



CHALLENGES TO ACHIEVING EFFECTIVE MANAGEMENT OF PROCESSES IN STATE HOSPITALS IN BULGARIA

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ABSTRACT

The aim of this paper is to analyze the financial status and efficiency of business processes in Bulgarian state hospitals, with the goal of identifying key problems and proposing workable solutions.

Methods: Quantitative and qualitative methods were used, including analysis of public financial reports, scientific publications, WHO reports, IPI reports, and data from the Ministry of Health.

Results: The analysis shows low profitability, high levels of debt, and a weak degree of digitalization. Main problematic areas include personnel costs, medicines, and administrative activities.

Conclusions: Recommendations include the digitalization of processes, centralized procurement, resource optimization, and adopting foreign best practices.

Keywords: health management, efficiency, digitalization, hospital management, state hospitals, financial analysis, business processes

INTRODUCTION

The healthcare system in Bulgaria operates under conditions of dynamic change, limited resources, and increasing societal expectations. State hospitals, which play a key role in providing secondary and tertiary medical care, face serious challenges related to financial stability and management efficiency. The shortage of medical specialists, outdated infrastructure, and low levels of digitalization further complicate their capacity for sustainable development.

In recent years, public debate about the efficiency of state healthcare facilities has intensified, with various analyses highlighting inefficiencies in procurement, accountability, personnel management, and cost control (1, 2). Additionally, accumulated liabilities and overdue payments raise questions about the financial viability of some hospitals (3).

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This article aims to explore the main challenges in managing business processes within healthcare institutions, review good international practices, and propose adapted solutions applicable to the Bulgarian context.

METHODOLOGY

This study combines elements of review analysis and original empirical research. The methods used include:

- **Document analysis:** Analyzing official reports from the World Health Organization (4), the Institute for Market Economics (5), the Court of Auditors, and data from the National Statistical Institute.
- **Comparative analysis:** Evaluating the financial condition of state hospitals from 2013 to 2023, focusing on profitability, debt ratios, and trends in revenues and expenses.
- **Selection of key business processes:** Identifying processes with high financial impact, including human resources management, procurement of medicines, IT infrastructure, and reporting (6).
- **Qualitative analysis:** Incorporating good international practices, including those from Estonia, Finland, and Germany, related to

electronic health records, centralized procurement, and strategic control.

RESULTS

Analysis of public financial reports indicates that revenues of Bulgarian state hospitals increased from 1.15 billion BGN in 2013 to 2.7 billion BGN in 2023. However, expenses also grew proportionally, reaching 2.61 billion BGN in 2023, resulting in limited profitability (between 1.5% and 4.5%).

Accumulated losses in 2023 amounted to 400 million BGN, while total liabilities exceeded 640 million BGN. The analysis of indebtedness shows that overdue liabilities are concentrated in a limited number of hospitals (including the Specialized Hospital for Active Treatment of Hematological Diseases EAD - SHATHD, with over 11 million BGN).

The business processes with the greatest financial weight are:

- **Expenses for medicines and medical supplies:** This includes activities and flows such as consumption planning → ordering → delivery → acceptance and storage → distribution to wards → use → reporting/disposal. Main participants are the pharmaceutical sector, doctors, nurses, warehouse staff, accounting, and suppliers. Typical inputs and outputs include lists of required medicines and supplies, contracts/price lists, invoices, electronic prescriptions, and treatment protocols. Key performance indicators (KPIs) are average therapy cost per patient, percentage of expired/damaged items, inventory days, and the share of urgent orders. Common issues include fragmented ordering leading to higher costs, manual inventory cards hiding shortages/excess, and low traceability of series/batches, posing safety risks. This process accounts for 35–40% of the hospital budget, based on expenses for drugs, medical supplies, and laboratory reagents.

- **Personnel remuneration process:** This involves activities such as staffing planning → scheduling → time tracking → payroll calculations → payments → reporting and analysis. Main participants are HR departments, clinic managers, finance departments, staff, and social insurance institutions. Typical inputs and outputs include staffing schedules, duty rosters, data on night shifts, payroll slips, and insurance files. KPIs include labor costs as a percentage of total

expenses, average salary by category, staff turnover rate, and schedule coverage rate. Common problems are frequent overtime leading to overspending, lack of electronic reporting causing payment disputes, nurse shortages resulting in overloads, and risks to quality. Personnel remuneration accounts for 50–55% of the hospital budget, covering basic salaries, additional pay, and social contributions. The weighted average share is calculated by summing “Personnel costs,” “Other remuneration and contributions,” and dividing by total expenses.

- **Infrastructure maintenance and modernization:** Activities include asset inventory → preventive maintenance scheduling → repairs/replacements → depreciation and leasing → planned investments. Participants are technical staff, biomedical engineers, equipment suppliers, finance, and management. Typical inputs and outputs include equipment passports, service/leasing contracts, repair requests, and depreciation reports. KPIs are the percentage of operational equipment, repair costs, unplanned downtimes, and energy consumption per square meter. Common issues involve outdated technology, costly repairs, lack of CMMS (Computerized Maintenance Management System), unplanned outages, and deferred capital expenditures, which can reduce clinical activity. Expenses related to repairs and maintenance, depreciation, and leasing vary between 5–7% annually.

- **Administrative activities without digital support:** This process includes activities such as registration, reception, archiving, invoicing, procurement, correspondence, and reporting to the National Health Insurance Fund (NHIF) and other authorities. Participants are registrars, secretaries, accountants, coders (for clinical pathways), and management. Typical inputs and outputs include paper files, outpatient sheets, manual logs, NHIF reports, invoices, cash orders, and external correspondence. KPIs are patient registration time, rejected claims percentage, office supplies per patient, and duplicate records count. Common problems include duplicate data entry (paper + electronic), leading to time loss, missed or incorrect codes resulting in unpaid claims, and difficulties in archiving delaying treatment or audits. The share of costs related to this process in the overall hospital budget, mainly for external services (stationery, courier, security,

software licenses), is about 4–6%. Despite the relatively small share, the absence of digital systems causes high indirect costs and efficiency loss, classifying it as a “high-impact process.”

The processes and their percentage shares listed in **Table 1** are derived from public annual

reports of state hospitals (“Income and Expense Report” and “Cash Flow Report”) and summarized analyses from the Institute for Market Economics (IPI) and the Court of Auditors, where costs are grouped into main categories.

Table 1. Percentage ratio of expenses by economic elements in public hospitals

Source / Year	Personnel ¹	Medicines + Supplies ²	Current Repairs, Depreciation, Leasing ³	Others / Administration ⁴
Summary (State Hospitals 2021), data from IPI based on published reports	51.6%	37.8%	6.4%	4.2%
Summary (State Hospitals 2019)	53.1%	35.4%	6.8%	4.7%
WHO/European Observatory, “Health Systems in Transition – Bulgaria” (2018) – Hospital Sector	~50–55%	~35–40%	5–7%	3–5%
NSI, Section 86 (2020) – Cost Structure	50.9%	36.6%	6.1%	6.4%

The processes are defined based on the accounting categories with the largest share of the total expenses of state hospitals and are averaged over the last 5–7 years, based on public financial statements and summarized in analyses by IPI (2023), the Court of Auditors (2022), and the report “Health Systems in Transition – Bulgaria” (WHO/European

Observatory, 2018). Small deviations in the ranges (e.g., 35–40%) reflect annual fluctuations and differences between hospitals, but the overall trend remains stable.

Figure 1 illustrates the trends in revenues and expenditures of Bulgarian state hospitals for the period 2013 – 2023.

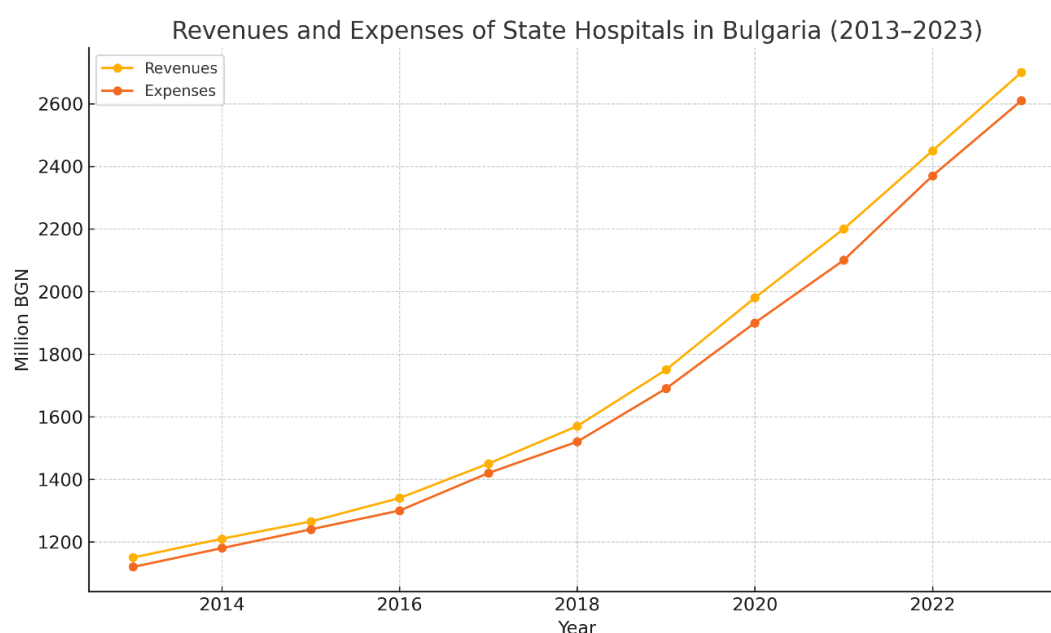


Figure 1. Revenues and expenditures of Bulgarian state hospitals, 2013 – 2023.

The proportional rise in expenses alongside revenues underscores the system's limited profitability and the urgent need for structural reforms (7).

Table 2 summarises the key financial indicators of Bulgarian state hospitals for 2013 – 2023. It lists annual revenues, expenditures, accumulated losses and total liabilities, expressed in million BGN.

Table 2. Financial indicators of Bulgarian state hospitals, 2013 – 2023.

Year	Revenues (mln BGN)	Expenses (mln BGN)	Accumulated Losses (mln BGN)	Total Liabilities (mln BGN)
2013	1 150	1 120	180	300
2014	1 210	1 180	200	320
2015	1 265	1 240	220	350
2016	1 340	1 300	250	380
2017	1 450	1 420	280	420
2018	1 570	1 520	310	470
2019	1 750	1 690	350	500
2020	1 980	1 900	380	550
2021	2 200	2 100	400	600
2022	2 450	2 370	420	620
2023	2 700	2 610	400	643

BGN = Bulgarian lev.

These findings capture the overall financial dynamics of the sector over the past decade and substantiate the quantitative findings of the analysis (8).

The chart and table clearly show the steady rise in revenues and expenditures of Bulgarian state hospitals between 2013 and 2023, along with parallel trends in losses and liabilities.

The author of this article therefore asks what can be done or applied to improve business process management in Bulgarian state hospitals. Considering the good European practices for managing the processes under investigation here, such as in Estonia, Finland, Germany, the Netherlands and Denmark, we can borrow quite good ideas that can be relatively easily implemented in our healthcare.

- Estonia has implemented a national e-Health ecosystem ("X-Road + e-Estonia"), covering all public and private hospitals. The key digital and organizational elements are a universal electronic health record (EHR), 100% e-prescription and e-oncology, a centralized drug auction (State Shared Service Centre) and an e-Procurement portal, mandatory for public hospitals. The measurable effect observed is an 11% lower average price of generics after the first year, less than 5 minutes average admission time, 0 paper files and less than 1% drug waste.

- Helsinki Region and HUS in Finland have implemented "Kanta" + "Apotti". The initiative covers 28 hospitals and 1.6 million inhabitants. The key digital and organizational elements are a unified clinical and social EPR (Epic-Apotti), e-Shift and mobile scheduling for staff and HUS-Logistics – a central warehouse and a robotic pharmacy. The effect that is observed is 30% less overtime for nurses, 26% lower stock levels (Days of inventory) and 90% electronic invoicing to "Kela", the national social security authority in the country.

- Good practices in Germany, and in particular in Helios Kliniken and the Krankenhauszukunftsgesetz (KHZG), cover 90 or more hospitals and 5.6 million patients per year. The organizational elements here include a centralized shared-service center that covers HR, finance and procurement, Lean paths and an "automatic" DRG coder, and a KHZG fund of 4.3 billion euros for HIS, CMMS and telemedicine. The measurable effects of these innovations are more than 300 million euros in annual savings from consolidated procurement, 12% shorter length of stay (LOS) in Helios clinics and 80% fewer rejected invoices from health insurance funds in the country.

- The case in the Netherlands at Erasmus MC (Rotterdam) covers the university hospital and 1,400 hospital beds. The implemented good practices are a robotic central pharmacy and GS1 barcoding at the bedside, "Closed loop

medication” – scanning the patient’s wristband and Predictive-maintenance IoT for linear accelerators. The effects that have been achieved are up to 75% fewer medication errors, around 2.1 million euros saved per year from rejected marriage and have reduced service costs by 18%.

- In Denmark – Region Midt with the implementation of the “eSundhed” and CMMS initiatives covering 4 regional hospitals, the organizational innovations are a full CMMS platform (Planon) for building and medical equipment, BIM models for the new hospital campuses (Aarhus University Hospital) and have achieved integration with SKI’s e-procurements, which are under concluded national framework contracts. The measurable effect of these innovations is 20% less emergency repairs, 8% saved energy consumption/sq m and an average price per procedure of minus 6% compared to 2014.

Through a comparative analysis with successful European models, several deficits in Bulgarian practice are highlighted: low degree of digitalization (electronic records, telemedicine), weak centralization in procurement, and lack of strategic performance indicators.

What can we “translate” to the Bulgarian conditions in which public hospitals operate? In the case of the problem of the expensive and chaotic drug supply process, we can use a proven solution from the example of Estonia / Germany - a common state drug auction and e-warehouse. The first step with the lowest costs would be a pilot centralization of the 5 most costly elements according to the Ministry of Health (9). The next problematic process is overloaded schedules and overtime, here the solution would be to use the practice of Finland - e-Shift and self-exchange of shifts. This is possible by introducing a mobile application for schedules in at least two clinics. Regarding the problem of expensive maintenance and equipment breakdowns, we can implement CMMS - software that registers assets, plans preventive maintenance and monitors repairs/breakdowns of equipment and buildings and IoT sensors - a network of sensors/devices that transmit data (e.g. temperature, vibrations) for preliminary maintenance, as in Denmark. The first step that can be taken is to make an inventory with QR codes of the equipment and then create a module for prevention. The process related to slow paper administration can

be improved and refined by using the useful solution of Estonia - 100% electronic records and electronic invoicing. This can be achieved through mandatory e-invoicing to the NHIF (National Health Insurance Fund in Bulgaria) or the implementation of a pilot HIS-integrated system for clinical, administrative and financial data in the hospital in one department.

Successful models combine centralization of expensive processes (drugs, logistics, HR), standardized digital platforms (HIS/ERP/CMMS) and a legal framework that mandates electronic services (e-prescription, e-invoice). The implementation of even individual modules (e.g. e-Shift or central auction for oncology drugs) shows rapid financial effects within 12–24 months.

CONCLUSIONS AND RECOMMENDATIONS

The comprehensive analysis of the financial data, process maps and international comparisons allows for the formulation of five mutually complementary courses of action. Based on the above, the following conclusions and recommendations are formulated:

- There is a need for reform in administrative practices through digital systems (electronic document management, integrated health records). In the cases of 30–40% of non-medical staff time is wasted on manual data entry and processing of paper documents, and up to 5% of invoices to the NHIF are rejected due to technical errors. It is recommended to introduce an integrated hospital information system (HIS) with an electronic document management module and a single electronic health record (EHR). The expected effect is a reduction in registration time by $\geq 35\%$, a reduction in rejected payments below 1%, savings of ~2–3 million BGN per year for an average university hospital;
- Centralized procurement of medicines and consumables will reduce prices and administrative costs. Decentralized “piece by piece” tenders lead to 10–15% higher prices and duplication of warehouse stocks. It is recommended to create a national or regional Shared Service Centre, to create and sign framework contracts with suppliers via an e-Procurement portal (as in Estonia and Germany) and to open robotic central pharmacies and barcode/RFID traceability to the hospital bed. The expected effect would be a decrease in the average purchase price by 8–12%, a reduction

in “on-shelf” stocks by >25% and fewer scrapped/expired batches (<1%);

- HR policy should be optimized through training, digital tools and a fair motivation system. More than 50% of the budget of public hospitals goes to staff, and the turnover of nurses exceeds 15% annually. It is recommended to introduce an e-Shift platform (mobile self-exchange of shifts, automatic verification of statutory breaks), implement a differentiated system for continuing education (CPD) - e Learning and simulation centers and options for a "retention" package - a bonus for KPI results, subsidized training and housing programs. In this situation, the expected effect would be 5–7% lower extraordinary costs, reduced turnover up to 8% and improved staff satisfaction index (NPS>50);

- It is necessary to invest in energy efficiency and modernization of the building stock. Hospital buildings (in most cases from the 1970s) consume 250–300kWh/m², i.e. about 30% above the average European standard. It is recommended to conduct energy audits and implement a BMS (Building Management System) and replace lighting with LED, heat pumps/gas boilers, solar roofs. Models such as “Energy Performance Contracting” (EPC) would allow a private partner to finance the measures against shared savings. The expected effect of these activities would be 15–25% lower utility costs, a return on investment (ROI) between 4–6 years, better conditions for patients (temperature comfort and air quality). Good practices from countries such as Finland, Germany and Estonia can be adapted to the Bulgarian context, especially in the areas of telemedicine, information security and transparency of governance.

The implementation of these recommendations requires a coordinated effort from the state, hospital management and local authorities, in order to achieve more sustainable, efficient and transparent healthcare.

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