STUDIECENTRUM VOOR ECONOMISCH EN SOCIAAL ONDERZOEK

VAKGROEP PUBLIEKE ECONOMIE

LABORATORY TESTING IN THE GENERAL PRACTITIONER'S OFFICE : ECONOMIC CONSEQUENCES

Diana DE GRAEVE*
Krista HUYBRECHTS*
Luc DESSERS**
Jan HEYRMAN**

report 92/269

February 1992

* UFSIA, Studiecentrum voor Economisch en Sociaal Onderzoek
** KUL, and Vlaams Huisartseninstituut

Universitaire Faculteiten St.-Ignatius
Prinsstraat 13 - 2000 Antwerpen

D/1992/1169/04

ABSTRACT

The QBC is a newly developed laboratory instrument for use in a general practitioner's office. In this article, the effect of the introduction of the QBC is analyzed in a controlled experiment. The attention is focused on the usage and appreciation of the instrument by the general practitioner. In addition the impact of the instrument on the treatment behavior and medical costs for a few specific conditions and on the total prescription costs for blood analyses is estimated. Last of all, the effect of the use of the QBC on the income of the physician is analyzed.

ACKNOWLEDGEMENTS

****

The authors are grateful to Becton Dickinson for their financial support. We also appreciate the collaboration of all general practitioners who were willing to collect the necessary data. Special thanks are due to Prof. G. Carrin and Prof. W. Nonneman who offered helpful comments on the setup of the experiment and on earlier drafts of this paper.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Laboratory tests in general practice are used to exclude or confirm diagnosis and to monitor treatment. Usually blood samples are analyzed in a laboratory, which subsequently informs the physician of the test results. On the basis of these results, the physician can start or adjust therapy.
The biggest advantage of decentralized testing (the physician analyzes the blood sample himself), is timely information. The physician can immediately integrate the information of the test result in the clinical management of the patient. This means possibly that the correct therapy can immediately be started or that further investigations are more to the point.

The QBC (**Q**uick **B**lood **C**ount) is now a newly developed lab instrument for decentralized blood testing. It is developed by Becton Dickinson, for use in a general practitioner's office. The instrument makes it possible for the physician to dispose of eight bloodparameters, e.g.

- platelets
- lymphocytes/monocytes
- percentage lymphocytes/monocytes
- granulocyte
- percentage granulocyte
- white blood cells
- hematocrit
- hemoglobin

The purpose of this study is twofold. First we will evaluate usage and appreciation of the QBC by the general practitioner (GP). Secondly, we will estimate the effect of the use of the QBC on medical costs.

Paragraph two of this article describes the methodology used in this study. The frequency, reason and time of use of the QBC in our sample as well as the evaluation

of the instrument by the GP is presented in paragraph three. Paragraph four analyzes the economic impact of the introduction of the QBC. Our attention is directed to changes in the overall prescribing of blood analyses and in the treatment behavior for a few specific conditions. The focus of paragraph five is on the impact of the use of the QBC on the income of the physician. Paragraph six concludes.

2. METHODOLOGY

The effect of the introduction of the QBC will be tested in a controlled experiment to which 43 general practitioners agreed to participate (non-random sample[1]). The experiment was set up as follows.

In a **first registration period** (5/3/1990 till 29/4/1990), participating physicians were asked to register the medical history of patients with some predetermined complaints (indications) on a questionnaire. These conditions were:

- follow-up toxical medication;
- acute strong abdominal pain;
- sore throat;
- potential anaemic conditions;
- fatigue without a cause.

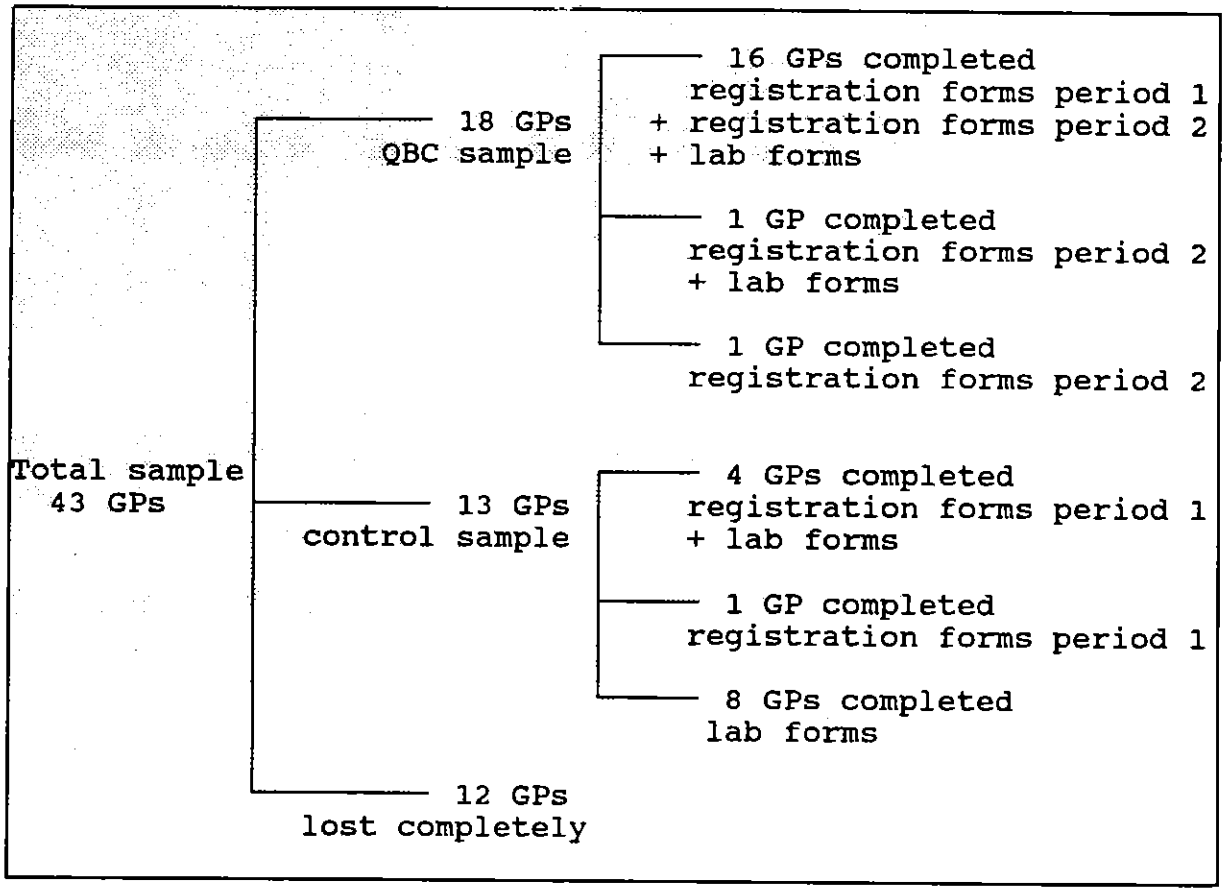
This registration form will enable us to follow the treatment and calculate the treatment costs of the specified conditions.
In addition the GPs should keep (a double of) the prescriptions of blood analyses of all patients.

In a **second registration period** (7/5/1990 - 1/7/1990) half of the physicians received a QBC for use in their offices. This group will be called the 'QBC-group'. The GPs were learned how to use the equipment (in one week between the two registration periods). They were told that they could use the instrument whenever they thought it

was useful. For this group the registration went on as in the first period. Registration forms had to be filled in for the five specific conditions and each time when a blood sample was taken for analyses with the QBC.
The other half of the sample didn't receive the equipment. They constituted the control group and only had to collect all prescriptions of blood analyses.

Because of incomplete and inaccurate registration, our total sample was heavily reduced. The resulting situation is presented in figure 1.

Figure 1 : Sample Size



As you can see, not all physicians have a complete registration for all forms and in all phases. In the following, whenever we analyze data for a specific phase or form, we will use all complete registrations available. When we make comparisons between

different phases or forms we will only use physicians present in all compared subsamples.

Before presenting the results, we want to stress that our (remaining) sample is too small to draw any firm conclusions. This is all the more true since physicians reveal a highly dispersed prescribing behavior. Results can only be viewed as preliminary, guiding future research.

3. USE OF THE QBC AND EVALUATION BY THE GP

3.1 Use of the QBC

In phase two, 18 physicians received the QBC. In this eight-week period, these physicians used the QBC 538 times. This amounts to a mean use of 30 times per physician, or 3.2 times per 100 patient contacts.

For the five specified conditions, the equipment was used 364 times (see table 1) or for 60% of the cases. The QBC is most heavily used for potential anaemic conditions (93% of cases), for acute abdominal pain (86% of cases) and for fatigue without cause (83% of cases). These three conditions taken together amount for nearly half (49%) of the total use. For the follow-up of toxic medication and for sore throat, the QBC is still used for respectively 64% and 26% of consultations for these specific conditions.

As concerns the time of use of the QBC, this was predominantly during consultation, in presence of the patient (72%), and to a lesser extent after the patient left the practice (13%). Use of the equipment after the consultations or after home visits is rare (respectively 6% and 8%) (see table 2).

Table 1 : Use of the QBC by the physician

Use QBC	C O N D I T I O N 1	2	3	4	5	1→5	6	1→6
percentage	64%	86%	26%	93%	83%	60%	95%	68%
absolute	42	56	61	100	105	364	174	538

Condition 1 = follow-up toxic medication
2 = acute abdominal pain
3 = sore throat
4 = potential anaemic conditions
5 = fatigue without cause
6 = other

Table 2 : Time of use of the QBC

Time of use of the QBC	frequencies
* in the presence of the patient	383 (72%)
* during consultation when patient left	69 (13%)
* after home visits	43 (8%)
* after consultations	32 (6%)
* other	2 (0%)

When looking at these figures, one should bear in mind that the incentives for the physician to use or not use the QBC, are different in this experiment, than they will be after registration of the equipment. In our experiment, the physician did not bear any financial costs for the use of the equipment. On the other hand, he could not charge the patient for the performed tests.

3.2 Evaluation of the QBC

The registration forms of phase two of physicians in the QBC-group, contained a few questions concerning the therapeutic and diagnostic value of the equipment for the patient. Whenever the QBC was used, physicians had to fill in these evaluation questions. Physicians generally appreciate that blood parameters are directly available (see table 3). They confirm that, when used, the QBC helps in immediately eliminating certain pathologies in 70% of cases. The QBC also helps for a quick follow-up of an illness or therapy (66% of cases), for the reduction of the number of differential diagnosis (63% of cases) and for stating (59% of cases) or confirming (56% of cases) diagnosis. Physicians agree with the proposition that the QBC makes further blood analyses more to the point (75% of patients). For 36% of the patients, the physicians even state that the use of the QBC makes further blood analyses needless.

In addition, the physicians of the QBC subsample received an extra questionnaire after the registration period. Now, the physicians were asked to evaluate the QBC in general. They had to express their agreement/disagreement with seven statements on a scale from 10 (agree totally) to 1 (disagree totally).

In general, one can say that physicians are rather satisfied with the equipment (see table 4). It is simple (mean score of 8) and quick (mean score of 7) to manipulate and physicians trust it (mean score of 7). The QBC has a surplus value when formulating the differential diagnosis, for the treatment and for the follow-up of patients (mean score always ≥ 6). Physicians are skeptical that further blood analyses demanded, will be more specific (mean score of 4).

Seventy percent of physicians wants to have the results of a complet, the blood analyses performed by the QBC, immediately for 1 to 5 % of all patient contacts. Only for anaemic conditions and acute abdominal pain, a majority of physicians thinks the complet is also sufficient. Most of the time, more analyses are preferable.

This may also explain why physicians think the equipment is not especially useful, or even not useful at all for urgent cases, or for patients with a known pathology.

Table 3 : Evaluation of the QBC during use: descriptive statistics

PROPOSITION	JUDGEMENT
1. Use of the QBC makes further blood analyses needless	right : 181 (36%) wrong : 321 (64%)
2. Use of the QBC makes further blood analyses more to the point	right : 292 (75%) wrong : 96 (25%)
3. Use of the QBC helps for stating a diagnosis	right : 298 (59%) wrong : 98 (20%) doubt : 22 (4%) irrelevant:84 (17%)
4. Use of the QBC helps for confirming a diagnosis	right : 284 (56%) wrong : 100 (20%) doubt : 14 (3%) irrelevant:105(21%)
5. Use of the QBC helps for eliminating the number of differential diagnoses	right : 318 (63%) wrong : 73 (15%) doubt : 13 (3%) irrelevant:99 (20%)
6. Use of the QBC helps for immediately eliminating pathologies	right : 353 (70%) wrong : 39 (8%) doubt : 17 (3%) irrelevant:96 (18%)
7. The QBC helps for a quick follow-up of an illness or therapy	right : 335 (66%) wrong : 49 (10%) doubt : 7 (1%) irrelevant:114(23%)

Table 4 : Evaluation of the QBC ex post: descriptive statistics

Questions	Answers (18 QBC-physicians
Evaluate these statements on a scale of ten points	**Evaluation scale 10.....1 totally agree totally disagree**
* The information concerning use of QBC is excellent	mean score = 9
* Technical manipulation is very simple	mean score = 8
* Manipulation is not time-intensive	mean score = 7
* The QBC is fully confident	mean score = 7
* Using the QBC means a surplus value for my practice	mean score = 6
* The QBC enables to formulate the differential diagnosis more quickly and easier	mean score = 7
* The QBC fastens therapy and gives more certainty	mean score = 7
* Due to the QBC, I could follow my patients better	mean score = 6
* Due to the QBC, further blood analysis are more specific	mean score = 4

Table 4 : Evaluation of the QBC ex post: descriptive statistic
(continuation)

Questions	Answers
This complet is sufficient for most cases of	
* acute abdominal pain	Yes : 10 GPs (62.5%) No : 6 GPs (37.5%)
* follow-up toxical medication	Yes : 7 GPs (41.2%) No : 10 GPs (58.8%)
* sore throat	Yes : 8 GPs (47.1%) No : 9 GPs (52.9%)
* anaemic conditions	Yes : 11 GPs (61.1%) No : 7 GPs (38.9%)
* fatigue	Yes : 7 GPs (38.9%) No : 11 GPs (61.1%)
How often would you like to have the results of the QBC tests immediately (for 100 contacts?)	never : no GPs 1 to 5 : 12 GPs (70.5 %) 6 to 10 : 2 GPs (11.8%) 11 to 20: 3 GPs (17.7%) > 20 : no GPs
Did your consultations change because of the QBC?	Yes : 2 GPs (11.1%) Sometimes: 13 GPs (72.2%) No : 3 GPs (16.7%)
Do you think the QBC is useful for urgent cases?	Yes : 8 GPs (47%) Not particularly:8GPs(47%) Not at all: 1 GP (6%)
Do you think the QBC is useful for patients with known pathology?	Yes : 7 GPs (39%) Not particularly:10 GPs (56%) Not at all: 1 GP (6%)

4. INFLUENCE OF THE QBC ON THE PRESCRIBING BEHAVIOR OF THE PHYSICIAN

In this fourth paragraph, we will analyse if, and how, the behavior of the physician changes, when using the QBC. We will more particularly look at the prescribing of laboratory tests and at the treatment of the five particular conditions.

4.1. Influence of the QBC on lab-test ordering

During phase one and phase two, lab-test ordering (blood analyses) of 29 physicians was registrated. In the second phase, 17 of these physicians have been working with a QBC. The hypothesis we formulate is that when using the QBC, further blood analyses may be omitted or that test ordering is more selective. We therefore compare the two experimental groups. We determine the price and the number of analyses per prescription and per patient contact for the two phases.

An overview of the mean prescribing behavior of clinical biology for the different subsamples and for the different registration periods, can be found in table 5. The price and the number of analyses decline from the first registration period to the second as well for the whole sample as for the two subsamples. Contrary to expectations, the decline is biggest for the control group. Analysis of variance for the different variables show however that there is no statistically significant[2] difference in the decline between the two experimental groups (see table 6). The hypothesis that the QBC reduces the number of prescriptions and the number of analyses per prescription, is not confirmed.

Neither in the control group, nor in the QBC group is the prescribing behavior statistically significant[3] different between the two registration periods (see results of the paired t-test in table 7).

Table 5 : **Laboratory tests during registration in the different samples and registration periods**

Description	Total Sample	Control Sample	QBC Sample
F I R S T R E G I S T R A T I O N P E R I O D			
Price per prescription	1 568	1 524	1 599
Price per contact	88	97	84
Analyses per prescription	17.4	16.8	17.8
Analyses per contact	0.9	1.0	0.9
S E C O N D R E G I S T R A T I O N P E R I O D			
Price per prescription	1 505	1 436	1 554
Price per contact	77	69	82
Analyses per prescription	16.6	16.1	16.9
Analyses per contact	0.9	0.8	0.9
D I F F E R E N C E (period one - period two)			
Price per prescription	63	88	45
Price per contact	11	28	2
Analyses per prescription	0.8	0.7	0.8
Analyses per contact	0	0.2	0

Table 6 : **Statistical significance of the change in prescribing behavior between experimental groups: an analysis of variance**

Variable	F-value	Degrees of freedom	F-probability
Difference between phase 1 and phase 2 in the:			
Price per prescription	1.13	1 and 27	0.72
Price per contact	2.92	1 and 21	0.10
Analyses per prescription	0.26	1 and 27	0.87
Analysis per contact	1.06	1 and 21	0.31

Table 7 : **Statistical significance of the change in prescribing behavior between registration periods: a paired t-test**

Variable definition	t-value	degrees of freedom	probability
1. control sample			
Price per prescription	1.24	11	0.24
Price per contact	1.69	7	0.13
Analysis per prescription	1.25	11	0.28
Analysis per contact	1.29	7	0.24
2. QBC-sample			
Price per prescription	0.54	16	0.60
Price per contact	0.29	14	0.78
Analysis per prescription	1.08	16	0.30
Analysis per contact	0.44	7	0.66

4.2 Influence of the QBC on the treatment of five specific conditions

A pilot study revealed that the complet, the blood analyses performed by the QBC, were especially interesting for five conditions (follow-up of toxic medication, acute heavy abdominal pain, sore throat, potential anaemic conditions and fatigue without a cause. During phase one and two, sixteen physicians using the QBC, have completed registration forms for all their patients with these specific conditions. In this paragraph we will analyse the influence of the QBC on the treatment of the conditions on the basis of these registration forms.

Table 8 summarizes treatment patterns for the conditions in registration period one and two. As you can see, there are no statistically significant differences in the number of patients with sickness absence, referred, having a follow-up or a technical intervention. Neither did the costs of prescribed medicines change during the two registration periods. Only the number of patients for which a blood sample was sent

to a laboratory, reduced significantly. This was especially true for patients with fatigue without a cause, with a potential anaemic condition and for patients on follow-up of toxic medication (see table 9).

Table 8 : **Statistical significance of the change in treatment patterns of patients with five specific conditions in registration periods one and two: a paired t-test**

Variable description	registration period one	registration period two	t-test sign.
% of patients with sickness absence	36%	30%	.19
% of patients referred	11%	15%	.24
% of patients needing a follow-up	81%	79%	.37
costs of prescribed drugs per patient	360 BF	323 BF	.47
% of patients with an intervention	7%	9%	.52
% of patients with blood sample for lab	55%	39%	.00

Table 9 : **Statistical significance of the change in laboratory testing for five specific conditions: a paired t-test**

Condition	% patients with lab tests		difference (phase 1 - phase 2)	t-value	degrees of freedom	pro-babi-lity
	phase1	phase2				
toxic medication	83%	60%	22%	1.88	9	0.09
abdominal pain	35%	31%	3%	0.39	9	0.71
sore throat	19%	10%	8%	0.74	13	0.47
anaemic conditions	87%	57%	30%	2.63	10	0.03
fatigue	66%	47%	19%	3.21	14	0.01

When we look at the prescriptions for blood analyses of the patients with the specified conditions, the former findings are confirmed. Table 10 shows that the mean price per patient, of the blood analyses performed in a laboratory, is 180 BF lower in period two. This global cost decrease is due to a drop in the number of patients receiving a prescription, and not to a reduction in the cost per prescription. Taking the five conditions separately, we observe a statistically significant reduction in the laboratory costs for patients with potential anaemic conditions (reduction of 428 BF, significance $p < 0.02$) and for patients with fatigue without a cause (reduction of 387 BF, significance $p < 0.001$). Here, cost savings on the lab bill more than compensate spending for the QBC which amount to respectively 306 BF and 260 BF for the two conditions. This is no longer the case when we take all conditions together. Total costs now increase with some 60 BF per patient contact.

Table 10 **Statistical significance of the change in test costs for five specific conditions: a paired t-test**

	C O N D I T I O N S 1→5					
	1	2	3	4	5	
Price per prescription						
first period (1)	980	1249	1934	1577	2205	1636
second period (2)	1312	1538	2577	1734	2071	1807
difference (1) - (2)	-332	-289	-642	-157	133	-172
t-value	-1.2	-0.5	-6.7	-0.9	0.6	-1.4
degrees of freedom	8	3	3	9	11	38
significance	0.45	0.65	0.01	0.42	0.58	0.17
Price per patient						
first period (1)	785	465	349	1317	1272	851
second period (2)	755	476	324	889	885	669
difference (1) - (2)	29	-11	24	429	387	181
t-value	0.1	-0.1	0.1	3.4	3.9	2.0
degrees of freedom	9	8	11	9	12	53
significance	0.92	0.96	0.94	0.01	0.00	0.06

with condition 1 = follow-up toxical medication
condition 2 = acute heavy abdominal pain
condition 3 = sore throat
condition 4 = potential anaemic condition
condition 5 = fatigue without a cause

Let us remind you however that these results are only based on a very small sample of physicians, and that they are not compared to a control group. Results can certainly not be extrapolated.

5. INFLUENCE OF THE QBC ON THE INCOME OF THE PHYSICIAN

Use of a QBC in the practice, brings about costs and income for the general practitioner.

Costs embody fixed and variable costs. Variable costs comprise a tube to collect the blood costing 60BF and the time input of the physician, which is estimated at 178 BF (8 minutes at a wage rate of 1 335 BF/hour[4]). The fixed costs comprise the costs of the equipment and taxes, 229 747 BF. When we take an amortization period five years and a marginal tax rate of 50% (tax reduction for the physician due to higher costs), yearly fixed costs amount to 22 975 BF.
The income is made up of the social security tariffs the physician receives for the blood analyses and a supplementary fee. These amount to 356 BF.

The break-even point, giving the number of blood analyses performed with the QBC, for which the costs match the revenue, is situated at 195 analyses a year. It is the result of the following equation:

$$356x=22975+(60+178)*x$$

with : x = yearly number of blood analyses

Figure two gives a graphic representation of the influence on the income of the physician of different utilization rates of the QBC. This is done for our basic scenario, where we take a physician time input of 8 minutes[5]. It is also done for alternative values of the time input of 45 BF, 112 BF and 223 BF[6]. The break-even points vary from 92 to 125 and to 315 analyses for these three alternative scenarios. As you can see there is a direct positive effect of the number of analyses performed on the physician's yearly income.

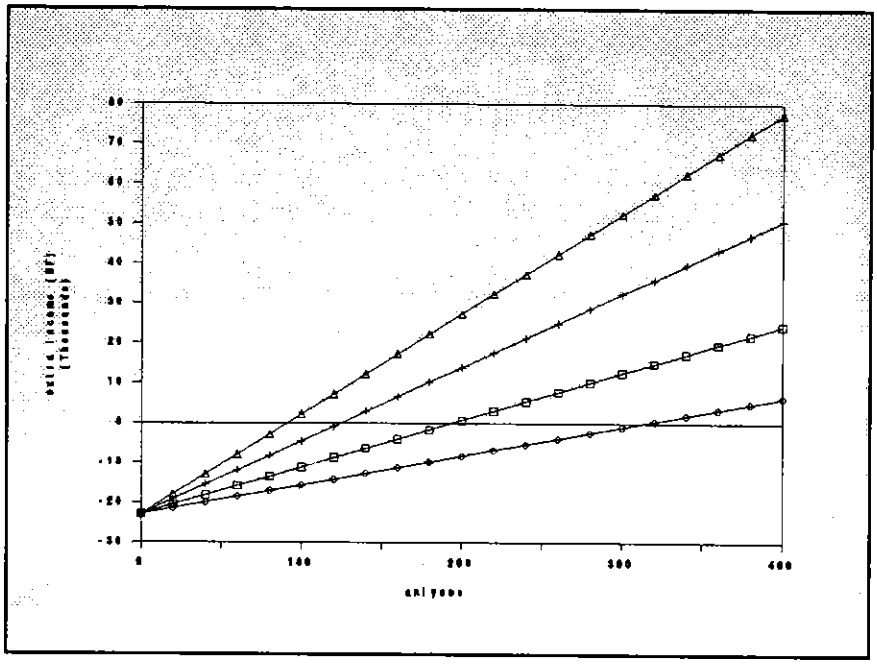
Figure 2 : The extra income of the physician, using the QBC
(no discount rate)

Parameter values

discount rate = 0%
amortization period
= 5 years
value of time input:
△ = 45 BF
\+ = 112 BF
□ = 178 BF
◇ = 223 BF

Break-even points

△ = 92
\+ = 125
□ = 195
◇ = 315



When we take the differential timing of costs and benefits into account (costs are paid immediately, whereas tax exemptions and income are realized during the whole five-year period), we get the following equation to obtain the break-even number of analyses:

$$(356-60-178)\ x\left(\frac{1-e^{-r5}}{r}\right) + 22975\left(\frac{1-e^{-r5}}{r}\right) - 229747$$

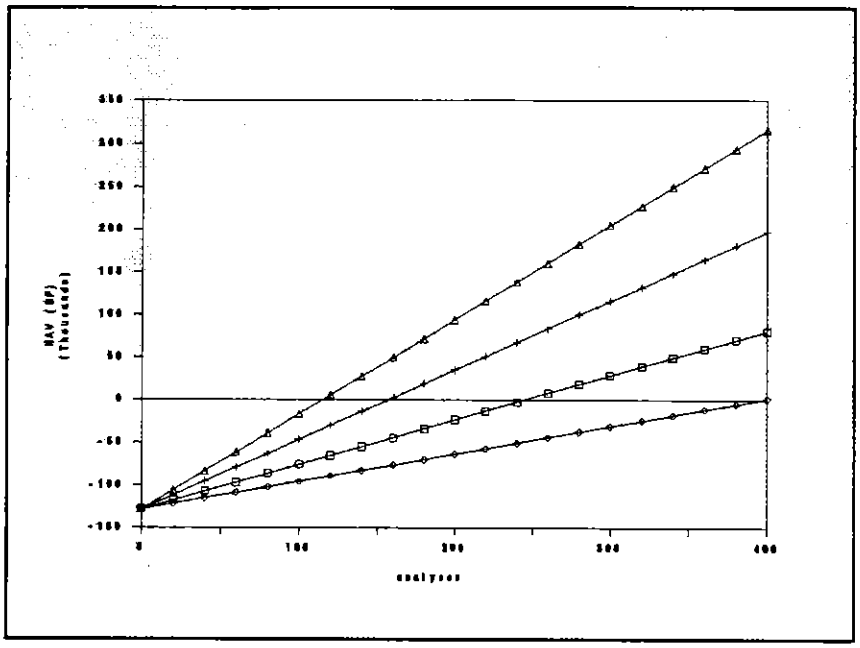
with : x = yearly number of blood analyses in year 1 to 5
r = discount rate

With the discount rate set equal to 5 percent[7], 255 blood analyses have to be performed in a year to equalize benefits and costs.

Again we varied the time input of the physician from 45 BF, to 112 BF and to 223 BF. We have then calculated the Net Actual Value of the extra income for the

physician during the economic life time of the equipment of five years, for different numbers of analyses performed each year, during five years[8]. Although the physician now has to perform a greater number of analyses to break even, (115, 157 and 397 analyses respectively) the direct positive link between the number of analyses performed and income maintains.

Figure 3 : **The extra income of the physician, using the QBC**
(positive discount rate)



parameter values

discount rate = 5%
amortization
period = 5 years
time input:
△ = 45 BF
\+ = 112 BF
□ = 178 BF
◇ = 223 BF

Break-even points

△ = 115
\+ = 157
□ = 245
◇ = 397

From the analysis it is very clear that the value of the time input is an important factor to explain the profitability of the QBC for the GP.

Firstly, this value is made up of the time spent to perform the QBC analyses. In our experiment, the physicians stated that the length of the consultation time is extended with 8 minutes, when the QBC is used. Experts however told us that this extra time input is extremely large and could certainly be reduced, perhaps to a level as low as two minutes. When learning physicians how to use the equipment, the organizational aspects to limit extra time input, should certainly be stressed.

Secondly, the implicit hourly wage rate determines the value of the time input. It is obviuous now that starting GPs, with only a small number of patients, have a much lower implicit wage rate and thus face smaller costs when using the QBC. These

physicians could well view the QBC as an attractive way to supplement their income. On the premise of course that they have a minimal number of patients, to reach the small break-even number of tests.

6. CONCLUSION

The QBC is a laboratory instrument which is appreciated by the general practitioner. In particular circumstances, it is convenient for the physician to directly dispose of test results, to confirm or state diagnosis (differential diagnosis) or for follow-up of the patient. The QBC certainly represents a surplus value in the GP's practice.

However it is much less clear whether the use of the QBC will have any direct impact on the treatment of the patient. In our modest experiment, lab prescribing excluded, we could not find any significant change in the treatment of five specific conditions: follow-up toxical medication, acute strong abdominal pain, sore throat, potential anaemic conditions and fatigue without a cause. The small number of analyses that can be performed on the QBC, the very high number of laboratories in Belgium with a quick service and the mostly non-emergency patients seen by a GP, are factors that might contribute to these findings. Although the results of our experiment are too limited to be generalized, the above arguments indicate that potential treatment benefits will at most be very small.

On the other hand we did observe significant reductions in the number of prescriptions for blood analyses in a laboratory for two of the five conditions (potential anaemia and fatigue). Because of higher costs of own blood analyses, cost savings for clinical biology were not obtained in our experiment. Given the positive link between use of the QBC and income of the physician, more generalized use of the QBC might well entail cost increases. The introduction of decentralized lab testing, might help to contain costs of clinical biology however. Alternative

remuneration systems and accompanying programs educating physicians to prescribe more selectively, might well be necessary then.

ENDNOTES

1. The physicians were recruited via a letter inviting to participate, published in a Journal; in addition 200 physicians, collaborators of the 'Wetenschappelijke Vereniging voor Vlaamse Huisartsen' received the letter personally.

2. In the analysis of variance, we have to reject the hypothesis that the means in the different subgroups are equal, when the significance level is sufficiently small (usually ≤ 0.05 or sometimes even ≤ 0.01).

3. Also with the paired t-test, we have to drop the hypothesis that the means in the different subgroups are equal, when the significance level is sufficiently small.

4. The wage rate is calculated as follows:
The mean duration of a consultation is 19 minutes (DE GRAEVE (1989). Eighty eight percent of consultations are performed by a GP with a degree of continuing education and cost 435 BF. Twelve percent of consultations are performed by GPs without this degree and cost 337 BF. This gives us a mean wage rate of (0.88*435BF + 0.12*337BF)/19minutes = 22.3 BF/minute, or 1335 BF/hour.

5. In our experiment, the mean extra time input necessary for performing a blood analysis with the QBC, was eight minutes (as stated by the physician).

6. When we take the time input to perform the QBC-analysis fixed at 8 minutes, the values correspond to a wage rate of 338 BF/hour, 840 BF/hour and 1673 BF/hour respectively. Alternatively one could fix the wage rate at 1335 BF per hour and vary the time input to perform the QBC-tests from 2 to 5 and to 10 minutes.

7. The discount rate does only reflect time preference, since all costs and benefits are expressed in base-year prices.

8. We did not calculate the yearly extra income, since this value differs from year to year (because of the use of a discount rate and the differential timing of costs and benefits). We thus calculated the Net Actual Value of the extra income during the five years.

BIBLIOGRAPHY

BERNSTEIN, L.H. "Decentralized testing: cost implications and benefits", in Clinical biochemistry nearer the patient II. Ed. V.M. MARKS en K.G.M.M. ALBERTI, London, Baillière Tindall, 1986, blz.159-165.

BORGQUIST, L. en N. TRYDING. Decentralized laboratory testing: organizational, behavioural and economic consequences. European Conference on Health Economics, 1989, 20 blz.

BUCKLY, B.M. en P.M.G. BROUGHTON. "A clinical view of analytical performance requirements", in Clinical biochemistry nearer the patient II. Ed. V.M. MARKS en K.G.M.M. ALBERTI, London, Baillière Tindall, 1986, blz.45-58.

DE GRAEVE, D. Economische aspecten van geneesmiddelenconsumptie: empirische modellen van artsen- en patiëntengedrag. (proefschrift), Antwerpen, UFSIA, 1989.

EPSTEIN, A.M. en B.J. Mc NEIL, Factors influencing ambulatory test use. Center for the analysis of health practices, Boston, 22 blz.

HAAN, G.J.H. "Reflotron (discussie)", Huisarts en wetenschap, 1989, vol.32, nr.7, blz.275-277.

GIBB, I. "Pre- and post-analytical considerations in near-patient testing", in Clinical biochemistry nearer the patient II. Ed. V.M. MARKS en K.G.M.M. ALBERTI, London, Baillière Tindall, 1986, blz.103-113.

GOTTLIEB, S. et.al. "Short report: performance of Ames Seralyzer in the doctor's office", in Clinical biochemistry nearer the patient II. Ed. V.M. MARKS en K.G.M.M. ALBERTI, London, Baillière Tindall, 1986, blz.126-128.

KESENNE, J. en L. CANNOODT. Laboratory testing in the Belgian health care. Second World Congress on Health Economics (10-14 september 1990, Zürich), 25 blz.

MARKS, V.M. "Nearer-patient testing: an overview", in Clinical biochemistry nearer the patient II. Ed. V.M. MARKS en K.G.M.M. ALBERTI, London, Baillière Tindall, 1986, blz.3-9.

PETRANYI, G. et.al. "Usefulness of the reflotron dry-chemistry analyzer in metabolic outpatient clinics", in Clinical biochemistry nearer the patient II. Ed. V.M. MARKS en K.G.M.M. ALBERTI, London, Baillière Tindall, 1986, blz.129-139.

SOBEMAP-SESAM. Klinische biologie (eindrapport), mei 1989.

STOTT, N.C.H. "Desktop laboratory technology in general practice: quality assurance schemes are important", British Medical Journal. september 1989, vol.299, blz.579-580.

STRAUB, E.J. en T. HUGHES. "Laboratory testing in the physician's office", in Clinical biochemistry nearer the patient II. Ed. V.M. MARKS en K.G.M.M. ALBERTI, London, Baillière Tindall, 1986, blz.122-125.

TRYDING, N. "Clinical need for analysis nearer the patient", Upsala Journal of Medical Sciences. 1986, vol.91, blz.185-188.

VAN DEN BOSCH, W. et.al. "De reflotron in de huisartspraktijk: meer mogelijkheden voor de huisarts om zelf laboratoriumbepalingen te verrichten", Huisarts en Wetenschap. 1989, vol.32, nr.3, blz.96-99.

LIJST VAN RECENTE SESO-RAPPORTEN

DE BRABANDER G., m.m.v. BLOMMAERT K., GILLE A., LEZY L., MAES T. en F. Witlox, Aspecten van het Antwerpse economische en financiële draagvlak, maart 1991, 60 blz. **(91/254)**

SCHROYEN F., Demand system under rationing : an introduction with special reference to the implications of separability assumptions, March 1991, 26 blz. **(91/255)**

TORFS K. en D. DE GRAEVE, A cost-effectiveness analysis of AOTAL, a drug used to prevent relapse in weaned alcoholics, April 1991, 43 blz. **(91/256)**

VAN POECK A. en J. VAN GOMPEL, The decline in unemployment (1984-90) and the wage formation hypothesis, May 1991, 31 blz. **(91/257)**

HEYLEN F., Long-term unemployment in the OECD-countries. The relevance of structural labour market and labour market policy characteristics, May 1991, 40 blz. **(91/258)**

KONINGS J., Experimentele economie als onderzoeksmethodologie : basisprincipes en resultaten van een duopolie-experiment, juni 1991, 28 blz. **(91/259)**

VAN TRIER W., "State Bonus" or basic income in the age of reconstruction, September 1991, 145 blz. **(91/260)**

PAUWELS W., Some properties of the Hicks and Morishima elasticities of substitution, September 1991, 22 blz. **(91/261)**

MEULEPAS M. en J. PLASMANS, ESTIMATING AND FORECASTING EXCHANGE RATES BY MEANS OF PPP AND UIP, An application on the Belgian Franc and the Dutch Guilder vis à vis the DM and US Dollar, September 1991, 49 blz. **(91/262)**

PEERSMAN G. en A. VAN POECK, De Belgische competitiviteitswet : een betwistbaar instrument, november 1991, 23 blz. **(91/263)**

PLASMANS J. en H. PAUWELS, Modelling and forecasting Belgian stock market prices, December 1991, 59 blz. **(91/264)**

ITO Y., PLASMANS J., DE ZEEUW A., CERVIO PINHO A. & A. MARKINK, Hierarchical optimal control for policy evaluation using econometric models for the European Community, November 1991, 48 blz. **(91/265)**

JENNES G. en G. DIERICKX, Belastingstelsels en belastingbeleid (1955-1988). Een vergelijkende analyse, januari 1992, 51 blz. **(91/266)**

JENNES G. en G. DIERICKX, Het belastingbeleid in 15 OESO-landen (1955-1988) : alternatieve verklaringen, januari 1992, 103 blz. **(91/267)**

DE BORGER B., KERSTENS K., MOESEN W. en J. VANNESTE, Explaining differences in productive efficiency : an application to Belgian municipalities, February 1992, 27 blz. **(91/268)**