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Assessing the Economic Impact of the New System of Care for Arterial Hypertension in Tula Oblast, Russia

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Summary

The Quality Assurance Project/Russia implemented an improved system of care for the management of arterial hypertension (AH) in Tula Oblast in 1999. The components of the new system of AH care included a program for screening at-risk patients, evidence-based guidelines, and a health promotion program. After this improvement, the number of patients managed at the primary care level increased significantly and hospitalizations associated with AH decreased significantly. This study quantified the economic effects of these changes and provided cost information for further redesign of the system of AH care: namely, shifting resources from hospitals to primary care.

Cost and usage data associated with AH care were obtained for all adults assigned to five general practitioners (GPs) during six months before introduction of the new guidelines in 1998 (10,312 adults) and for six months after introduction in 2001 (8,880 adults). AH admissions per 1000 adults dropped 17 percent following introduction of the new guidelines, while adults registered for AH outpatient care increased 47 percent. The cost of AH inpatient care per 1000 adults dropped 32 percent while cost of outpatient care rose 61 percent. However, because one AH inpatient stay costs about ten times as much as caring for the average AH outpatient for one year, overall costs associated with AH care dropped 23 percent among the patients assigned to the five GPs and 11 percent on a per population basis. The most important effect of the new guidelines on cost was the reduction in the number and per-patient cost of unscheduled emergency admissions for AH care.

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Table of Contents

SUMMARY	I
I. INTRODUCTION	1
II. METHODS.....	1
A. Study Design.....	1
B. Population Sample	1
C. Summary of Cost Measurement Methodology	1
III. RESULTS	3
A. Usage Pattern.....	3
B. Cost of AH Care	5
C. The High Cost of Unregistered Patients	5
IV. CONCLUSION AND DISCUSSION	6

Assessing the Economic Impact of the New System of Care for Arterial Hypertension in Tula Oblast, Russia

Hany Abdallah

I. Introduction

The Quality Assurance Project/Russia initiated a demonstration project in Tula Oblast in 1998 with the aim of improving the system of care for arterial hypertension (AH). Significant changes in the system of care affected the identification of patients with hypertension in the community, the clinical guidelines for managing hypertension, and the organization of care and promoting healthy lifestyles.¹

Screening led to more outpatient management of hypertension, and combined with good blood pressure control, also resulted in fewer hospitalizations associated with hypertension. This report summarizes findings from a cost study that measured the economic impact of changing the care system. The study hypothesized that these changes would lead to a reallocation of funds from more expensive hospital care to more cost-effective primary care, possibly saving money for the larger health system.

II. Methods

A. Study Design

The study was conducted in Novomoskov, Tula Oblast, Russia. Each general practitioner (GP) in Tula Oblast is assigned a service population of residents in the area. This study involved five Novomoskov GPs who treated patients in three clinics. The GPs' service population was 10,312 adults (over 15 years old) in 1998 and 8,880 in 2001. Novomoskov Hospital provided emergency and inpatient care to all adult patients in the study population along with patients assigned to other GPs and clinics in Novomoskov.

The study used a before and after cross-sectional design. The Before period was January through June 1998 prior to implementation of AH guidelines, and the After period was January through June 2001, following implementation.

B. Population Sample

Adults in the service population who had received AH outpatient care, or had been identified and classified as having AH, were designated as "registered." They may or may not have been under active GP observation. Adults in the service population who had neither received prior AH outpatient care nor been identified as suffering from AH were designated as "unregistered."

C. Summary of Cost Measurement Methodology

The cost of AH outpatient care was estimated from a sample of the adults assigned to the five GPs during the Before and After study periods. The number of adults from the Before and After service populations who were registered as AH outpatients was 288 in 1998 and 365 in 2001. A random sample of 297 outpatient records were drawn from the adults registered as AH patients: 147 in the Before group and 150 in the After group. Information on outpatient costs was obtained from the records of these 297 patients (see Figure 1).

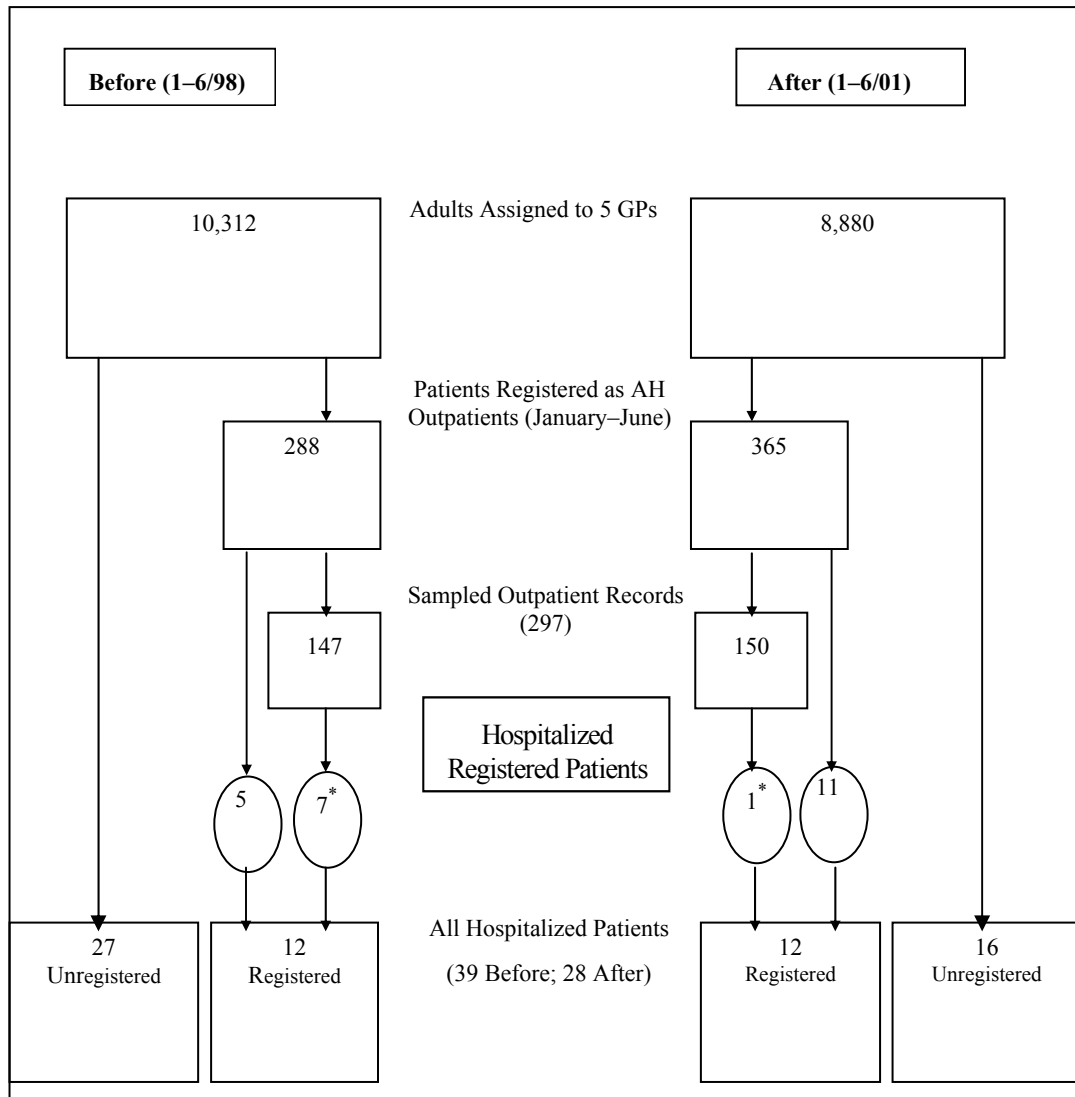
The study measured the average cost per patient and the total cost of treating AH in clinic, emergency, and hospital settings, before and after implementation of the new system. The cost data were analyzed from

Abbreviations

AH	Arterial hypertension
GP	General practitioner
N	Number

¹ The improvements are reported in: *Improving the system of care for patients suffering from arterial hypertension*. 2001. The Quality Assurance Project, University Research Co., LLC, Bethesda, MD. Published by the Quality Assurance Project for the U.S. Agency for International Development and the U.S.-Russia Joint Commission on Economic and Technological Cooperation Health Committee.

Figure 1 Schematic of Hospital Cases Reviewed



three perspectives: (1) per-patient costs related to AH care, (2) total AH costs to the healthcare system over six months, and (3) total AH costs per 1,000 adults over six months.

Information on the elements of care provided to patients who were hospitalized and/or seen as outpatients was obtained from patient medical records, including:²

Cost Category	Description
Medication	Type, dose, and quantity of drugs provided during hospital stay and/or prescribed in outpatient visit(s)
Frequency of visits to outpatient clinic	Number of visits recorded during Before and After periods
Paraclinical care and tests	Type and quantity of paraclinical tests during hospital stay and/or outpatient visit
Length of hospital stay	Admission and release dates for hospital stay(s)
Procedures (e.g., physiotherapy, sauna)	Type and quantity of major procedures performed
Other medical record information	Other relevant information from patient records: age, gender, date of first visit, name of GP, complicating conditions (e.g., diabetes), and other treated conditions

Sources for information also included:

Cost Item	Source
Unit cost of drug for given dose	Central pharmacy and hospital pharmacy
Unit cost of paraclinical test	Novomoskovsk Hospital
Cost per hospital day	Novomoskovsk Hospital, normative and actual, for major complications of AH (including cost of salary, social tax, depreciation, and overhead)
Cost per medical procedure	Novomoskovsk Hospital
Cost of outpatient visit	Tula Oblast financial records

Costs obtained for 1998 were adjusted to account for inflation and the devaluation of the ruble; 1998 prices are expressed in their 2001 equivalent value.

III. Results

A. Usage Pattern

Between the Before and After periods, the number of AH inpatients dropped from 39 to 28 and the number of registered AH outpatients rose from 288 to 365. This is 3.78 AH inpatients per 1,000 adults before compared to 3.15 after (difference not statistically significant) and 27.9 AH outpatients per 1000 adults before and 41.1 after (difference borderline significant, $p=.05$). Nearly all of the reduction in AH admissions was due to fewer unregistered hospitalized patients: 69 percent of AH admissions (27 of 39) were unregistered in the Before group, compared to 57 percent (16 of 28) in the After group (difference highly significant, $p<.001$). Most of the unregistered hospitalized patients were direct emergency admissions (not referred from the outpatient clinic).

² Other elements of interest were investigated but not summarized here included time and cost of screening and promotion activities, average time spent by providers per visit, number of AH patients hospitalized and seen in clinic, expected number of new cases (based on prevalence and incidence rates), estimated number of existing cases based on prevalence, number of beds by department and in total, hospitalization days by department and in total for hospital, and total for patients with AH crises.

Table 1 Summary of Total Six-Month Direct Cost of Caring for Patients with AH

	January–June 1998 (Before New program) ¹							January–June 2001 (After New Program)							% Change	
	N	Unit Cost (rubles)	Units/ Patient	Cost/ Patient	No. of Patients	Total 6-mth Cost	Cost / 1,000 Adults ²	N	Unit Cost (rubles)	Units/ Patient	Cost/ Patient	No. of Patients	Total 6-mth Cost	Cost / 1000 Adults ²	Total 6-mth Cost	Cost / 1,000 Adults ²
Inpatient Cost:																
Hospital bed	39	67.1 per day	20.40	1,371.4	39	53,483	5,186	28	64.4/ per day	17.03	1,097.0	28	30,715	3,459	- 43%	- 33%
Drugs	39	1,105.6 per stay	1.00	1,105.6	39	43,118	4,181	28	1,070.0 per stay	1.00	1,070.0	28	29,961	3,374	- 31%	- 19%
Exam	39	383.3 per stay	1.00	383.3	39	14,948	1,450	28	202.8 per stay	1.00	202.8	28	5,677	639	- 62%	- 56%
Procedures	17	148.6 per stay	0.44	64.8	39	2,527	245	12	40.4 per stay	0.43	17.3	28	484	55	- 81%	- 78%
Total Inpatient Cost				2,925.0	39	114,075	11,062				2,387.1		66,838	7,527	- 41%	- 32%
Outpatient Cost:																
Visit	147	20.2 per visit	2.23	45.0	288	12,960	1,257	150	20.2 per visit	2.42	48.8	365	17,820	2,007	+37%	+60%
Drugs	140	41.5 per 6 ms	0.95	39.5	288	11,381	1,104	146	40.5 per 6 ms	0.97	39.4	365	14,377	1,619	+26%	+47%
Exams	78	57.1 per 6 ms	0.53	30.3	288	8,723	846	104	54.4 per 6 ms	0.69	37.7	365	13,771	1,551	+58%	+83%
Total Outpatient Cost				114.8	288	33,065	3,206						45,968	5,177	+39%	+61%
Total In- and Outpatient Cost						147,140	14,268						112,806	12,698	- 23%	- 11%

Notes: (1) All cost in rubles. Costs in 1998 expressed in 2001 equivalent values to adjust for inflation. (2) Cost per 1,000 adults based on adult population assigned to same 5 GPs in 1998 (10,312) and in 2001 (8,880).

B. Cost of AH Care

Table 1 summarizes the results. The average per-patient cost for AH inpatient care dropped from 2,925 rubles before the intervention to 2,387 after, while the average per-patient cost for AH outpatient care rose from 114 to 125 rubles. All inpatients in the study had only one AH admission during the six-month period under study, while the outpatient cost reflects all outpatient AH care provided during each six-month study period. Total costs to the health system (inpatient plus outpatient) for AH care to the population served by the five GPs dropped 23 percent following the new guidelines: from 147,140 rubles in the Before period to 112,806 in the After period. This savings resulted from a 41 percent decrease in inpatient AH costs (from 114,075 to 66,838 rubles) and a 39 percent increase in outpatient AH costs (from 33,065 to 45,968 rubles). The decrease in total AH costs per 1,000 adults was not as large: Total AH costs per 1,000 adults dropped 11 percent, from 14,269 to 12,703 rubles. (The number of adults in the system decreased between 1998 and 2001 from 10,312 adults to 8,880.)

The largest contributors to the cost of AH care were: (a) the high cost of in-hospital care (particularly for unregistered patients), (b) the many days of hospitalization (about 18.7 days every six months, accounting for about 46 percent of all inpatient costs), and (c) high inpatient drug costs (accounting for about 41 percent of all inpatient costs).

A different set of factors was responsible for most of the observed *change* in costs between the Before and After time periods:

- The 14 percent reduction in the number of adults in the service population
- The 18 percent reduction in the per-patient inpatient cost, a drop that was manifested in all four elements of inpatient care (hospital stays, drugs, exams, procedures)
- The 17 percent reduction in the rate of AH admissions (from 3.78 to 3.15 per 1,000 adults)
- The 10 percent increase in per-patient outpatient costs, due largely to a rise in the cost of exams
- The 47 percent increase in the rate of registered AH outpatients (from 27.9 to 41.1 per 1,000 adults)

Thus, the substantial reduction in inpatient cost was partially offset by the increase in outpatient cost (Figure 2). The key to understanding the relationship of inpatient and outpatient costs is that per-patient inpatient cost is a lot higher than per-patient outpatient cost. In fact, the cost incurred as a result of admitting one AH patient equals the cost of caring for an AH outpatient care for about ten years.

C. The High Cost of Unregistered Patients

Unregistered patients accounted for a large percentage of all inpatient AH cost. In the Before period, unregistered patients generated 80 percent of all AH inpatient costs, and in the After period they generated 63 percent. Total six-month costs of unregistered AH inpatients dropped from 94,284 to 42,656 rubles, while inpatient costs for registered patients remained at about 24,000 rubles (Table 2). Two factors drove the reduction in cost for unregistered inpatient AH care: fewer unregistered admissions (27 before and 16 after) and a lower per-patient cost of unregistered inpatients. Before the new guidelines, unregistered patients had much higher average cost per admission than registered patients (3,409 rubles for unregistered versus 1,858 rubles for registered). After implementation of the new guidelines, the cost of treating unregistered patients is more in line with that of treating registered ones.

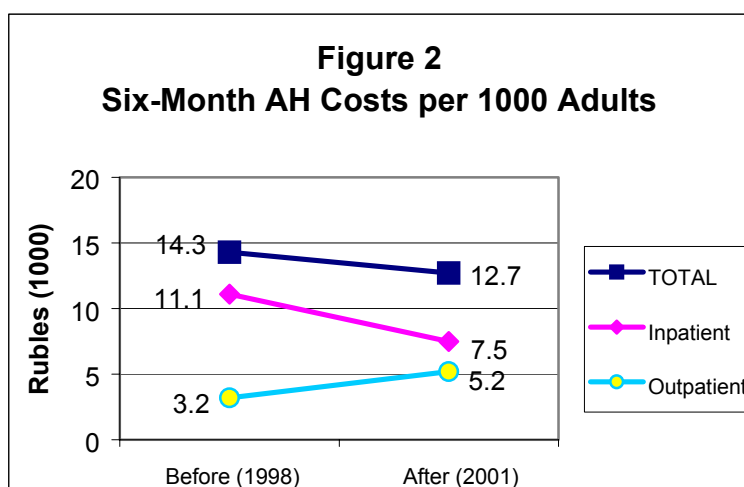


Table 2 Cost of AH Inpatient Care of Registered and Unregistered Patients

	Before (1998)	After (2001)	Percentage Change
Registered:			
Average cost per admission ^{1,2}	1,858	2,046	+ 10.1
Number of admissions	12	12	
Admissions per 1,000 adults ³	1.16	1.35	+16.1
Cost per 1,000 adults	2,162	2,765	+27.9
Unregistered:			
Average cost per admission	3,409	2,626	- 23.0
Number of admissions	27	16	
Admissions per 1,000 adults	2.62	1.80	- 31.2
Cost per 1,000 adults	8,926	4,732	- 47.0
Notes: (1) All costs in rubles, adjusted for inflation to 2001 value. (2) Admissions are for the six-month period (January-June) in both 1998 and 2001. (3) The "per 1,000 adults" calculations assume a denominator of 10,312 adults in 1998 and 8,880 in 2001. (4) Very small discrepancies exist between Tables 1 and 2 due to rounding.			

IV. Conclusion and Discussion

To the extent that quality outpatient care avoids complications and the associated costs of inpatient care, outpatient care is a cost-effective strategy. The study findings support our hypothesis that the new AH guidelines would shift AH care from more expensive inpatient care to less expensive outpatient care, and result in lower overall costs for AH care. As intended, following introduction of the new guidelines the rate of hospital admissions for AH dropped while the number of AH cases under outpatient care rose. In addition, the cost per AH admission decreased 18 percent while the per-outpatient cost rose 9 percent. The net result was a decrease of 11 percent in total costs for AH care, measured per 1,000 adults in the service population.

While it is impossible to show that the new AH guidelines caused the reduction in the number of hospitalizations among unregistered patients, one plausible explanation is that the new guidelines reduced the severity of admitted cases, thereby reducing the cost per case. Early screening and preventive action (advocated by the new guidelines) probably reduced the occurrence of emergency and more complicated AH cases, which require more expensive hospital care. The large drop in the per-patient cost of inpatient care for unregistered patients (from about 3,400 to 2,600 rubles), combined with the fact that unregistered patients account for the entire decrease in number of hospitalizations,³ suggests that treating unregistered AH patients had a significant impact on the economic burden of AH.

We believe this decrease in cost was due primarily to the new guidelines, although several other factors may have contributed. For example, some patients from the service population may have received AH care elsewhere: This possibility is probably minimal due to the stability of the area population and the requirement that people receive care in the assigned service area. Also, we have assumed that the need for care per 1,000 adults was the same in the Before and After periods, but if the age and severity distribution differed in the two study periods, the need for care and therefore cost would differ.

It is possible that causes other than the new guidelines were responsible for the changing pattern and cost of AH care in the two years between the two measurements, such as long-term trends or events other than the new guidelines. Such possibilities were not controlled for in this study. We are not aware of any long-term trends or events that would have caused the observed changes, and in light of the specific intent of the new guidelines to shift the pattern of care towards outpatient care, we believe it is reasonable to conclude that the new guidelines caused most of the cost reduction. Furthermore, as noted above, the increased outpatient activity is probably the reason for the reduction in AH admissions of patients who

³ Unregistered patients accounting for the change in the number of total hospitalized patients for AH changed from 27 to 16, whereas registered cases numbered 12 Before and After (Figure 1).

were not previously registered for AH care, which in turn was the primary reason for the drop in per-inpatient cost for AH care.

The cost savings have not necessarily been turned to productive use. Concerted management actions are required to capitalize on the accrued and potential savings. Such actions could involve realignment of personnel and material resources in the short term and capital investments (for example, rationalization of hospital bed capacity) in the long term. These changes should be made in consideration of other changes occurring in the management of public health priorities (such as other diseases that require hospital care) and in the broader context of the health financing system. It is intended that a second phase of this study will address these issues and propose the best shift of resources to support the cost-effective management of AH.

The improved management of AH under the new guidelines may have far-reaching consequences on individual productivity, life expectancy, and quality of life, benefits that could render the costs of increased screening and preventive care less significant.

