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Worksite-Screenings for Hypertension with Follow-up: Experiences from the Munich Blood Pressure Program

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Introduction

High blood pressure is a common condition in the adult population of industrialized countries. The Munich Blood Pressure Study (MBS 1980/81) revealed that on average every fifth person in the age range 30 to 69 years belonged to the group of actual hypertensives, i.e. they had blood pressure values of systolic ≥ 160 mm Hg and/or diastolic ≥ 95 mm Hg or they were on antihypertensive medication [1]. Younger hypertensives, in particular males, were less aware of their hypertension and they received antihypertensive medication in a lower proportion than older or female hypertensives.

In a response to these findings the Munich Blood Pressure Program (MBP) was created in 1982 [2,3]. Three major strategies have been developed to reduce hypertension-induced cardiovascular sequelae in the population of Munich.

Worksite screenings for elevated blood pressure were an important component of this approach which in addition comprised coordinated education and training of professionals in the field of hypertension management and activities to increase the public awareness for hypertension.

As some studies had already shown the effectiveness of worksite intervention programs in other countries [4,5] it was decided to plan the MBP as a demonstration rather than a randomised, controlled research project. The feasibility of worksite-screenings for hypertension in the FRG was to be assessed. The focus of scientific interest was on the acceptance of the offered screenings by young males, a 'hard-to-reach' group, the number of detected hypertensives that could effectively be referred to a family physician for further management, and changes of treatment and control of hypertension at a follow-up examination of the same screenees after two years.

The MBP screened subjects at various worksites to allow for more general conclusions that were not restricted to only one or a few specific sites. The results are accordingly reported as a summary over all subjects screened.

Methods

Screening Procedures

Staff members from eighteen different firms were invited to a screening examination during working hours. Participation was voluntary and free. Blood pressure (BP) was measured by a team of specially trained MBP technicians. The examination consisted of a brief interview and a duplicate BP measurement with a Random-Zero-Sphygmomanometer [6]. Participants were asked to return for a reexamination within one to eight days if the BP value of the second measurement was ≥ 140/90 mm Hg. Confirmation of elevated BP at the reexamination prompted referral to the family physician (two-step-screening).

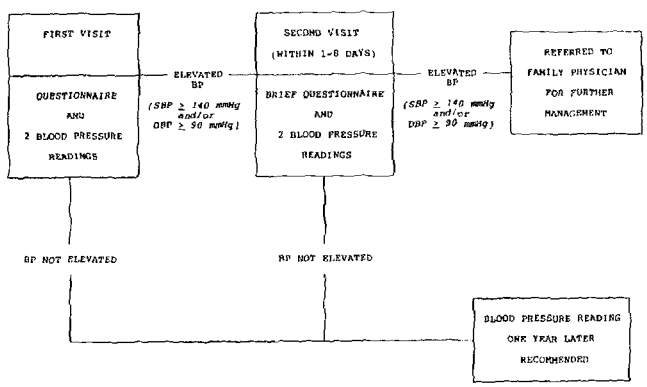

Fig. 1: Two-Stage-Procedure of the MBP worksite screenings.

The Primary Screening (PS) of 18 worksites was performed in 1983/84. A Re-Screening (RS) of the PS participants was organized in 1985/86 in 14 worksites. The examination procedures were identical.

Definition of Actual Hypertension

Participants were defined as actually hypertensive if:
- systolic BP was ≥ 160 mm Hg and/or
- diastolic BP was ≥ 95 mm Hg or
- use of antihypertensive medication was reported.

Computer-Based Reminder System (CBRS)
Participants with BP values ≥ 140/90 mm Hg and normotensive subjects with reported use of antihypertensive medication (who had given written consent to participate in the MBP) were handed postage-free postcards subsequent to the screenings [6,7]. The postcards were to be filled out by the physician in the office noting the BP values measured and whether treatment was started or not. Cards returned to the MBP documented effective referrals to the family physician following the screening. The CBRS kept a file for each eligible screenee containing all BP values available to the MBP (screening and postcard) as well as the latest treatment status. A score was defined for each individual originating from data on BP, treatment status, and referral and this score was used to define time intervals after which the participants were reminded of their suspected hypertension and the need for adequate care[7]. Aims of the CBRS were to increase the proportion of effective referrals to physicians and to support adherence to the physician's therapeutic regimen.

Results

Participation at Primary Screening 1983/84
A total of 7310 persons were screened at 18 worksites. This corresponds to a participation of 51% (men 50%, women 52%). Participation was rather homogeneous over the age groups. Almost two-thirds of the participants were male, only about one third was female. The tabulation of participants by ten-year age groups shows that almost 80% of the screened population were below 50 years of age.

Tab. 1. Participants of the Primary Screening (PS) at 18 worksites, by age and sex. MBP 1983/84.

Age	Men		Women	
	n	(%)	n	(%)
< 30	942	20.4	863	32.0
30-39	1003	21.8	554	20.5
40-49	1538	33.4	733	27.1
50-59	944	20.5	487	18.0
≥ 60	181	3.9	65	2.4
Total	4608	100.0	2702	100.0

Prevalence of Hypertension at Primary Screening in 1983/84
During the first examination of the PS, 824 men and 262 women were suspected of being actual hypertensives. This corresponds to a prevalence of 17.9% in men and 9.7% in women; age-specific prevalences were lowest in young age and rose consistently with aging. However, when looking at absolute numbers rather than proportional frequencies it becomes obvious that most of the suspected hypertensives were below the age of 50 years.

Tab. 2. Prevalence (%) and absolute numbers (n) of suspected actual hypertensives at first examination. Primary Screening (PS) at 18 worksites, by age and sex. MBP 1983/84.

Age	Men		Women	
	Prevalence (%)	Absolute Number n	Prevalence (%)	Absolute Number n
< 30	9.9	93	1.5	13
30-39	14.0	140	4.2	23
40-49	16.5	254	11.7	86
50-59	29.7	280	25.3	123
≥ 60	31.5	57	26.6	17
Total	17.9	824	9.7	262

Two-Step-Screening
Of the subjects eligible for reexamination during the PS (those with BP ≥ 140/90 mm Hg), 75% complied with the request for another duplicate BP measurement. Actual hypertension was confirmed in 380 men and 129 women. Table 3 shows that also after exclusion of a large proportion of 'false-positives', younger male hypertensives still prevailed in the screening yield. The drug treatment status was low at ages under 50 years.

Referral to Physicians
A large group of screenees was addressed by the CBRS including borderline hypertensives, hypertensives without a second-step-examination, and confirmed actual hypertensives (n=1482). The proportion

Tab. 3. Numbers (n) and treatment status of actual hypertensives who were confirmed by a two-step-screening. Primary Screening (PS) of 18 worksites, by age and sex. MBP 1983/84.

Age	Treatment Status	Men (n)	Women (n)
< 50			
	untreated	172	37
	treated	43	17
≥ 50			
	untreated	97	31
	treated	68	44
Total		380	129

of effective referrals as determined by returned postcards was highest in the group of confirmed actual hypertensives. They sent back filled-in cards in 73% of all cases.

Rescreening in 1985/86

After two years, the MBP returned to 14 of the 18 worksites for a follow-up of the PS-screenees. Observers and procedures of BP measurement were the same as during the PS. It was possible to examine 417 subjects whose hypertension had been confirmed either in the course of the PS or in a doctor's office on a prior occasion. A comparison of their treatment and control status in 1983/84 with that two years later is shown in Figure 2. It is obvious that in these hypertensives, who had all been addressed regularly by the CBRS, a marked increase in the proportion of treated and controlled hypertension had occured. This increase was present in younger and older hypertensives.

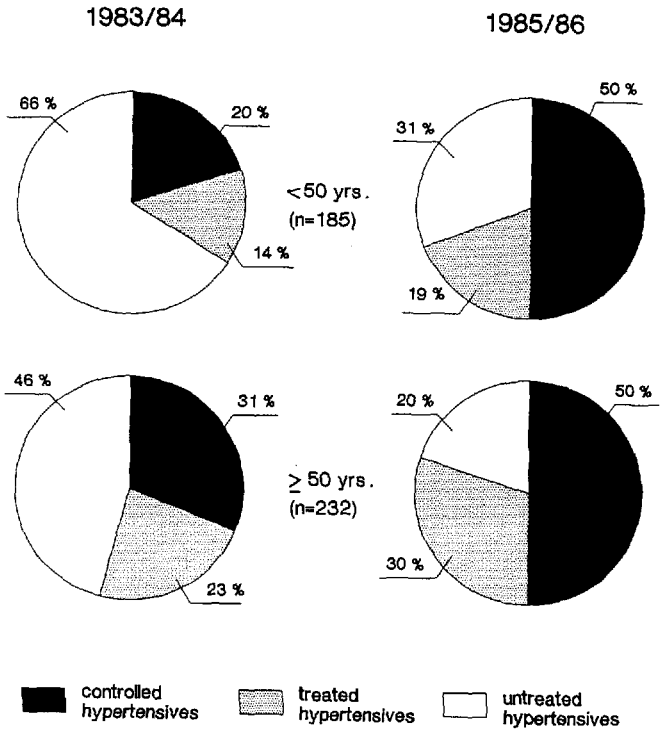

Fig. 2: Changes in treatment and control status of hypertension from 1983/84 (Primary Screening) to 1985/86 (Re-Screening), confirmed hypertensives (n= 417) who participated in both screenings.

Discussion

The MBP worksite screenings were offered as an activity from «outside» and as such were not integrated into a long-term perspective of worksite-based health promotion programs by e.g. occupational health departments. Though confidentiality problems seem to be smaller for the workforce when screening is performed by external technicians, a severe drawback results from the very restricted time periods conceded for screenings by company managements. This explains largely the variation of participation between the different firms. In addition, local characteristics such as high proportions of employees working in the field or scattered arrangement of the plant buildings often impeded the achievement of satisfactory participation. Standardized follow-up invitations, e.g. by phone or by circulars, were not made possible, either. The observed participations reflect in our view what is presently achievable in the industrial setting of the FRG. They are in accordance with participations given in a report on worksite screenings in Bremen [8].

The age-specific prevalences of arterial hypertension in the MBP, based on one-occasion duplicate measurements, were within the confidence limits as calculated from the MBS 1980/81 survey [1,7]. When focussing on the number of hypertensives filtered out, it became obvious that the specific demographic characteristics of the workforces had caused an enrichment of male and also of younger hypertensives in the screening yield. This effect persisted after elimination of false positives by a second examination. It underscores the suitability and feasibility of worksite screenings as an instrument to successfully approach so called «hard-to-reach» hypertensives [6].

The installation of a CBRS within the framework of the MBP had been determined predominantly by the idea that early treatment should be an obligatory result of the early detection of hypertension. As on-site treatment by occupational physicians is prohibited in the FRG early treatment can best be ensured by referrals to the family physician. The number of returned postcards considered indicative of a successful referral as consequence of the MBP-screenings certainly underestimates the proportion of hypertensives effectively referred because in several cases either doctors or patients refused to return these cards. In light of these considerations it is a reasonable assumption that approximately 80% of all detected hypertensives actually saw their doctor after the screenings. Only very intensive follow-up procedures proved more effective in this regard [4,5].

The MBP was not conceived as a randomised, controlled intervention trial. This renders the results of our rescreening examination after two years subject to several critical comments. Self-selection of particularly responsive hypertensives into the rescreened sample is one possibility that may have favorably biased the outcome in 1985/86. Furthermore, the absence of a control group makes it impossible to distinguish beneficial effects of the CBRS from spontaneous improvements in the treatment and control status of hypertensives. There can be no doubt, however, that the level of treatment and control was in fact raised in the rescreened group of hypertensives. A moderately intensive follow-up procedure such as the CBRS may have contributed to this improvement. This is suggested by the finding that the changes observed were

more pronounced in those with successful referral (returned postcard) than in those who had not returned their cards to the MBP.
Experiences from the MBP are now being used to devise a Working Group on Worksite Prevention within the recently established National Blood Pressure Program (NBP) for the Federal Republic of Germany [9].

Summary
In 1983/84, the Munich Blood Pressure Program (MBP) performed worksite screenings for arterial hypertension at 18 Munich companies. A participation of 51% (n=7310) was achieved. After duplicate measurements of casual blood pressure 1084 participants were suspected of having actual hypertension. All suspected cases were invited for a reexamination to reduce the number of false-positive hypertensives. Individuals with persisting hypertension after this two-step-screening were predominantly male, on the average younger than 50 years and showed a low level of antihypertensive drug treatment. About 75% of all detected hypertensives saw a family physician subsequent to the screenings for further management. Referrals and patient compliance were frequently reinforced by a computer based reminder system. A follow-up examination was performed among the MBP participants after two years. It showed that in 417 confirmed hypertensives of the primary screenings a marked increase in the proportion of treated and controlled hypertensives had occured. This was true for younger and older hypertensives.

Résumé
Dépistage de l'hypertension avec follow-up sur le lieu de travail : résultats du programme munichois sur l'hypertension
En 1983/84, le programme munichois sur l'hypertension a accompli un dépistage dans 18 industries. Une participation de 51% (n=7310) a été atteinte. Après une double mesure de la pression, 1084 participants ont été considérés comme suspects d'hypertension; ils ont tous été invités à un nouvel examen pour réduire le nombre de faux-positifs. Les personnes avec une hypertension persistante lors de ce deuxième examen étaient surtout de sexe masculin, d'un âge inférieur à 50 ans, et avaient un niveau faible de médication. Environ 75% de tous les hypertendus détectés ont vu un généraliste après ce dépistage pour un traitement. Les transferts de patients et leur compliance ont été améliorés par un système de rappel informatisé. Un examen de follow-up a été effectué chez les participants du programme après 2 ans. Il a montré que parmi les 417 hypertendus avérés découverts lors du premier dépistage, la proportion de cas traités et contrôlés avait augmenté substantiellement, aussi bien chez les jeunes que chez les vieux.

Zusammenfasssung
Betriebsscreening auf Hypertonie mit Follow Up: Ergebnisse des Münchner Blutdruck-Programmes
Im Jahr 1983/84 wurden vom Münchner Blutdruck-Programm (MBP) Screening-Untersuchungen auf arterielle Hypertonie in 18 Münchner Betrieben durchgeführt. An den Untersuchungen nahmen 7310 Personen teil, dies entspricht einer Beteiligung von 51%. Nach zweimaliger Messung des Gelegenheitsblutdruckes bestand bei 1084 Personen ein Verdacht auf Vorliegen einer Hypertonie. Alle Verdachtsfälle wurden zu einer Nachuntersuchung innnerhalb von 1–8 Tagen aufgefordert, um falsch-positive Probanden auszuschließen. Von den nach diesem 2-Stufen-Screening verbleibenden Hypertonikern waren mehr als die Hälfte jünger als 50 Jahre, fast 75% waren Männer und der Behandlungsstatus war – insbesondere bei jüngeren Männern – niedrig. In der Folge der Screenings suchten etwa 75% der Hypertoniker einen Hausarzt zur weiteren Betreuung auf. Überweisungsverhalten und Compliance wurden durch regelmäßige Anschreiben über ein computerbasiertes Erinnerungsverfahren unterstützt. Ein Wiederholungs-Screening wurde allen Teilnehmern des Erst-Screenings im Jahre 1985/86 angeboten. Die Nachuntersuchung von 417 bestätigten Hypertonikern erbrachte, daß sich der Behandlungs- und Kontrollgrad der Hypertonie deutlich gebessert hatte. Dies galt auch für die jüngeren Hypertoniker.

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