



The Use of Individualized Analytical Tools in the Management of the Specialized Oncology Treatment Center SOLO I

Submitted: 11 July 2025

Accepted: 20 November 2025

Published: 17 August 2026

Krzysztof Osmański¹

<https://orcid.org/0009-0004-8650-9402>

Magdalena Sakowicz²

<https://orcid.org/0009-0004-5581-0497>

Dorota Ścieżka¹

<https://orcid.org/0009-0006-7295-7356>

Izabela Dorota Gołębiak¹

<https://orcid.org/0000-0002-3504-6434>

¹ Management, Szpital Grochowski im. dr med. Rafała Masztaka Sp. z o.o. Warsaw, Poland

² Management, Maria Skłodowska-Curie National Research Institute of Oncology, Warsaw, Poland

Corresponding author

Krzysztof Osmański

Management, Szpital Grochowski im. dr med. Rafała Masztaka Sp. z o.o.

Grenadierów 51/59, 04-073, Warsaw, Poland

krzysztof.osmanski1@wp.pl

Abstract

Monitoring the contract with the National Health Fund (NFZ) in healthcare providers is a process of ongoing managerial control aimed at confirming whether the NFZ agreement is being implemented in accordance with its terms, and whether the provision of health services by the provider is financially and organizationally optimal. Revenue analysis from the NFZ in healthcare providers requires specialized IT tools that enable the collection, processing, analysis, and reporting of financial and medical data, transforming them into concrete managerial information. Individualized analytical and reporting tools are primarily used for the ongoing monitoring of NFZ contract implementation, especially for revenue analysis by departments, service scopes, Diagnosis-Related Groups (DRGs), contracted products, as well as for determining the profitability of medical procedures or identifying services not settled or rejected from settlement by the NFZ. They allow for the early detection of irregularities and provide the opportunity for immediate implementation of appropriate managerial decisions to qualitatively regulate the situation.

Key words: oncology, healthcare provider, analytical tools, SOLO I, revenue management from the National Health Fund (NFZ)

Introduction

The introduction of the National Oncology Network into the Polish legal system intended to ensure comprehensive and coordinated oncological care by healthcare providers that have been qualified, according to strictly defined criteria, as Specialized Oncology Treatment Centers (SOLO – *Specialized Oncology Treatment Center*) as well as by the so-called cooperating facilities [1]. In accordance with the provisions of the Act on the National Oncology Network (UoKSO – *Act on the National Oncology Network*) Specialized Oncology Treatment Centers (SOLO) have been distinguished – hospitals that perform oncology-related procedures to varying extents and at different levels. These include:

- **SOLO III** – highly specialized hospitals that provide the most complex medical services. In these facilities, patients can receive treatment in all three areas of oncological therapy: chemotherapy, surgical treatment, and radiotherapy.
- **SOLO II** – hospitals that provide at least two of the three areas of oncological treatment (chemotherapy, surgical treatment, radiotherapy).
- **SOLO I** – medical facilities that provide basic oncological services, meaning at least one of the three areas of oncological treatment (chemotherapy or surgical treatment or radiotherapy).

The specialized centers mentioned above are required to meet the criteria that a healthcare provider must fulfill in order to join the National Oncology Network and be classified at the appropriate SOLO level [2]. The qualification of providers in individual voivodeships was carried out by the directors of the regional branches of the National Health Fund (NFZ) based on Article 9 (4) of the Act as well as on behalf of the President of the NFZ, based on the appropriate authorizations. The current state applicable in the Mazowieckie voivodeship is valid from July 26, 2024 until July 26, 2026.

In line with the applicable Act on the National Oncology Network (UoKSO) and the qualification to this network, the Specialized Oncology Treatment Center that is the subject of the analysis provided hereby, has also been classified. Additionally to its current status as a first-level hospital within the basic hospital care system (*PSZ – basic hospital care system*), it has been classified as SOLO I due to the scope of oncological services it provides, namely surgical treatment. At the same time, all oncological services, including chemotherapy and contracted drug programs, previously provided by the hospital, continue to be delivered on the basis of healthcare service agreements. Therefore, it is very important to ensure continuous monitoring of the settlement of services carried out in the chemotherapy ward and to further develop the scope of oncology [3]. This monitoring is to be supported by individualized analytical tools that collect relevant data and transform it into concrete information.

The Act on the National Oncology Network has created the need to obtain rapid and precise managerial information regarding the provision of

oncological services, and above all, the ongoing monitoring of contract execution levels, including the degree of lump-sum utilization, since such information affects decisions about financial resources disbursed by the NFZ [4, 5]. It seems necessary to strengthen control over the process of accounting and financing oncological healthcare services within the provider by using analytical tools that enable monitoring of the provision of medical services against the financial–material plan proposed in a given scope by the relevant Regional Branch of the NFZ. These tools must also allow for forecasting the cost-effectiveness of a provider classified as SOLO I by evaluating the implementation of contracts in oncological areas during a given settlement period [6].

Material and method

Data sets related to the provision of healthcare services in the chemotherapy ward of a first-level hospital within the basic hospital care system (PSZ), classified as SOLO I, were analyzed. Information on completed oncological medical services is collected in the hospital's internal IT system (*Hospital Information System – HIS*) as well as obtained from applications provided by the National Health Fund (NFZ). Using individualized analytical tools, such as reports within the Medical Reporting System (*MSR – Medical Reporting System*), which serve the purposes of effective monitoring, accurate accounting, and financing of healthcare services, continuous managerial control of oncology-related revenues – including chemotherapy and drug programs – is possible. The MSR report is based on data sets continuously fed from the healthcare provider's internal IT systems and NFZ external applications, namely the Hospital Information System (HIS) and the Information Flow Management System (*SZOI – Information Flow Management System*).

Objective of the study

1. To demonstrate that it is possible to develop cost-free, individualized, and dynamic analytical tools based on internal resources, which

support and improve the management process of a Specialized Oncology Treatment Center SOLO I.

- 2. To demonstrate the positive impact of the implemented analytical tool on the financial efficiency of the one-day chemotherapy ward – using as an example a hospital classified as SOLO I, which is also a first-level facility within the basic hospital care system (PSZ) in the Mazowieckie voivodeship.

Results

Thanks to the use of reports aggregated by the individualized analytical tool, in the years 2021–2024, it was possible to make appropriate managerial decisions, which allowed for maintaining a steady upward trend in the value of healthcare services delivered under the NFZ contract across the various departments of the healthcare provider, including the analyzed one-day chemotherapy ward. Table 1 presents a detailed report on the fulfilment of services under the chemotherapy contract and drug programs contracted in the hospital’s chemotherapy ward.

Table 1. Specialized Oncology Treatment Center SOLO I – DETAILED REPORT ON CONTRACT FULFILLMENT

CHEMOTHERAPY DEPARTMENT		January–May 2025	
Service scope name	Unit product name	Number of medical services	Value of medical services [PLN]
		SUM (January–May)	SUM (January–May)
Drug program – treatment of patients with prostate cancer	Diagnostics in the program for treating patients with prostate cancer	1	407
	One-day hospitalization related to program fulfilment	1	861
Drug program – treatments of patients with prostate cancer		2	1 268
Drugs in the drug program – treatment of patients with breast cancer		2	4 637

CHEMOTHERAPY DEPARTMENT		January–May 2025	
Service scope name	Unit product name	Number of medical services	Value of medical services [PLN]
		SUM (January–May)	SUM (January–May)
Drug program – treatment of patients with breast cancer	Diagnostics in the neoadjuvant or adjuvant treatment program for HER2+ breast cancer	51	24 142
	Diagnostics in the metastatic treatment program for HER2+ breast cancer	10	4 826
	One-day hospitalization related to program fulfilment	78	67 197
Drug program – treatment of patients with breast cancer		139	96 165
Drugs in the drug program – treatment of patients with breast cancer		186	608 372
Drug program – treatment of patients with urothelial cancer	Diagnostics in the program for treating patients with urothelial cancer – 1st year of therapy	61	18 401
	Diagnostics in the program for treating patients with urothelial cancer – 2nd and subsequent years of therapy	2	423
	One-day hospitalization related to program fulfilment	128	110 271
Drug program – treatment of patients with urothelial cancer		191	129 095
Drugs in the drug program – treatment of patients with urothelial cancer		289	1 054 480
One-day Chemotherapy with combined scope	One-day hospitalization in other cases	16	9 301
	One-day hospitalization using single-use elastomeric pumps for infusion therapy	32	28 886
	One-day hospitalization related to administration of a drug from part A of the drug catalogue	600	422 464
One-day chemotherapy with combined scope		648	460 651
Active substances in one-day chemotherapy with combined scope		1 486	199 424
CHEMOTHERAPY DEPARTMENT		2 943	2 554 092

Source: IT systems of the SOLO I center.

A detailed analysis in selected periods (monthly, quarterly, semi-annual, annual) of both the number of services provided and the revenues obtained from them within individual points of the contract facilitates quick and efficient managerial control of revenues received from the payer. Aggregated annual data obtained through the MSR in the years 2022–2024, based on the services delivered in the chemotherapy ward under the chemotherapy contract and contracted drug programs, were also analyzed:

- Treatment of patients with prostate cancer;
- Treatment of patients with urothelial cancer;
- Treatment of patients with breast cancer;
- Prevention of bone complications in adult patients with advanced neoplastic disease.

Contracts with NFZ under chemotherapy and drug program agreements have a rather specific structure, as they include the administration of drugs from reimbursement catalogs within services provided in one-day or multi-day hospitalization modes (inpatient treatment), as well as in the outpatient setting (clinic) [5, 6].

In the SOLO I healthcare provider, which has contracted services in the one-day surgery ward, revenues from NFZ for delivered services (number of services and value, shown in Table 1 for the period 2022–2024) were continuously analyzed using MSR analytical tools.

Table 2. Number of services and revenues [PLN] from provided services and drugs in the one-day surgery ward at a SOLO I hospital in the years 2022–2024

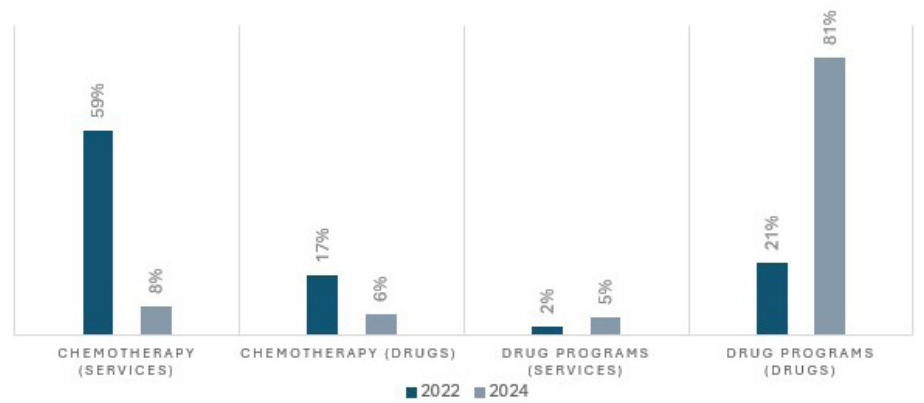
ONE-DAY SURGERY DEPARTMENT	Number of medical services			Increase 2022→2024	Medical services value [PLN]		
	2022	2023	2024		2022	2023	2024
Chemotherapy (services)	1 445	1 708	2 604	+80,3%	568 754	688 117	1 043 172
Chemotherapy (drugs)	3 132	4 139	7 031	+124,5%	166 848	253 794	785 150
Drug programs (services)	60	781	1 589	+2 548,3%	23 324	292 181	621 454
Drug programs (drugs)	78	951	2 150	+2 656,4%	199 019	2 898 739	8 407 451
	4 715	7 579	13 374		957 946	4 132 830	10 57 227

Source: IT systems of the SOLO I center.

Data obtained from the analytical tool, aggregated in Table 2, indicate that the highest revenue growth occurred within the drug program contract (both for drugs and services), which reflects a substantial increase in the volume of patients receiving treatment under these drug programs. In monetary terms, the value of drugs in the drug programs increased from PLN 199,000 in 2022 to over PLN 8.4 million in 2024, representing more than an eightfold year-on-year increase in the first period and generating further strong growth in the subsequent time frame.

2022, however, the largest percentage share of total revenue under these contracts came from revenues related to the provision of services under the chemotherapy contract, within which drugs were administered, accounting for 17.4% of total revenue in these contracts. In 2022, the revenue from services and drugs in the drug programs was, respectively: 2.4% (services), 20.8% (drugs). By 2024, the revenue structure had changed significantly, with the largest percentage share being drugs: 80.6% in the drug programs. This situation is illustrated in Figure 1.

Figure 1. Revenue structure (percentage share) from services in fulfilled contracts: drug programs and chemotherapy in 2022 and 2024



Source: IT systems of the SOLO I center.

In 2022, the contract was primarily based on chemotherapy services, whereas by 2024, reimbursement for drugs in the drug programs clearly dominated, accounting for over 80% of the total contract value.

The data in Table 3, on the other hand, present how the number of inpatient and outpatient services under the chemotherapy contract changed from 2022 to 2024. In total, drugs from the chemotherapy catalog were administered during 5,742 one-day hospitalizations related to drug administration, and a clear upward trend in the provision of these services can be observed.

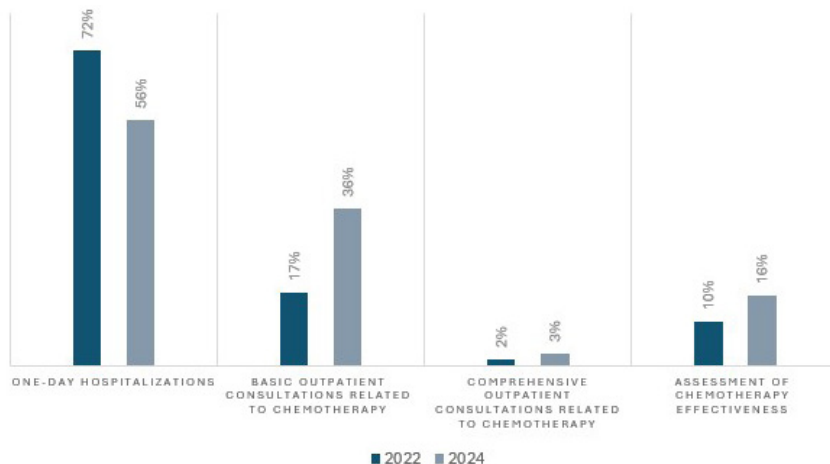
Table 3. Number of one-day hospitalizations (NFZ) Revenue from NFZ

Inpatient services under the chemotherapy contract	2022	2023	2024	Increase 2022–2024
Number of one-day hospitalizations	1 445	1 698	2 599	+79.9%
Number of basic outpatient consultations related to chemotherapy	335	1 161	1 659	+395.2%
Number of comprehensive outpatient consultations related to chemotherapy	31	142	133	+329.0%
Periodic assessment of chemotherapy effectiveness	202	561	742	+267.3%

Source: IT systems of the SOLO I center.

The largest percentage increase between 2022 and 2024 occurred in the number of basic and comprehensive outpatient consultations. During the analyzed period, the number of one-day hospitalizations also increased (+79.9%), while the number of comprehensive consultations in 2024 slightly decreased (−6.3%) compared to the previous year. Although the total number of services grows year by year, their proportions change. The structure of services, i.e., their percentage share of the total number, is shown in Figure 2.

Figure 2. Structure of services provided, understood as % of total



Source: IT systems of the SOLO I center.

In 2022, one-day hospitalizations had the largest share: 71.7%, followed by basic outpatient consultations: 16.6%, comprehensive consultations: 1.5%, and assessment of chemotherapy effectiveness: 10.0%.

Between 2022 and 2024, the proportion of hospitalizations decreased, while the importance of outpatient consultations, especially basic consultations, increased. This trend aligns with the concept of the so-called inverted service pyramid, which assumes a shift of the medical service workload from hospital care to specialized outpatient care. Administration of drugs from the reimbursement catalog on an outpatient basis may result from the appropriate qualification of patients for day treatment, cost and workflow optimization, as well as NFZ requirements.

The significant increase in the number of basic outpatient consultations indicates greater use of the clinic in managing patients between treatment cycles.

The increase in the number of outpatient consultations may improve profitability, as they require less time and fewer resources than hospitalization. However, it should be noted that revenue from a single service is lower, and implementing this model requires ensuring greater availability of doctors and nurses in day clinics. The reorganization and redefinition of comprehensive consultations in chemotherapy caused a decrease in the number of such consultations in 2024. At the same time, thanks to managerial actions, there was an increase in the number of reported services funding additional tests performed within the service: periodic assessment of treatment effectiveness.

This is also a result of the growing number of patients receiving chemotherapy and the requirement to perform such assessments every three months, in accordance with NFZ regulations. In 2024, new drug programs were contracted in the one-day chemotherapy ward. The number of services delivered within the drug programs in 2023–2024 shows a very clear increase in the number of patients treated under the drug programs, both in one-day hospitalization and outpatient admissions. This situation is illustrated in Table 4.

Table 4. Number of drug administrations from the reimbursement catalog in one-day hospitalizations and consultations within contracted drug programs in the one-day chemotherapy ward

One-day chemotherapy ward	One-day hospitalization related to program fulfillment			Outpatient admission related to program fulfillment		
	2023	2024	Change	2023	2024	Change
Drug program – treatment of patients with prostate cancer	75	74	–1.3%	303	447	+47.5%
Drug program – treatment of patients with breast cancer	265	684	+158.1%	48	264	+450.0%
Drug program – treatment of patients with urothelial cancer	54	133	+146.3%		1	
Drug program – prevention of bone complications	12	26	+116.7%	26	88	+238.5%
Total	406	917	+125.9%	377	800	+112.2%

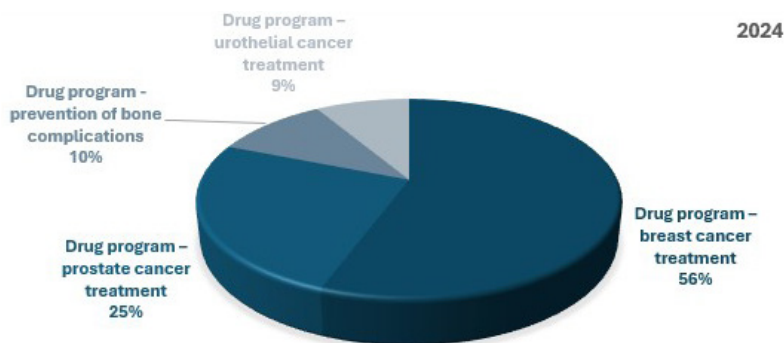
Source: IT systems of the SOLO I center.

The largest increase in one-day hospitalizations concerns the breast cancer program, which in 2024 accounts for 74.6% of the total growth in this mode. The most dynamic growth in outpatient admissions is seen in the breast cancer program (+450%) and in the prevention of bone complications (+238.5%). The urothelial cancer program barely generated any outpatient admissions.

During the analyzed period, there was an increase in the number of patients within the drug programs, which was a result of contracting new programs and expanding existing contracts, thereby broadening the possibilities for treating patients with cancers. At the same time, NFZ reimbursements grew faster than the number of patients, suggesting an increase in the average value of services per patient (costly therapies, a greater number of procedures). With such a rapid increase in patient numbers, it is necessary to expand the availability of staff and clinic infrastructure to avoid longer waiting times.

The structure of all services within the drug programs, i.e., one-day hospitalizations related to program implementation and outpatient admissions related to program implementation, in 2024 was as follows: breast cancer treatment – 55.7% of all services; prostate cancer treatment – 25.3%; prevention of bone complications – 10.4%; urothelial cancer treatment 8.6% (Figure 3). In 2023, prostate cancer dominated (46.6%), but in 2024, the breast cancer treatment program clearly assumed the leading position.

Figure 3. Structure of services provided – percentage share (hospitalizations + outpatient consultations) in contracted drug programs in 2024



Source: IT systems of the SOLO I center.

In 2024, there was a clear change in the profile of the drug program – the breast cancer treatment program became dominant in both treatment modes. The total number of services increased by 119% (from 783 in 2023 to 1,717 in 2024), which requires increasing the throughput of the day ward and strengthening the nursing and medical staff. However, it should be noted that a significant increase in services within high-cost programs (e.g., breast cancer) directly increases revenue from reimbursements but also raises the risk of liquidity issues in the event of delays in NFZ payments.

It should also be emphasized that the growing dependence of SOLO I healthcare providers on reimbursements for high-cost drugs requires constant monitoring of invoices, reports, and compliance with program criteria. The high scale of drug expenditures makes financial risk a real possibility due to delays in reimbursement for services and drugs under the chemotherapy and drug program contracts. Therefore, strict control of costs and drug logistics is necessary to avoid losses resulting from underutilization or errors in settlements. Ongoing monitoring using individualized analytical tools ensures full utilization of funds and minimizes the risk of loss. It allows for forecasting shortages or overperformance in advance, facilitates negotiations with NFZ, and protects financial liquidity, especially in the area of high-cost drugs.

Data aggregated and processed by analytical tools indicate that, thanks to the use of individualized solutions and the implementation of appropriate managerial decisions based on the generated information, the value of the executed contract during the analyzed period showed a systematic upward trend. The creation and practical use of individualized analytical tools, understood as direct support for managerial decision-making at the operational level, lead to further improvements in operational performance [7, 8].

The analysis of data contained in analytical reports can also help identify areas where the quality of patient care raises concerns, which in turn allows for rapid corrective actions.

As the number of services provided under the chemotherapy contract and drug programs increases, there is greater involvement of administrative staff (secretaries, oncology treatment coordinators, health service billing department employees) in coding medical services. It should be emphasized

that, according to the new model of oncology care organization resulting from the implementation of the National Oncology Network, the role and responsibilities of the oncology coordinator have been modified. In 2015, the so-called oncology package introduced the position of oncology coordinator; however, due to rather loose legal regulations, this role was perceived inconsistently and, in many facilities, the person fulfilling the function of the oncology package coordinator was often reassigned to other tasks.

The hospital has undertaken measures to properly organize the oncology patient pathway, taking into account the appropriate tasks and roles of oncology coordinators. Based on current legal regulations and with the patient's best interests in mind, organizational algorithms were developed for managing patients holding a DiLO card (diagnostics and oncology treatment). Properly organized work of the coordinator in the hospital clinics greatly facilitates the patient's "navigation within the system" and contributes to improving the quality of oncological services provided. By properly planning the subsequent stages of diagnostic and therapeutic procedures, the coordinator reduces the burden on the patient, shortens the duration of individual diagnostic and treatment stages, and helps eliminate inconsistencies and gaps in information transfer between the units involved in rapid oncology therapy.

After the healthcare provider was classified into the SOLO I group and legal provisions were clarified, the tasks of coordinators in the hospital were adjusted to the currently implemented algorithm for managing oncology patients. According to the new model, oncology care coordinators, as trained professionals, should perform their functions by:

- direct contact with patients, providing information and education,
- navigation within standardized oncology care processes.

Essential elements include tools that improve communication as well as digital tools supporting data integration processes among the various participants in oncology care [9]. Thanks to their work, patients' sense of safety should significantly increase, as they often find themselves unexpectedly in a very difficult life situation due to their illness. Crucial in this context is the assistance and care provided by the coordinator from the very beginning – starting from

the suspicion of cancer – since this is when patients' fears and uncertainty are the greatest.

Discussion

Research on the key organizational changes implemented by legislation to improve outcomes for cancer patients has become a critical area of study due to the increasing complexity and cost of cancer care in Poland and worldwide [10, 11]. The introduction of the National Oncology Network into the organization of cancer treatment in Poland created a real legal basis for changing the management of oncology patient care. Reforms implemented in Poland, as well as globally, in the organization of oncology services (including the introduction of the patient safety and economical management (lean management) act) [12, 13] have introduced new models of care delivery, payment structures, and quality standards, reflecting the shift from volume-based to value-based care [14, 15]. The growing burden of cancer, with projected costs reaching hundreds of billions annually, underscores the practical significance of these organizational changes. The integration of multidisciplinary teams and patient-centered approaches has evolved over the past decade, highlighting the need for systemic transformation to improve outcomes [10, 11, 16, 17].

Thanks to the implementation of an individualized analytical tool, it became possible to continuously monitor the level of healthcare service delivery for patients, including revenues generated from services in the chemotherapy ward. Identifying irregularities and areas requiring optimization in the provision of medical services is another important and complex process, which – with the support of tools such as the Medical Reporting System (MSR) – has objective (quantitative) grounds for implementing changes and can proceed quickly and effectively. The system analyzes data against specific indicators of exceeding or underutilizing NFZ contract limits, automatically collecting data from various sources, including the HIS (Hospital Information System), NFZ billing systems, electronic medical records (EDM), as well as accounting and HR data. By integrating these data, a comprehensive view of the activity of the analyzed ward was obtained. The data are analyzed by management

staff, who assess the causes of detected irregularities, verify whether they result from system, organizational, or staffing issues, and make decisions regarding corrective or optimization measures. These measures may involve changes in the organization of medical staff work, training on proper service coding, modifications to patient pathways to improve efficiency, or more precise adjustment of the offered services. MSR helps to monitor the effects of implemented corrective actions by tracking improvements in indicators such as revenue growth or reduction in unbilled services. Rapid analysis of financial and medical data conducted using MSR enabled effective managerial decision-making by increasing transparency and improving internal control over the execution of NFZ contracts. The system proved to be a key element supporting the management of the unit under highly dynamic healthcare conditions, confirming its practical value and evident effectiveness. The creation and implementation of individualized, automated, dynamic analytical tools significantly improved the management of the SOLO I Specialized Oncology Treatment Center. Primarily, such tools support administrative-level management processes. Automated analytical tools, through developed algorithms and mechanisms for generating reports and analyses, greatly accelerate administrative processes. Automatically generated reports and data reduce staff workload. Dynamic tools allow better management of the center under the variable conditions of the healthcare provider's environment.

The Medical Reporting System (MSR) has become the foundation for effective management of the SOLO I Specialized Oncology Treatment Center in the analyzed hospital. Its implementation allowed for the integration and automation of many processes, significantly improving the day-to-day functioning of the facility. The system enabled the collection, analysis, processing, and reporting of both medical and financial data, creating a solid basis for managerial decision-making.

In the management of the chemotherapy ward, the tool allowed for continuous monitoring of revenues, controlling the provision of medical services, and identifying potential irregularities, enabling faster responses to potential problems [18] and eliminating the risk of their recurrence. Thanks to automated data analysis, detecting deviations from standards – such as errors

in service coding, delays in medical documentation, or exceeding contract limits – became much simpler. Moreover, the reporting system allowed for the creation of detailed real-time reports, which served as essential tools for audits and management control. This, in turn, improved transparency of financial operations and optimized the use of available resources. As a result, the Center was able not only to adapt its operations to changing market conditions but also to achieve strategic goals efficiently and in compliance with applicable standards. In the context of increasing requirements and complex procedures related to contracting oncology services, the MSR provided crucial support in maintaining the financial and operational stability of the facility in the healthcare services market. The use of analytical tools is essential for making accurate managerial decisions, particularly regarding the financial efficiency of the unit, with special emphasis on the one-day chemotherapy ward. From the perspective of managing such a specialized ward, analytics enables more precise monitoring of costs, resources, and service reimbursement efficiency, which can lead to better management of both costs and the quality of services provided. Analytical tools improve financial efficiency by optimizing resource utilization and collecting data on procedure costs. Analyzing these data allows for more accurate estimation of which therapies are the most expensive and which are more cost-effective relative to treatment outcomes. Analytics provides data for financial forecasting based on historical data, aiding in better budget planning. Predicting patient numbers, treatment costs, and required resources allows for more precise expense planning and the identification of potential financial risks. Accurate financial analyses enable more informed decisions regarding investments in modern equipment, medications, or infrastructure expansion, taking into account actual needs and available resources. At the same time, analytical tools allow for the ongoing identification of areas where treatment processes are less efficient or more costly, enabling faster implementation of corrective actions. Analytical tools can analyze patient numbers and service demand, facilitating better planning of human resources. In the one-day chemotherapy ward, this can mean better alignment of the number of nurses, doctors, and other specialists with actual demand. Automatically generated reports allow for faster audits and

assessment of ward performance. High-quality reports can help identify not only areas for improvement but also areas that generate savings [19]. The use of analytical tools in the one-day chemotherapy ward has the potential to significantly increase financial efficiency, both by optimizing costs and improving treatment quality. Such tools support more informed decision-making, which not only enhances patient care quality but also contributes to better financial management of the facility. In the context of financial management, precise analytical data can provide better budget control and enable more flexible adaptation to changing conditions. In the case of the hospital classified as SOLO I, the process of using the analytical tool proved to be fully justified, reasonable, and functional.

Summary

Research on the impact of the National Oncology Network on cancer treatment outcomes in Poland has become a critical area of study due to the increasing burden of cancer and the need for coordinated care to improve patient outcomes [20, 21]. Cancer remains the leading cause of mortality in Poland, with lung cancer accounting for 17% of malignant tumors in men and 9% in women between 2015 and 2019, and it remains the primary cause of cancer-related deaths [20, 21]. Rising incidence and mortality rates, combined with demographic changes such as population aging, highlight the urgency of improving oncology care [22, 23]. In recent years, Poland has initiated reforms, including the 2015 fast-track cancer diagnosis and treatment pathway and the 2019 pilot of the National Oncology Network (NCN), aimed at improving care coordination and quality monitoring [21, 24]. These changes reflect a broader international trend toward integrated cancer care networks [25, 26].

This fully justifies the need to create and utilize individualized analytical tools for monitoring chemotherapy processes, processing related data, and transforming it into accurate and reliable information that can be appropriately used by the facility's management staff for decision-making.

There is relatively little professional literature describing the impact of customized analytical tools in the management of the SOLO I Specialist

Oncology Treatment Center. The available studies focus on presenting Business Intelligence data in a general way, rather than on tailor-made solutions for a given entity.

It should be emphasized that SOLO I healthcare entities operate under conditions of high cost pressure, limited public funds, and growing quality and technological requirements. Therefore, analytical and organizational activities are crucial for optimizing costs and improving economic efficiency without compromising the quality of patient care. Thus, analytical activities that improve financial results have a huge role, as they allow better control of costs and revenues, streamline organizational processes, improve the efficiency of resource utilization, and increase the quality of services and patient satisfaction.

As a result of analytical measures taken, including an analysis of the unit costs of individual procedures (e.g., chemotherapy, radiotherapy, hospitalization) and profitability, as well as decisions to rationalize resources by reducing fixed and variable costs, the effectiveness of the NFZ contract was increased, which had an impact on the financial results of the healthcare entity.

In practice, the implementation of analytical and organizational measures can bring about:

1. A reduction in operating costs by 10–20%.
2. A reduction in the average length of hospitalization by 0.5–1 day.
3. An increase in the number of settled services by 5–15%.
4. Improvement in quality indicators (e.g., lower complication rate).
5. Optimization of drug and material management.
6. Increase in revenue from the provision of healthcare services.

According to the analysis of the patient satisfaction survey conducted annually at the facility, patients report higher satisfaction and trust in the medical team, as well as a feeling that their therapy is “tailor-made”. They also note shorter waiting times for results and therapeutic decisions, reduced stress, and an improved sense of security.

Conclusions

1. The creation and implementation of individualized, automated, dynamic analytical tools enables efficient management of the SOLO I Specialized Oncology Treatment Center.
2. The use of analytical tools supports accurate and appropriate managerial decision – making, significantly impacting the financial efficiency of the one-day chemotherapy ward.
3. The analytical and organizational measures implemented in the health-care facility (SOLO I) contributed to a gradual improvement in financial results. There was a noticeable increase in cost efficiency (cost reduction through effective drug and material management, as well as administrative costs) by 10–20% in the analyzed period 2022–2024, as well as an increase in the profitability of the procedures performed. As a result, the net financial result of the oncology department gradually increased in 2022–2024.
4. In parallel with the financial effects, the impact of the implemented measures on patient satisfaction is also important. Patient satisfaction surveys conducted in 2022–2024 showed an increase in the overall assessment of service quality from 4.1 to 4.6 on a five-point scale. Patients pointed to improved communication with staff, shorter waiting times, and higher quality of coordination services.

LIST OF ABBREVIATIONS IN ORDER OF APPEARANCE

The abbreviation used	Meaning of the abbreviation
NFZ	National Health Fund
UoKSO	Act on the National Oncology Network
PSZ	Basic hospital care system
KSO	National Oncology Network
SOLO	Specialized Oncology Treatment Center
HIS	Hospital Information System
MSR	Medical Reporting System
SZOI	Information Flow Management System
DiLO	Diagnostics and oncology treatment card
EDM	Electronic medical records
NCN	National Oncology Network

Source: IT systems of the SOLO I center.

References

1. Ustawa z dnia 9 marca 2023 r. o Krajowej Sieci Onkologicznej. Dz.U. 2023 poz. 650; 2023.
2. Rozporządzenie Ministra Zdrowia z dnia 3 lipca 2024 r. w sprawie szczegółowych kryteriów warunkujących przynależność podmiotu wykonującego działalność leczniczą do poziomu zabezpieczenia opieki onkologicznej Krajowej Sieci Onkologicznej Specjalistyczny Ośrodek Leczenia Onkologicznego. Dz.U. 2024 poz. 1008; 2024.
3. Ustawa z dnia 27 sierpnia 2004 r. o świadczeniach opieki zdrowotnej finansowanych ze środków publicznych. Dz.U. 2004 nr 210 poz. 2135; 2004.
4. Rozporządzenie Ministra Zdrowia z dnia 22 listopada 2013 r. w sprawie świadczeń gwarantowanych z zakresu leczenia szpitalnego. Dz.U. 2013 poz. 1520; 2013.
5. Zarządzenie Nr 71/2025/DGL Prezesa Narodowego Funduszu Zdrowia z dnia 4 sierpnia 2025 r. w sprawie określenia warunków zawierania i realizacji umów w rodzaju leczenie szpitalne w zakresie chemioterapii; 2025.
6. Narodowy Fundusz Z. Zarządzenie Nr 9/2025/DGL Prezesa Narodowego Funduszu Zdrowia z dnia 30 stycznia 2025 r. w sprawie określenia

- warunków zawierania i realizacji umów w rodzaju leczenie szpitalne w zakresie programu lekowe. Zarządzenie. Warszawa: Narodowy Fundusz Zdrowia; 2025.
7. Lewandowski R, Kożuch A, Sasak J. Kontrola zarządcza w placówkach ochrony zdrowia. Wolters Kluwer Polska; 2018.
 8. Drucker PF. Praktyka zarządzania. Warszawa: MT Biznes; 2017.
 9. Stańczak-Strumiłło K, Kotapski R. Zarządzanie finansami w podmiotach leczniczych. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego; 2021.
 10. Olszak CM, Batko K. The Use of Business Intelligence Systems in Health-care Organizations in Poland. *Proceedings of the Federated Conference on Computer Science and Information Systems*; 2012. 969–976.
 11. Chen H, Chiang RHL, Storey VC. Business Intelligence and Analytics: From Big Data to Big Impact. *MIS Q* 2012; 36(4): 1165–1188. <https://doi.org/10.2307/41703503>.
 12. Jacobs R, Smith PC, Street A. Mierzenie efektywności w ochronie zdrowia. Warszawa: ABC Wolters Kluwer Business; 2013.
 13. Nejati M, Razavi M, Harirchi I, Zendehtdel K, Nejati P. The Impact of Provider Payment Reforms and Associated Care Delivery Models on Cost and Quality in Cancer Care: A systematic literature review. *PLOS ONE* 2019; 14(4): e0214382. <https://doi.org/10.1371/journal.pone.0214382>.
 14. Cheng FK. Book Review: The Comprehensive Cancer Center: Development, Integration and Implementation. *AIM* 2024; 2(3): 16–18. <https://doi.org/10.59652/AIM.V2I3.262>.
 15. Ibrahim AM, Ananthaiah V, Makary MA. What Health Care Reform Means for Surgical Oncology. *Ann Surg Oncol* 2011; 18(1): 6–7. <https://doi.org/10.1245/s10434-010-1357-9>.
 16. Flood AB, Fennell ML, Devers KJ. Health Care Reforms as Multilevel Interventions in Cancer Care. *J Natl Cancer Inst Monogr* 2012; 2012(44): 80–85. <https://doi.org/10.1093/jncimonographs/lgs012>.
 17. Apte SM, Patel K. Payment Reform: An Unprecedented and Evolving Impact on Gynecologic Oncology. *Front Oncol* 2016; 6: 84. <https://doi.org/10.3389/fonc.2016.00084>.

18. Kline RM, Adelson KB, Kirshner JJ, Strawbridge LM, Devita M, Sinanis N, Conway PH, Basch E. The Oncology Care Model. *Am Soc Clin Oncol Educ Book*. 2017; 37: 460–466. https://doi.org/10.1200/edbk_174909.
19. Bergin RJ, Whitfield K, White V, Milne RL, Emery JD, Boltong A, Hill D, Mitchell P, Roder D, Walpole E, te Marvelde L, Thomas RJS. Optimal Care Pathways. *J Cancer Policy* 2020; 25: 100245. <https://doi.org/10.1016/j.jcpo.2020.100245>.
20. Hickmann E, Richter P, Schlieter H, Cemazar M, Dudek-Godeau D, Grapentin N, Griesshammer E, Jelenc M, Liutkauskienė S, Ravaud A, Troussard X, Wesselmann S. Operationalizing Patient-Centered Care: Conceptual Framework of Comprehensive Cancer Care Networks. *JMIR Cancer* 2025; 11: e596832024. <https://doi.org/10.2196/59683>.
21. Kotapski R, Kowalak R, Lew G. Rachunek kosztów i rachunkowość zarządcza. *Kompendium wiedzy*. Wrocław: MARINA; 2020.
22. Świdorska GK, Pielaszek M. Rachunkowość zarządcza w podmiotach leczniczych. Warszawa: Wolters Kluwer; 2015.
23. Trembecki Ł, Sztuder A, Dębicka I, Matkowski R, Maciejczyk A. The pilot project of the National Cancer Network in Poland: Assessment of the functioning of the National Cancer Network and results from quality indicators for lung cancer (2019–2021). *BMC Cancer* 2022; 22(1): 939. <https://doi.org/10.1186/s12885-022-10020-9>.
24. Sagan A, Kowalska-Bobko I, Gałązka-Sobotka M, Holecki T, Maciejczyk A, McKee M. Assessing Recent Efforts to Improve Organization of Cancer Care in Poland. *International Journal of Environmental Research and Public Health*. 2022; 19(15): 9369. <https://doi.org/10.3390/ijerph19159369>.
25. Wojciechowska U, Didkowska J, Koćmiel A. Nowotwory złośliwe w Polsce jako problem zdrowia publicznego. *Studia Demograficzne* 2012; 1(161): 153–166.
26. Dahms S, Nowicki A. Epidemiology and Treatment Outcomes of Colorectal Cancer in Poland. *Polski Przegląd Chirurgiczny* 2015; 87(11): 598–605.