.09	0.000
Follow-up visit	-0.21	-0.70	0.27	0.387
Year of examination (2009 and after vs before 2009)	0.33	-0.66	1.32	0.514
Sex (male vs female)	-0.32	-1.50	0.87	0.601
Age (per 10 years)	-2.91	-3.39	-2.42	0.000
Systolic BP (per 10 mm Hg)	3.48	3.21	3.76	0.000
Cholesterol	0.37	-0.09	0.83	0.114
Fasting plasma glucose (mmol/l)	0.05	-0.58	0.68	0.874
BMI (per 5 kg/m^2)	-0.17	-0.75	0.42	0.576
LVH	-0.15	-2.84	2.55	0.902
Years with hypertension diagnosis (per 10 years)	0.03	-1.01	1.06	0.957
Established CV disease	-0.85	-2.40	0.70	0.283
Number of antihypertensive medication	-0.37	-0.90	0.16	0.175
Lipid lowering therapy	-1.32	-2.54	-0.11	0.033
Smoking	0.08	-1.42	1.58	0.916
Alcohol	-0.27	-1.16	0.61	0.547
Physical activity	-0.09	-0.99	0.81	0.841
Weight reduction	1.77	0.61	2.94	0.003
Increased physical activity	-0.24	-1.46	0.98	0.701
Smoking cessation	0.80	-1.37	2.97	0.469
Alcohol reduction	0.00	-2.45	2.45	0.999
BP = blood pressure, CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus				

Table S7: Pooled multivariable logistic mixed-effect regression results describing the association between BP target achievement and demographic/health related variables across all patients (n =1003).

Predictors of BP target achievement	OR	95%CI	95%CI	p-value
(Intercept)	0.08	0.01	0.53	0.009
Follow-up visit	1.49	1.28	1.74	0.000
Year of examination (2009 and after vs before 2009)	1.17	0.87	1.58	0.308
Sex (male vs Female)	1.46	1.05	2.03	0.023
Age (per 10 years)	1.22	1.07	1.39	0.004
Cholesterol	0.88	0.76	1.03	0.107
Fasting plasma glucose (mmol/l)	0.94	0.82	1.08	0.395
BMI (per 5 kg/m^2)	1.13	0.97	1.32	0.120
LVH	0.69	0.42	1.13	0.138
DM	0.07	0.04	0.12	0.000
Years with hypertension diagnosis (per 10 years)	0.82	0.65	1.02	0.078
Established CV disease	1.50	1.01	2.25	0.047
Number of antihypertensive medication	1.09	0.94	1.27	0.261
Lipid lowering therapy	1.07	0.84	1.37	0.587
Smoking	0.87	0.57	1.31	0.497
Alcohol	1.21	0.95	1.53	0.121
Physical activity	1.06	0.85	1.33	0.602
CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus				

Table S8: Complete case sensitivity analyses. Multivariable linear mixed-effect regression results describing the association between systolic blood pressure and demographic/health-related variables among patients with complicated hypertension (n = 116, number of observations = 142).

Predictors of systolic BP	Estimate	95%CI	95%CI	Standard error	t value
(Intercept)	55.39	4.14	107.13	25.07	2.21
Follow-up visit	0.54	-3.01	3.72	1.59	0.34
Year of examination (2009 and after vs before 2009)	-3.99	-10.08	1.99	2.99	-1.33
Sex (male vs female)	-0.41	-8.25	7.55	3.96	-0.10
Age (per 10 years)	2.78	-0.94	6.42	1.82	1.53
Systolic BP (per 10 mm Hg)	9.17	6.52	11.91	1.31	7.01
Cholesterol	0.91	-1.49	3.32	1.21	0.75
Fasting plasma glucose (mmol/l)	0.43	-0.91	1.78	0.68	0.63
BMI (per 5 kg/m^2)	-2.68	-6.08	0.69	1.70	-1.58
LVH	-6.20	-12.51	0.22	3.19	-1.94
DM	-2.74	-11.02	5.57	3.97	-0.69
Years with hypertension diagnosis (per 10 years)	2.10	-1.32	5.56	1.73	1.21
Established CV disease	3.06	-3.22	9.30	2.89	1.06
Number of antihypertensive medication	2.11	-0.98	5.26	1.55	1.36
Lipid lowering therapy	-1.70	-5.71	2.33	2.03	-0.84
Smoking	0.87	-6.89	8.62	3.89	0.22
Alcohol	-0.74	-5.04	3.59	2.16	-0.34
Physical activity	0.47	-3.28	4.23	1.90	0.25
Weight reduction	0.39	-5.90	6.27	2.83	0.14
Increased physical activity	-4.15	-9.22	1.09	2.57	-1.61
Smoking cessation	7.86	-1.43	17.60	4.71	1.67
Alcohol reduction	-1.36	-11.76	10.02	5.15	-0.26
BP = blood pressure, CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus					

Table S9: Complete case sensitivity analyses. Multivariable linear mixed-effect regression results describing the association between diastolic blood pressure and demographic/health related variables across patients with complicated hypertension (n = 116, number of observations = 142).

Predictors of diastolic BP	Estimate	95%CI	95%CI	Standard error	t value
(Intercept)	69.04	45.86	92.07	11.66	5.92
Follow-up visit	-0.02	-2.04	2.03	1.03	-0.02
Year of examination (2009 and after vs before 2009)	-2.87	-6.09	0.34	1.62	-1.77
Sex (male vs female)	4.23	0.53	7.97	1.88	2.25
Age (per 10 years)	-3.26	-4.97	-1.53	0.87	-3.75
Systolic BP (per 10 mm Hg)	2.71	1.98	3.44	0.37	7.36
Cholesterol	-0.41	-1.65	0.84	0.63	-0.65
Fasting plasma glucose (mmol/l)	0.16	-0.58	0.90	0.37	0.43
BMI (per 5 kg/m²)	0.99	-0.68	2.68	0.84	1.17
LVH	1.70	-1.81	5.19	1.76	0.96
DM	-4.69	-8.75	-0.58	2.03	-2.31
Years with hypertension diagnosis (per 10 years)	-0.37	-2.03	1.28	0.84	-0.44
Established CV disease	-0.28	-3.41	2.84	1.57	-0.18
Number of antihypertensive medication	-1.18	-2.86	0.50	0.85	-1.39
Lipid lowering therapy	0.94	-1.12	3.00	1.04	0.90
Smoking	-1.54	-5.58	2.51	2.05	-0.75
Alcohol	-0.40	-2.60	1.79	1.11	-0.36
Physical activity	-0.26	-2.14	1.62	0.95	-0.27
Weight reduction	2.04	-1.53	5.59	1.63	1.25
Increased physical activity	-1.64	-4.82	1.51	1.54	-1.07
Smoking cessation	-1.19	-7.20	4.89	3.05	-0.39
Alcohol reduction	-4.94	-11.40	1.36	3.12	-1.58
BP = blood pressure, CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus					

Table S10: Complete case sensitivity analyses- Multivariable logistic mixed-effect regression results describing the association between blood pressure goal attainment and demographic/health-related variables among patients with complicated hypertension (n = 116, Number of observations = 142).

Predictors of BP target achievement	OR	95%CI	95%CI	p-value
(Intercept)	0.00	0.00	6.84	0.108
Follow-up visit	2.00	0.81	4.93	0.130
Year of examination (2009 and after vs before 2009)	2.45	0.59	10.10	0.216
Sex (male vs Female)	1.40	0.26	7.60	0.698
Age (per 10 years)	2.02	0.82	4.98	0.126
Cholesterol	0.77	0.44	1.36	0.370
Fasting plasma glucose (mmol/l)	1.01	0.68	1.49	0.974
BMI (per 5 kg/m²)	1.10	0.50	2.40	0.812
LVH	2.85	0.51	15.76	0.230
DM	1.23	0.18	8.33	0.836
Years with hypertension diagnosis (per 10 years)	0.60	0.27	1.32	0.204
Established CV disease	3.20	0.71	14.32	0.128
Number of antihypertensive medication	0.78	0.34	1.82	0.571
Lipid lowering therapy	0.66	0.24	1.76	0.402
Smoking	0.70	0.10	4.77	0.716
Alcohol	1.46	0.53	4.00	0.466
Physical activity	1.27	0.56	2.90	0.569

CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus

Table S11: Complete case sensitivity analyses. Multivariable cumulative link mixed model results describing the association between antihypertensive combination therapy and demographic/health related variables among patients with complicated hypertension (n = 179).

Predictors of BP target achievement	OR	95%CI	95%CI	p-value
Follow-up visit	0.31	0.31	0.32	0.000
Year of examination (2009 and after vs before 2009)	0.26	0.05	1.41	0.119
Sex (male vs female)	0.05	0.00	1.13	0.059
Age (per 10 years)	0.65	0.65	0.65	0.000
Systolic BP (per 10 mm Hg)	0.75	0.75	0.75	0.000
Diastolic BP (per 10 mm Hg)	0.54	0.54	0.54	0.000
Cholesterol	0.80	0.80	0.80	0.000
Fasting plasma glucose (mmol/l)	2.54	2.54	2.55	0.000
BMI (per 5 kg/m²)	2.48	2.48	2.48	0.000
LVH	5.39	0.19	155.04	0.325
DM	0.24	0.23	0.24	0.000
Years with hypertension diagnosis (per 10 years)	4.72	4.72	4.73	0.000
Established CV disease	129.56	9.76	1720.58	0.000
Lipid lowering therapy	9.88	9.87	9.89	0.000
Smoking	0.04	0.00	1.26	0.067
Alcohol	10.94	10.92	10.95	0.000

*Physical activity had to be excluded due to too many missing data in the model.
BP = blood pressure, CV = cardiovascular disease, BMI = body mass index, LVH = Left ventricular hypertrophy, DM = diabetes mellitus