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Experience improves economical compliance of home blood pressure monitoring

Juha P Varis* and Ilkka M. Kantola

*Correspondence: juha.varis@tyks.fi

Division of Medicine, Turku University Hospital, University of Turku, Finland.

Abstract

Background: Home blood pressure monitoring (HBPM) is a valid way of assessing blood pressure. It has been shown to reduce antihypertensive treatment cost and the number of drugs needed. However, the proper economical commitment of the patients has not been clarified.

Methods: From a pool of 40000 Finns a sample of one thousand hypertensive people who had access to e-mail and who had performed HBPM was randomly selected. Their opinion about an acceptable price for a HBPM device was asked by using an electronic questionnaire. Altogether 640 people answered the questionnaire.

Results: Majority of the study patients without own experience of HBPM considered 60 € as an upper level for HBPM device. Nearly 40% saw 30 € as a maximum price for a HBPM device. Among patients who own a HBPM device the situation was different. Quite few valuated the HBPM devices below 30 €. The price level of 61-90 € was the most acceptable. Family income level did not play any major role in the valuation of HBPM devices.

Conclusion: The financial BP home measurement compliance of the patients without own HBPM device was low. Main reason for the measurement undervaluation is probably the low appreciationm of the concept of measuring BP at home. On the contrary, patients who had already a HBPM device and hence experience of its influence on the BP treatment had a tendency to pay higher prices for the device. As HBPM has been shown to decrease the cost of hypertension treatment the reimbursement of HBPM devices should be considered as already antihypertensive treatment is reimbursed.

Keywords: Blood pressure, home blood pressure monitoring, cost effectiveness, patients' opinion

Introduction

Cardiovascular diseases are still the leading causes of death world-wide [1]. Hypertension is the most important and controllable risk factor but reported treatment reports are still unsatisfactory [1-4]. This has called for new treatment and monitoring methods. Home blood pressure measurement (HBPM) has been accepted as a valid way to assess blood pressure [3]. In Finland more than 60% of the hypertensive patients used HBPM in 2006 [4]. Agarwal et al., [5] found in their meta-analysis that treatment-induced BP reductions were slightly but significantly higher (systolic 2.7 mm Hg and diastolic 1.7 mm Hg) as also the percentage of patients achieving BP control in patients using HBPM. Also more frequent medication changes in the presence of uncontrolled BP values were noticed. HBPM is a time consuming procedure and needs economical investment in the beginning and accordingly a good patient compliance is essential.

HBPM has been used for at least a decade and has gained patients' confidence. Only little, if anything, is known of the economical willingness from the patients' point of view to use HBPM. This study was planned to clarify the economical compliance aspects of HBPM and is a part of an earlier study which dealt with the patient compliance of the HBPM [6].

Methods

TNS Gallup Forum, a private Finnish population survey company, performed a blood pressure oriented inquiry in 2008. From their pool of 40 000 Finns who represent the total active-aged Finnish population, a random sample of one thousand individuals who self announced suffering from high blood pressure and used HBPM was selected. Their attitude towards HBPM was analyzed using a straightforward e-mailed electronic questionnaire, sent and completed through the Internet in February 2008. It had five simple questions and free space for people to write in their answers. The selected individuals were asked their opinion about the economic aspects of HBPM devices. Patients who did not possess a HBPM device were asked how much they are ready to pay for a device. The remaining patients with own HBPM device already at home were asked what would be a suitable price for a BP monitoring device. Patients were also asked their educational background and annual household income. Although all the selected individuals can not be regarded as patients, this nomination was used for practical reasons.

Student's T-test, ANOVA and Wilcoxon methods were used

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in statistical analysis. Results are given as mean and standard deviation (SD).

Results

Out of the one thousand selected subjects with hypertension and HBPM, a completed questionnaire was received from 640 individuals (295 men and 345 women). Nearly all subjects (93%, n=596) disclosed their social data, annual family income data and opinion about the economic aspects of HBPM devices and they are called the study patients. The mean age of the patients was 55.6 (18.9) years. The age distribution of the study patients is shown in detail in (**Table 1**). About half of the subjects suffered only from elevated blood pressure. Besides hypertension other diseases were reported by 45.3% of the patients (**Table 1**). About one third of the study patients had their household income in excess of 50000 € and quite equal shares had it between 50 000 and 30000 or less than 30 000 €. Patients' educational background was also evenly distributed between the used four categories (low educational background, blue collar workers, high school level and university level). The study patients´opinion about the economic aspects of HBPM devices is shown in (**Tables 2a** and **2b**).

Majority of the study patients (82%, 78% and 78%, respectively) in all three family income levels and with no own HBPM device considered 60 € as an upper level price for it. Only few patients (8%, 6%, 7%) were willing to pay more than 91 €, and none would have spent 151 € or more (**Table 2a**). Nearly 40% (38%, 35% and 39%, respectively) saw 30 € as a maximum price for a HBPM device. The annual family income level did not affect readiness of the patients to invest in HBPM device (**Table 2a**).

Among patients who had already an own HBPM device the result was different. Quite few valuated the HBPM devices under 30 €. The price level of 61-90 € was the most acceptable. A clear shift towards higher prices was observed compared to the patients with no own HBPM device (**Figure 1**). As in the patients with no own experience of HBPM the annual family income level did not effect on the valuation of HBPM device (**Table 2b**).

Table 1. Basic data of the study population.

Basic data	**n=640 (100%)**
Diabetes	99 (15)
Coronary heart disease	18 (3)
Dyslipemia	182 (28)
Chronicatrial fibrillation	14 (2)
Other cardiovascular disease	34 (5)
No cardiovascular disease	350 (55)
Sleep apnea	35 (5)
Age under 30 years	41 (6)
Age 30 to 44 years	115 (19)
Age 45 to 60 years	303 (47)
Age over 60 years	181 (28)
Social data	**n=627* (100%)**
Low educational background	88 (14)
Blue collar employee	138 (22)
High school degree	237 (38)
University or equivalent	164 (26)
Income data	**n=596* (100%)**
annual income <30000 €	189 (32)
annual income 30000-50000€	208 (35)
annual income >50000 €	199 (33)

*=number of patients who disclosed the respective data.

Table 2a. The amount how much patients with no own HBPM device are ready to pay for a device according to annual family income level (n=164).

*n=164**	**<30 000 €**		**30 000 to 50 000 €**		**>50 000 €**	
	n=64		**n=54**		**n=46**	
nothing	7	11%	4	7%	6	13%
<30 €	17	27%	15	28%	12	26%
31–60 €	28	44%	23	43%	18	39%
61–90 €	7	11%	9	17%	7	15%
91–120 €	5	8%	3	6%	3	7%
121–150 €	0	0%	0	0%	0	0%
>150 €	0	0%	0	0%	0	0%

Discussion

The core aim of the present study was to disclose the opinion of the patients about an acceptable price level for a home blood pressure measuring device. Accordingly the result of the present study can be interpreted as a cost-effectiveness analysis of HBPM devices from the patients' point of view. Patients valuated HBPM devices higher if they already owned one which is most probably a consequence of positive effects gained using the device.

Study patients were asked to valuate only the device itself. It seems that patients who did not own a HBPM device have neglected subjective and non-monetary values in HBPM, like for example the freedom to measure BP regardless of place or time. In our previous study [**4**] we showed that Finnish hypertensive patients had vague ideas about the fundamental benefit of BP treatment and they did not measure their BP at home as suggested in the European guidelines [**1**]. The economical comprehension of these patients concerning HBPM appears to be in line with this observation. Patients who already had a HBPM device and hence at least some experience of its influence on the BP treatment had a tendency to prefer higher prices for the device. This indicates the consideration and valuation of the non-monetary measurable effects. Results might have been even more suggestive if patients were

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Table 2b. The amount how much patients with HBPM device already at home consider as a suitable price for a monitoring device according to annual family income level (n=432).

*n=432**	<30 000 €		30 000 to 50 000 €		>50 000 €	
	n=125		n=154		n=153	
<30 €	15	12%	10	8%	13	10%
31–60 €	53	42%	57	35%	53	39%
61–90 €	41	33%	62	39%	60	33%
91–120 €	14	13%	20	17%	26	16%
121–150 €	1	1%	4	1%	1	2%
>150 €	1	1%	1	0%	0	0%

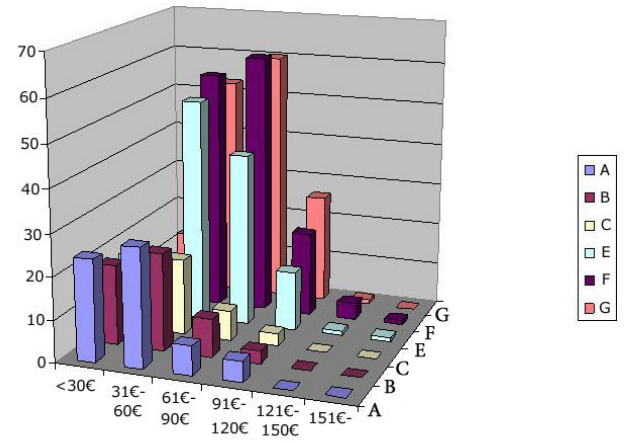

Figure 1. The amount (€) how much patients with no own HBPM (**A**, **B** and **C**) and with own HBPM (**E**, **F** and **G**) are willing to pay for a HBPM device according to their annual family income level* (n=596). *=A and E–annual income level<30000€, B and F-annual income level 30000 to 50000, C and G–annual income level>50000e.

instructed to evaluate the effects of HBMP more detailed.

Minority of the patients without own HBPM device was willing to spend more than 90 € and more than one third only maximum of 30 € for it. This low economic valuation of HBPM device underlines how much the patients valuate the preventive effects of blood pressure care on subjective level. Although a considerable sum of money, 90 € can be spent very easily in daily life. By 90 € you can bye for example about 50 litres of petrol or four boxes á 24 cans of beer in Finland. It is very common that people follow the principle that small benefits right now easily run over better benefits in the future. Thus the reluctance to invest in HBPM equipments is quite understandable as benefits of a proper antihypertensive care are often statistical and realize after a long period. This somewhat poor economical HBPM compliance of patients without own HBPM device may very well associate with failing BP treatment compliance. It seems that the more patients are involved in BP care the better is the economic compliance and most probably also the BP care.

Imai [5] stated in his review based on earlier studies [6,7] that the introduction of HBPM has resulted in a decrease in annual medical expenditure of about one trillion yen. Also the number of antihypertensive drugs has decreased [8,9]. Imai states that HBPM should be considered the gold standard for the diagnosis of hypertension. HBPM devices are not always cheap. At present the market price range for HBPM devices in Finland is between 27 and 266 € with mean price of 85 € and median of 73 € [10]. Due to great benefits seen in those studies concerning both the economy and morbidity in hypertension it would be beneficial that the HBPM devices were reimbursed as the antihypertensive drugs.

Neither economical status nor education seemed to influence the economical compliance with the HBPM equipments. Nearly indentical proportion of families with annual income in excess of 50000 € or less than 30000 € would have regarded a price tag of 90 € or more as an acceptable. It appears that the opinion about the economical cost effectiveness of the HBPM depends more on the attitude towards antihypertensive treatment and its consequences than the financial resources available.

The patient material in the present study was collected using a population pool of a private Gallup survey company. The method used enabled to communicate with the patients directly, without the influence of health care. On the other hand this method is susceptible for various biases like age, capability to use computer and perhaps also economical status. We also lack information about the antihypertensive medication, the detailed cardiovascular risk factor status of the patients and achieved BP values. Nevertheless, we believe that we have received real opinions of the hypertensive individuals. The present approach is better for collecting data about financial aspects of the home BP monitoring compared to situation where health care professionals interview patients and fill in questionnaires. Electronic questionnaire is quite straightforward and easy to complete and send back. Probably easiness explains why our answering percentage (64%) was considerable compared for example to 34% seen in the study of Tyson et al., using mailed questionnaire [11].

It is, of course, possible that data derived from hypertensive pool of the private survey company, although chosen randomly from all parts in Finland, is not applicable with the whole Finnish hypertensive population. Because in this survey BP data was not collected we cannot judge our material in relation to the severity of the hypertension. On the other hand the cardiovascular risk factor profile of the patients in our material was quite similar when compared with national cross-sectional BP studies [2]. Age distribution in our study was comparable with the home BP study by Niiranen et al., [13] but when compared with the population in a larger cross-sectional BP study by Varis et al., [2], the present material was somewhat younger. This increases the validity of the present

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paper as among the elderly physical activity or its absence affects the factors behind elevated BP [16].

Finland has very homogenous population and some enrichment of genetic diseases. Recent studies suggest that genetic factors like the calcium/calmodulin dependent kinase IV (CaMKIV) and signalling molecules, for example the G-protein-coupled receptor kinase (GRK) may play role in vascular tone regulation and hence in hypertension [17,18]. Although genetic factors may hamper the comparison or implementation of BP treatment or controlling results from different countries or nations, we believe that results from the present study can be applied to HBMP world-vide. Future BP treatment result studies considering the genetic factors are very warranted in this country.

Conclusion

The financial BP home measurement compliance of the patients without own HBPM device was low. Main reason for the measurement undervaluation is probably low appreciation of the concept of BP home measurement, like for example the freedom to measure BP at any time and thus guide their antihypertensive treatment. On the contrary, patients who had already a HBPM device and hence experience of its influence on the BP treatment had a tendency to pay higher prices for the device. As HBPM has been shown to decrease the cost of hypertension treatment the reimbursement of HBPM devices should be considered as already antihypertensive treatment is reimbursed.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors' contributions	JPV	IMK
Research concept and design	--	✓
Collection and/or assembly of data	--	✓
Data analysis and interpretation	✓	✓
Writing the article	✓	✓
Critical revision of the article	✓	✓
Final approval of article	✓	✓
Statistical analysis	✓	✓

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