

Financial Management in Surgical Departments: Balancing Cost, Quality, and Patient Care

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ABSTRACT

Balancing cost efficiency, technical developments, and patient care quality in surgical departments depends on good financial management. The approaches to maximize expenses including investment in innovative surgical technology, effective resource allocation, and cost management actions. To guarantee long-term financial viability while raising surgical accuracy and patient outcomes, hospitals must carefully assess the cost-benefit of robotic and AI-assisted operations. By lowering administrative tasks, guaranteeing proper payments, and thereby avoiding errors, the combination of digital health records and automated billing systems improves operational efficiency. Expanding surgical treatments through specialized programs and sophisticated operations also helps meet patient demand and create income. Reducing follow-up expenditures, enhancing post-surgical monitoring, and lowering hospital readmissions depend mostly on telemedicine integration. Transparency in invoicing and fair pricing are ethical and patient-centric financial ideas that guarantee surgical treatment accessibility while preserving economic stability. Using data-driven decision-making, streamlining surgical procedures, and implementing creative healthcare models can help hospitals to reach financial sustainability. A well-organized financial structure helps surgical departments to balance cost-effectiveness, high-quality treatment, and technical developments, so guaranteeing long-term development and better healthcare results.

Keywords: financial management, surgical departments, cost optimization, patient care, robotic surgery, telemedicine, automated billing.

1. INTRODUCTION

Financial management in surgical departments is essential for optimizing cost effectiveness, quality of treatment, and patient outcomes. Healthcare institutions must efficiently deploy resources to ensure the financial viability of surgical treatments while upholding superior medical standards. Due to the escalating expenses of surgical apparatus, supplies, and labor, meticulous planning and strategic cost management are vital to enhance operations while ensuring patient safety is not jeopardized. In contemporary healthcare, revenue production within surgical departments depends on insurance reimbursements, billing precision, and performance-based financial frameworks. Effective financial management entails investing in innovative surgical technology, including robotic-assisted operations and AI-driven diagnostics, which can improve surgical precision but necessitate substantial initial expenditure. Financial plans must prioritize patient-centeredness, guaranteeing that cost-reduction initiatives do not adversely affect patient care. Transparent billing, cost-effective treatment alternatives, and principled decision-making in resource distribution are essential for preserving trust and equity in healthcare. Through the integration of technology, optimization of operations, and execution of robust financial planning, surgical departments can attain a sustained equilibrium of cost efficiency, superior treatment quality, and favorable patient outcomes.

1.1 Cost Optimization in Surgical Operations

The ability of hospitals to optimize their surgical procedures without jeopardizing patient safety can be achieved through the streamlining of procurement processes, the reduction of waste, and the efficient management of workforce expenses. When it comes to surgical procedures, cost optimization is absolutely necessary in order to guarantee financial sustainability while still providing high-quality care to patients. It is essential to apply solutions that are cost-effective in surgical departments because these departments incur considerable expenses on equipment, consumables, and professionals with the necessary skills. When it comes to cutting costs, one of the most important methods to do it is by getting surgical supplies in an effective manner. This can be accomplished by hospitals through the negotiation of bulk discounts, the centralization of purchasing, and the collaboration with suppliers to get deals that are favorable in terms of cost. The implementation of just-in-time (JIT) inventory management helps to prevent overstocking and reduces the amount of expensive surgical items that are wasted, such as sutures, implants, and drugs. Transitioning from disposable surgical instruments to reusable ones might result in significant cost savings over the long term. Eliminating waste from surgical procedures and making better use of available resources are two other important aspects of cost reduction. Surgical kits that are standardized for certain procedures ensure that just the components that are required for the procedure are provided, hence preventing unnecessary usage. Digital tracking systems can also be utilized by hospitals in order to monitor inventory usage and find chances for waste reduction [1]. Through the optimization of the utilization of consumables like surgical drapes, gloves, and gowns, additional cost savings can be achieved while simultaneously maintaining the requirements of hygiene and safety. In order to optimize costs, it is equally vital to effectively manage the expenditures associated with staffing. As a result of the fact that labor expenditures constitute a significant component of surgery costs, hospitals are required to use intelligent workforce management solutions. These include allowing for flexible schedule, providing surgical personnel with cross-training opportunities, and employing per diem workers when they are required. The automation of administrative operations, such as scheduling and documentation, has the potential to improve operational efficiency and reduce overhead expenses. Surgical departments have the ability to drastically reduce expenses while maintaining the best possible standards of patient care if they implement these cost-optimization measures, which include efficient procurement, waste reduction, and labor management. Not only does the use of cost-effective financial planning in surgical procedures benefit hospitals, but it also makes surgical procedures more accessible and reasonably priced for patients [2].

2. BUDGETING AND FINANCIAL PLANNING

2.1 Managing and Predicting Surgical Department Expenses

Efficient financial management in surgical departments necessitates accurate forecasting and regulation of expenses to maintain sustainability while preserving patient care quality. Due to the substantial expenses linked to surgical procedures encompassing equipment, labor, consumables, and infrastructure hospitals must adopt strategic budgeting and expense management techniques. Healthcare organizations can maximize resource allocation and sustain financial stability by utilizing data-driven forecasting and implementing cost-control strategies. Precise expense forecasting is essential for predicting future expenditures and preventing financial deficits. Hospitals can utilize historical data, case volume patterns, and predictive analytics to forecast future expenses. Factors including patient influx, surgical case intricacy, and technological advancements must be taken into account to build accurate budgets. Forecasting aids in recognizing potential cost overruns, enabling administrators to implement proactive modifications prior to affecting the department's financial stability. Managing expenses necessitates a comprehensive strategy encompassing cost-effective procurement, streamlined workforce, and waste minimization. Surgical departments can decrease supply chain expenses by negotiating superior contracts with suppliers, engaging in bulk procurement, and employing just-in-time inventory management. Personnel expenses can be optimized via adaptable workforce scheduling, cross-training employees, and utilizing automation for

administrative functions. Reducing surgical waste such as surplus consumables and extra inventory can substantially decrease superfluous costs. Technology significantly contributes to financial management. Implementing automated financial tracking systems facilitates real-time expense monitoring, assisting administrators in identifying inefficiencies and potential for cost reduction. Artificial intelligence (AI)-driven decision-support technologies can augment budget planning by delivering insights into expenditure trends and optimizing resource distribution. By incorporating data-driven forecasting, effective procurement methods, and technology-based expense management, surgical departments can achieve financial sustainability. This strategy enhances operational efficiency while facilitating superior patient care by ensuring resources are allocated to areas of greatest need [3,4].

2.2 Budgeting for Surgical Technologies

Investing in novel surgical technology and innovations is crucial for improved patient outcomes, improving surgical precision, and sustaining a hospital's competitive advantage. These innovations frequently entail substantial expenses, necessitating meticulous financial planning and resource distribution. Hospitals must reconcile the demand for advanced surgical instruments with fiscal limitations to maintain financial viability. Strategic resource allocation commences with evaluating the hospital's long-term objectives and prioritizing investments according to patient demand, therapeutic advantages, and return on investment (ROI). Technologies like robotic-assisted surgery, AI-enhanced diagnostics, and minimally invasive surgical instruments can enhance efficiency and expedite patient recovery periods. Each investment must be assessed for cost-effectiveness and possible long-term savings. Although robotic systems may include substantial upfront expenditures, they can diminish surgical problems, cut hospital durations, and decrease overall operational costs. To enhance funding, hospitals may investigate alternative financing avenues, including grants, collaborations with medical device manufacturers, or leasing costly equipment rather than outright acquisition. Furthermore, a gradual implementation of new technologies initiating with pilot projects or restricted application in particular procedures can facilitate the evaluation of their efficacy prior to full-scale adoption. A crucial element of fund allocation is ensuring that technological expenditures correspond with staff training and infrastructural preparedness. A meticulously crafted budget must encompass expenses for surgeon training, software enhancements, and essential facility improvements to accommodate new equipment. Inadequate integration and training may result in the underutilization of costly technologies, causing financial inefficiencies. By judiciously allocating resources for surgical advances via comprehensive assessment, incremental implementation, and varied financing, hospitals can successfully incorporate new technologies while preserving fiscal stability. This method guarantees that innovations enhance patient care while promoting sustained cost efficiency [5].

2.3 Roles of Financial Management

Efficient financial management guarantees that firms attain stability, growth, and profitability while preserving operational efficiency. Effective planning and forecasting enable organizations to handle economic volatility, while capital structure management equilibrates financial risks and funding requirements. Strategic investment decisions and working capital management enhance resource allocation. Risk management protects assets, while financial reporting improves transparency, facilitating superior decision-making and adherence to regulations. The functions of Financial Management are illustrated in Figure 1.

1. *Financial Planning and Forecasting:* Financial planning is assessing the capital necessary to fulfill business objectives and devising strategies for the effective acquisition and allocation of these resources. Projecting future revenue, expenditures, and financial risks enables firms to make informed decisions. Effective financial planning guarantees corporate expansion, stability, and readiness for unforeseen circumstances.
2. *Management of Capital Structure:* This function aims to ascertain the optimal combination of debt and equity funding. Businesses must assess the cost of capital, risk variables, and long-term financial viability when determining how to finance their operations. An optimal capital structure reduces financial risk and increases profitability by maximizing funding sources.
3. *Financial Reporting and Analysis:* Organizations must compile and analyze financial accounts, including balance sheets, income statements, and cash flow statements, to monitor their financial health. Consistent financial reporting enables management to assess performance, implement strategic modifications, and adhere to legal and regulatory obligations. Financial analysis aids investors in making educated decisions [6].
4. *Risk Management:* Financial managers recognize, evaluate, and alleviate financial risks, encompassing market volatility, credit hazards, and operational difficulties. Employing risk management measures, including insurance, hedging, and diversification, safeguards the organization against unforeseen losses and bolsters financial stability.
5. *Profit Planning and Control:* This duty entails establishing financial objectives, assessing actual performance, and implementing corrective measures to attain profitability. Enterprises evaluate cost frameworks, pricing methodologies, and income sources to optimize profit margins while managing expenditures. Effective profit planning guarantees enduring sustainability and competitiveness.
6. *Cost Control and Reduction:* Cost management entails pinpointing opportunities for expense reduction without

compromising productivity or quality. Methods like budgetary control, process optimization, and technology adoption enhance business efficiency and profitability. By efficiently managing these financial operations, firms can provide financial stability, facilitate corporate expansion, and attain long-term success.

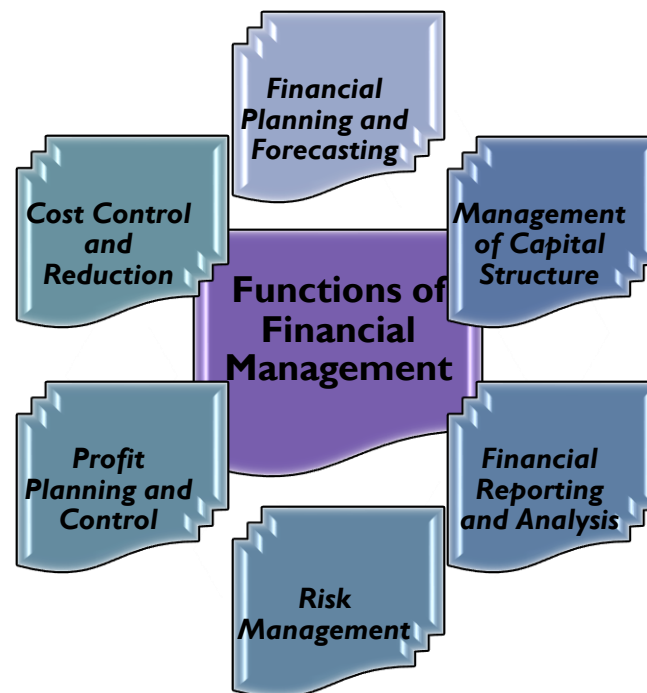


Figure 1: Functions of Financial Management

2.4 Cost-effective maintenance and facility upgrades

In order to maintain a high standard of surgical care while keeping costs under control, timely facility renovations and effective maintenance are crucial. Patient safety is improved, expensive emergency repairs are avoided, and equipment downtime is decreased in a well-maintained surgical department. However, controlling these costs necessitates a calculated strategy that strikes a compromise between the requirement for contemporary, fully functional facilities and budgetary limitations. One of the most economical ways to save long-term expenses is through preventive maintenance. Frequent maintenance of sterilization units, HVAC systems, and surgical equipment helps avoid malfunctions that can require costly emergency repairs or equipment replacement. IoT-enabled sensors and AI-driven analytics can be used by hospitals to perform predictive maintenance, which enables them to see any problems before they arise. This not only increases the longevity of medical equipment but also guarantees uninterrupted surgical procedures. Over time, energy-efficient facility improvements can drastically lower operating expenses. Medical equipment, climate control, and lighting all contribute to the high energy use of surgical departments. Using smart building management technology, installing energy-efficient HVAC systems, and switching to LED lighting can all reduce utility costs and increase sustainability. To increase productivity while preserving ideal operating room conditions, hospitals should also investigate green building projects like better insulation and automatic climate management. Hospitals can upgrade their buildings without incurring undue financial hardship thanks to flexible renovation plans. Hospitals can select improvements according to impact and urgency rather than undergoing extensive, expensive overhauls. Hospitals can distribute expenses over several budget cycles by implementing modular renovations, such as replacing obsolete operating room components in stages. Surgical departments can modernize their facilities at a reasonable cost by putting preventative maintenance into place, purchasing energy-efficient equipment, and implementing phased refurbishment plans [7,8].

3. PATIENT-CENTRIC FINANCIAL APPROACHES

It is crucial to maintain ethical and patient-focused financial management in surgical departments to achieve a balance between cost efficiency and quality care. Clear billing practices, equitable pricing structures, and support programs enable patients to obtain essential treatments without excessive financial burden. Hospitals ought to focus on delivering care that is both cost-effective and efficient by minimizing unnecessary procedures, all while upholding high medical standards. Insurance policies that prioritize ethics, transparent discussions regarding expenses, and fair distribution of resources help eliminate financial bias in treatment choices. By prioritizing patient welfare while ensuring financial sustainability,

healthcare providers can foster trust, enhance access to surgical care, and maintain ethical standards in their financial decisions. Figure 2 illustrates ethical and patient-centric financial approaches. By incorporating these ethical and patient-focused financial practices, hospitals can achieve financial sustainability while providing equitable, transparent, and high-quality surgical care for all patients.

- **Affordable Care Access:** Guaranteeing cost in surgical treatment is crucial for egalitarian healthcare. Hospitals ought to provide financial aid programs, adaptable payment plans, and sliding-scale pricing for economically disadvantaged patients. Equitable pricing structures must be implemented to avert exorbitant expenses for vital treatments. Minimizing superfluous testing and interventions concurrently reduces patient costs while preserving quality care.
- **Transparent Billing:** Transparent and forthright billing processes foster trust between healthcare institutions and patients. Detailed invoices must be issued, delineating all expenses to prevent ambiguity or concealed costs. Informing patients on insurance coverage, co-payments, and alternative financial options enables them to make informed choices. Hospitals must to establish strategies to avert surprise billing, guaranteeing that patients are informed of expenses in advance.
- **Fair Resource Allocation:** The equitable allocation of resources guarantees that all patients have essential surgical care, irrespective of their financial circumstances. Hospitals must prioritize essential and life-saving surgery over elective procedures in resource-constrained environments. Equitable access to operating room availability, proficient surgeons, and cutting-edge technology mitigates treatment inequities. Monetary factors must never influence the standard of treatment provided to a patient.
- **Cost-Effective Treatment:** Providing superior care without incurring exorbitant expenses necessitates the efficient use of resources. Hospitals must to adhere to evidence-based treatment regimens to reduce superfluous costs while guaranteeing good results. Surgical departments can enhance resource utilization by minimizing waste, adopting cost-effective strategies, and meticulously assessing the requirement of costly technologies. An equilibrium between innovation and affordability is essential for upholding ethical financial practices [9].
- **Ethical Insurance Practices:** Equitable insurance policies are essential for ensuring accessibility to surgical care. Hospitals ought to promote ethical reimbursement systems that ensure sufficient coverage for essential services. Preventing discrimination against high-risk patients or individuals with pre-existing conditions guarantees that financial constraints do not impede access to care. Cooperation among hospitals, insurers, and policymakers can result in more patient-centric and cost-effective healthcare models.

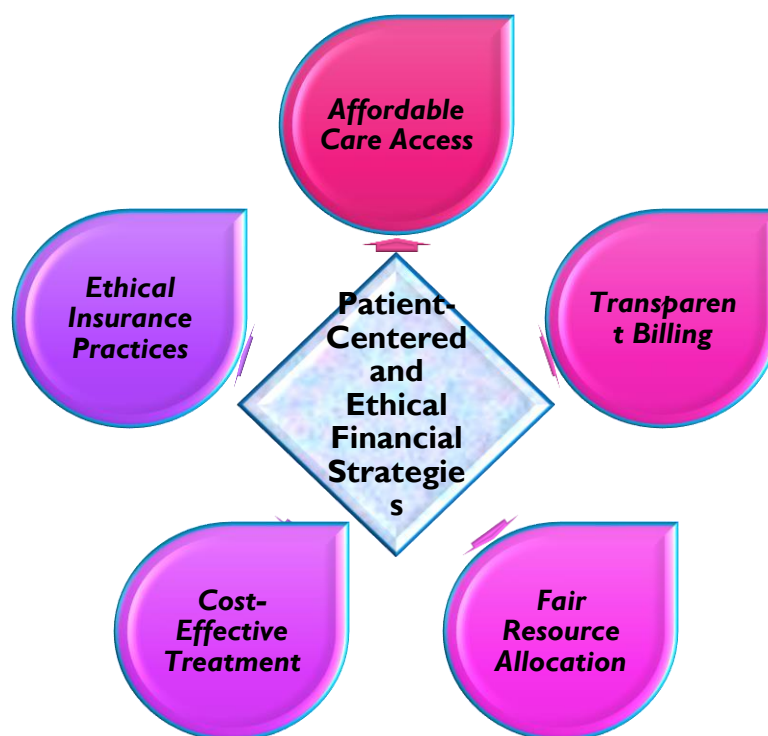


Figure 2: Patient-Centered and Ethical Financial Strategies

4. REVENUE GENERATION AND REIMBURSEMENT

4.1 Insurance claims and reimbursements

The efficient handling of insurance claims and reimbursements is crucial for sustaining the financial stability of surgical departments. Delays, inaccuracies, and administrative inefficiencies may result in revenue losses for hospitals and financial strain for patients. By enhancing claims management via faster processes, technological integration, and improved collaboration with insurers, healthcare providers can secure prompt reimbursements while alleviating administrative costs. A principal problem in insurance reimbursements is the intricacy of claims submission. Hospitals must use standardized billing procedures that adhere to insurance provider regulations. Precise coding of surgical operations, meticulous documenting of patient data, and prompt submission of claims are essential in reducing errors that result in rejections or delays. Instructing administrative personnel in optimal medical billing and coding techniques ensures adherence to changing requirements, hence minimizing claim processing inefficiencies. Technology is essential for enhancing the efficiency and precision of insurance claims. The implementation of electronic health records (EHRs) and automated billing systems facilitates the seamless integration of patient data with claims processing. AI-powered claims management systems can detect inaccuracies, confirm patient eligibility, and highlight potential problems before to submission. Real-time claim tracking systems enable hospitals to oversee claim statuses and proactively rectify errors, hence diminishing turnaround times and enhancing approval rates. Effective collaboration with insurance carriers is a crucial element of successful reimbursement. Creating direct communication lines with insurers enables hospitals to expedite dispute resolution, elucidate coverage policies, and confirm patient eligibility in real-time. Consistently evaluating contractual agreements with insurance providers guarantees that reimbursement rates are equitable and competitive. Regular audits of denied claims facilitate the identification of persistent issues and the implementation of corrective actions to mitigate future rejections [10].

Minimizing claim denials is essential for sustaining cash flow in hospitals. Numerous denials stem from insufficient documentation, erroneous coding, or absence of pre-authorization. Establishing a comprehensive pre-authorization process guarantees that operations comply with insurance standards prior to execution. Furthermore, the preservation of comprehensive medical records, encompassing physician notes and diagnostic reports, fortifies claims and diminishes the probability of conflicts. Ongoing staff training on insurance policy revisions and reimbursement protocols also aids in preventing expensive mistakes. Hospitals can augment efficiency by enhancing patient education regarding insurance claims and reimbursements. Patients frequently encounter difficulties comprehending their insurance coverage, co-payment obligations, and claims submission processes. Delivering explicit cost estimates before to treatment, elucidating potential out-of-pocket payments, and facilitating assistance with documentation might avert confusion and disagreements. Specialized financial counseling teams can assist patients in navigating the claims process, facilitating a more effective understanding of reimbursement timelines and payment alternatives. By implementing uniform billing methods, utilizing automation, enhancing insurer coordination, reducing claim denials, and informing patients, surgical departments can markedly improve the efficiency of insurance claims and reimbursements. This holistic strategy enhances hospital financial stability while simultaneously elevating patient happiness through a more efficient and transparent claims process [11].

4.2 Surgical services to improve financial sustainability

Increasing surgical services is a calculated move that will improve patient care and financial sustainability. Hospitals can increase their patient base and revenue by offering a wider variety of procedures, making the most use of operating rooms, and using cutting-edge surgical techniques. Diversifying services lessens reliance on a small number of processes, strengthening the financial model's resistance to changes in the economy. Minimally invasive and robotically assisted operations, which are in great demand because of their shorter recovery periods and shorter hospital stays, are a good method to increase surgical services. In addition to improving patient outcomes, these treatments boost surgical throughput, which enables hospitals to handle more cases without having to make major infrastructure expansions. In addition to increasing revenue streams, investing in specialty surgical programs like orthopedics, heart surgery, and oncology can draw referrals from smaller medical facilities. Another important component of financial sustainability is making the most of operating room use. Hospitals can increase daily procedure volume by optimizing scheduling, cutting turnaround times, and extending surgery hours when needed. Better financial success results from prioritizing high-demand procedures through the use of data-driven decision-making in resource allocation. Partnerships with government health programs and private insurers can also increase patient access to surgical procedures while guaranteeing consistent payment. Increasing the number of preoperative evaluations and surgical consultations conducted via telemedicine can help improve patient flow and maximize hospital effectiveness [12].

5. TECHNOLOGY INVESTMENTS FOR COST AND QUALITY BALANCE

5.1 Cost-benefit of robotic and AI-assisted surgeries

Robotic and AI-assisted surgeries have revolutionized contemporary surgical practices by improving precision, decreasing recuperation durations, and mitigating complications. These sophisticated technologies entail considerable expenses, necessitating hospitals to meticulously assess their financial implications. A cost-benefit study assesses whether investment

in robotic and AI-assisted surgical equipment yields long-term financial and clinical benefits. The initial expenditure for robotic surgical systems is substantial, encompassing costs for equipment acquisition, maintenance, and surgeon education. Hospitals must allocate resources for infrastructure enhancements and specific personnel training programs to guarantee seamless integration. Recurring expenses include software upgrades, disposable instruments, and maintenance exacerbate the financial strain. Notwithstanding these costs, robotic systems provide advantages like enhanced precision, diminished surgical errors, and abbreviated hospital stays, potentially resulting in financial savings in postoperative care and readmissions. AI-assisted surgeries augment decision-making by evaluating extensive patient data, refining diagnosis, and customizing treatment strategies. These technologies enhance surgical workflows, diminishing operation durations and augmenting operating room efficiency. Accelerated healing rates and reduced complications yield improved patient outcomes, potentially decreasing overall healthcare expenditures. Hospitals must evaluate whether these advantages warrant the substantial expenditure necessary for AI integration. To enhance financial sustainability, hospitals had to perform a comprehensive return-on-investment analysis, taking into account patient demand, payment regulations, and competitive advantages. Partnerships with technology suppliers, lease alternatives, and governmental financing opportunities can mitigate expenses. The strategic implementation of robotic and AI-assisted operations can improve surgical proficiency while maintaining long-term financial sustainability [13].

5.2 Digital records & billing

The implementation of digital health records and automated billing systems has resulted in a considerable improvement in the effectiveness of surgical departments as well as their ability to maintain their financial profitability. These technologies simplify administrative procedures, cut down on errors, and improve revenue cycle management, which in turn ensures that reimbursements are made on time and that accurate financial documentation is produced. Digital health records offer a consolidated platform for the storage and management of patient information, which may include the patient's medical history, diagnostic tests, and treatment recommendations. Hospitals have the ability to improve data accessibility, boost collaboration among healthcare providers, and minimize administrative expenses if they do away with paper-based documentation. It is also possible to improve decision-making through real-time access to patient records, which ultimately results in improved surgical outcomes and efficient resource use. Automated billing solutions further improve financial efficiency by reducing the number of errors that are caused by human intervention in the coding and submission of claims. The utilization of these technologies guarantees proper billing for surgical treatments, hence minimizing the occurrence of claim denials and delays in reimbursements. In order to assist hospitals in monitoring their financial performance, billing software that is powered by artificial intelligence may identify inconsistencies, indicate documentation that is inadequate, and provide reports in real time. In addition, automated billing lessens the administrative burden that is placed on hospital staff, which enables them to devote more of their attention to providing care to patients rather than manually entering data. While also guaranteeing that the hospital is in line with regulatory regulations, the combination of digital health records and automated billing systems allows for increased transparency in the institution's financial operations. Surgical departments have the ability to improve their operational efficiency, eliminate revenue leakage, and maintain a financially sustainable model if they use these technologies [14].

5.3 Reducing Costs of Follow-Up Care

An efficient technique for lowering follow-up costs while preserving high-quality patient care is the incorporation of telemedicine into surgical care, which has been increasingly popular in recent years. Through the utilization of digital communication tools, remote monitoring, and virtual consultations, hospitals are able to reduce the number of in-person visits that are required, hence reducing the overall costs of healthcare for both patients and providers. Telemedicine makes it possible for patients who have recently undergone surgery to receive follow-up care without having to travel to the hospital. This helps to reduce the costs that are connected with transportation, hospital resources, and administrative assistance. Through the use of virtual consultations, surgeons are able to evaluate the progress of the patient's recuperation, discuss any concerns, and make adjustments to treatment plans without the need for actual appointments. Not only does this lessen the financial burden that patients have to bear, but it also improves the efficiency of the hospital's workflow by freeing up clinical resources for use in more urgent cases. Real-time tracking of vital signs, wound healing, and medication adherence are all made possible through remote patient monitoring, which further improves the cost-effectiveness of healthcare treatment. Wearable technology and health applications powered by artificial intelligence give continuous data to medical professionals, which enables both the early detection of issues and the prompt implementation of interventions. Telemedicine helps reduce further medical expenses by lowering the number of times patients need to be readmitted to the hospital and attend emergency rooms. This contributes to an overall improvement in the financial sustainability of surgical departments. Telemedicine enhances patient satisfaction by providing follow-up care that is not only convenient but also easily accessible and delivered in a timely manner [15]. Hospitals have the ability to integrate safe digital platforms for communication, which allows them to maintain high-quality patient relations while still complying with requirements around data privacy. By deploying telemedicine technologies, surgical departments have the ability to drastically reduce the expenses associated with follow-up care, increase the efficiency of post-surgery care, and boost patient participation.

6. CONCLUSION

Efficient financial management in surgical departments necessitates a balanced strategy that optimizes expenditures, upholds high-quality service, and guarantees patient happiness. Through the implementation of cost-control techniques, hospitals can enhance operational efficiency while reducing superfluous costs. Strategic investments in innovative surgical technologies and infrastructural enhancements foster long-term financial viability, contingent upon thorough cost-benefit evaluations. Expanding surgical services and utilizing automation in billing and record-keeping augment revenue generating while alleviating administrative expenses. The implementation of robotic and AI-assisted operations, telemedicine integration, and digital health records enhances efficiency and patient outcomes, resulting in improved resource utilization. Ethical and patient-centered financial procedures guarantee transparency, equitable pricing, and accessible healthcare services for all patients. By using these measures, surgical departments can establish a sustainable financial model that facilitates technology breakthroughs, improves patient care, and fortifies the broader healthcare system. An effectively structured financial framework allows hospitals to deliver superior surgical services while ensuring economic stability and sustainable expansion.

REFERENCES

- [1] Xu, C.; Qu, Y.; Luan, T.H.; Eklund, P.W.; Xiang, Y.; Gao, L. A Lightweight and Attack-Proof Bidirectional Blockchain Paradigm for Internet of Things. *IEEE Internet Things J.* 2022, 9, 4371–4384.
- [2] Ning, Z.; Xia, F.; Ullah, N.; Kong, X.; Hu, X. Vehicular Social Networks: Enabling Smart Mobility. *IEEE Commun. Mag.* 2017, 55, 16–55.
- [3] Zhao, H.; Zhang, Y.; Huang, X.; Xiang, Y.; Su, C. A Physical-Layer Key Generation Approach Based on Received Signal Strength in Smart Homes. *IEEE Internet Things J.* 2022, 9, 4917–4927.
- [4] Wu, M.; Wang, K.; Cai, X.; Guo, S.; Guo, M.; Rong, C. A Comprehensive Survey of Blockchain: From Theory to IoT Applications and Beyond. *IEEE Internet Things J.* 2019, 6, 8114–8154.
- [5] Ning, Z.; Chen, H.; Wang, X.; Wang, S.; Guo, L. Blockchain-Enabled Electrical Fault Inspection and Secure Transmission in 5G Smart Grids. *IEEE J. Sel. Top. Signal Process.* 2022, 16, 82–96.
- [6] Wang, X.; Ning, Z.; Guo, L.; Guo, S.; Gao, X.; Wang, G. Mean-Field Learning for Edge Computing in Mobile Blockchain Networks. *IEEE Trans. Mob. Comput.* 2022.
- [7] Choi, T.M. Financing Product Development Projects in the Blockchain Era: Initial Coin Offerings Versus Traditional Bank Loans. *IEEE Trans. Eng. Manag.* 2022, 69, 3184–3196.
- [8] Shang, Z.; Ma, M.; Li, X. A Secure Group-Oriented Device-to-Device Authentication Protocol for 5G Wireless Networks. *IEEE Trans. Wirel. Commun.* 2020, 19, 7021–7032.
- [9] Wang, X.; Ning, Z.; Guo, S.; Wen, M.; Guo, L.; Poor, V. Dynamic UAV Deployment for Differentiated Services: A Multi-Agent Imitation Learning Based Approach. *IEEE Trans. Mob. Comput.* 2021.
- [10] Wang, X.; Ning, Z.; Wang, L. Offloading in Internet of Vehicles: A Fog-Enabled Real-Time Traffic Management System. *IEEE Trans. Ind. Inform.* 2018, 14, 4568–4578.
- [11] Ning, Z.; Zhang, K.; Wang, X.; Obaidat, M.S.; Guo, L.; Hu, X.; Hu, B.; Guo, Y.; Sadoun, B.; Kwok, R.Y.K. Joint Computing and Caching in 5G-Envisioned Internet of Vehicles: A Deep Reinforcement Learning-Based Traffic Control System. *IEEE Trans. Intell. Transp. Syst.* 2021, 22, 5201–5212.
- [12] Ning, Z.; Zhang, K.; Wang, X.; Guo, L.; Hu, X.; Huang, J.; Hu, B.; Kwok, R.Y.K. Intelligent Edge Computing in Internet of Vehicles: A Joint Computation Offloading and Caching Solution. *IEEE Trans. Intell. Transp. Syst.* 2021, 22, 2212–2225.
- [13] Ning, Z.; Huang, J.; Wang, X.; Rodrigues, J.J.P.C.; Guo, L. Mobile Edge Computing-Enabled Internet of Vehicles: Toward Energy-Efficient Scheduling. *IEEE Netw.* 2019, 33, 198–205.
- [14] Wazid, M.; Bera, B.; Das, A.K.; Mohanty, S.P.; Jo, M. Fortifying Smart Transportation Security through Public Blockchain. *IEEE Internet Things J.* 2022, 9, 16532–16545.
- [15] Wang, Y.; Zhang, A.; Zhang, P.; Qu, Y.; Yu, S. Security-Aware and Privacy-Preserving Personal Health Record Sharing Using Consortium Blockchain. *IEEE Internet Things J.* 2022, 9, 12014–12028.