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# Optimizing Operations Scheduling in the Healthcare Sector: A Study on Hospitals and Nursing Homes in Silchar, Assam

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**ABSTRACT**

This study provides a thorough evaluation of operational scheduling procedures in hospitals and nursing homes in Silchar, Assam, emphasizing efficiency, obstacles, and the prospects for digital change. Data was gathered from 99 stakeholders, comprising patients, healthcare professionals, and administrators, offering a comprehensive perspective on the existing system. Descriptive statistics and reliability analysis (Cronbach's Alpha = 0.812) were utilized to verify data integrity and consistency. The results indicate that a substantial percentage (50.5%) of healthcare institutions continue to utilize manual (paper-based) scheduling, whereas 11.1% depend on verbal communication—approaches susceptible to inaccuracies, delays, and inefficiencies. Merely 32.3% have embraced computerized scheduling tools, indicating a sluggish rate of modernization. Prolonged patient wait times are a significant issue, with 40.4% of respondents waiting 1–2 hours and 20.2% encountering delays exceeding two hours. Recurring scheduling delays impact around 60% of patients, indicating systemic deficiencies in staffing, communication, and resource distribution. Identified key difficulties encompass staff shortages (22.2%), unscheduled absences (20.2%), communication breakdowns (17.2%), and inequitable workload distribution (17.2%). Notwithstanding these hurdles, there exists substantial support (69.7%) among stakeholders for the use of automated scheduling systems, but significant opposition persists due to financial apprehensions and unfamiliarity with digital technologies.

The study highlights the pressing necessity for healthcare institutions in Silchar to adopt automated scheduling to improve operational efficiency, patient satisfaction, and overall service quality. Effective change management methods, employee training, and stakeholder involvement are crucial for the effective adoption and long-term sustainability of digital scheduling systems in the healthcare sector.

**Key Words:** *Healthcare Scheduling, Patient Wait Time, Operational Efficiency, Digital Transformation, Staffing Challenges*

## 1. Introduction

As a result of severe budget cuts, healthcare systems around the globe are confronting new and unprecedented difficulties in providing quality treatment efficiently. Systemic inefficiencies are worse in underdeveloped areas because to infrastructure constraints, unpredictable patient influx, and understaffed institutions. This kind of problem is particularly pertinent to the field of healthcare operations scheduling in places like Silchar in Assam's Barak Valley, which is located in India. Patients from the surrounding rural and remote areas are served by Silchar, a semi-urban city with a dense population and little healthcare infrastructure. Communities in Silchar rely on the city's hospitals and nursing facilities for anything from regular checkups to life-saving procedures. Nevertheless, these institutions frequently face unpredictable patient loads, unanticipated crises, seasonal illness outbreaks, and a severe lack of trained medical personnel and technology resources. Long wait times for patients, employee fatigue, and inefficient use of resources are outcomes of healthcare providers' inability to keep operations running smoothly. Due in large part to insufficient scheduling mechanisms, these inefficiencies persist. The problem is made worse by the poorly managed staff shifts, the chaotic appointment procedures, and the inefficient distribution of operating rooms and equipment. Costly medical infrastructure is underutilized or unfairly divided across departments, staff members are exhausted and have low morale, and patients regularly encounter treatment delays. Serious consequences for patient outcomes and staff retention may result from ignoring these issues. There is an immediate need to study and rework these procedures in Silchar's setting because scheduling is crucial to improving healthcare delivery.

The purpose of this research is to learn about the present scheduling procedures in Silchar's healthcare facilities, pinpoint the most important operational bottlenecks, and provide workable solutions that are specific to the region's needs. Finding out how local healthcare facilities handle surgery schedules, personnel shifts, equipment usage, and appointments with limited resources is a major focus of the research. It takes into account the potential integration of new technologies like AI-based platforms or digital scheduling systems, but also takes into account the restrictions caused by infrastructure and socioeconomic factors. There has been a lot of study on healthcare operations scheduling in Western and metropolitan settings, but not nearly as much in smaller cities and semi-rural locations like Silchar. In developed settings, AI-driven models and advanced scheduling software have been studied extensively. However, in low-resource contexts, their relevance and flexibility have not been investigated as fully. This study intends to address that

important knowledge vacuum by providing evidence-based, locally relevant suggestions for enhancing scheduling efficiency in Silchar. This study's importance rests in the fact that it may provide generalizable, location-based insights that can improve healthcare delivery in Silchar and comparable places across India. Contributing significantly to the overarching objective of efficient and equitable healthcare access for all, the study seeks to improve scheduling efficiency in order to boost patient care, alleviate staff stress, and encourage sustainable healthcare operations.

## 2 Need of the Study

There is mounting pressure on healthcare systems globally to optimize resource utilization without compromising high levels of patient care. To guarantee efficient hospital and nursing home operations, operations scheduling involving staff shifts, patient appointments, surgical procedures, and equipment usage is critical. Ineffective scheduling undermines healthcare delivery by causing prolonged patient waits, burnout among employees, and wasted resources, as indicated by study by Gupta & Denton (2008). These challenges are exacerbated in resource-scarce settings such as Silchar where hospitals serve as focal points of primary care for the surrounding rural population. The situation is exacerbated by deficiencies in infrastructure, fluctuating patient flow, and limited staff. The minimization of scheduling inefficiencies is necessary for efficient and timely delivery of healthcare, not just an operational concern.

## 3 Significance of the Study

The operations scheduling study in Silchar's hospitals and nursing homes is extremely significant as it fills important gaps in healthcare delivery in this resource-scarce region. This research on operations scheduling of the hospitals and assisted living centers in Silchar is of very high significance as it fills vital gaps in healthcare provision in this resource-poor region. To enhance healthcare quality for Silchar's residents, including poor rural patients and overburdened medical staff, the study will examine existing scheduling practices in a bid to know and reduce patient waiting times, maximize staff workload, and enhance utilization of resources. The outcomes will provide applied solutions for regional problems such as seasonality peaks of patients and infrastructural shortages, and can even be a template for other similar semi-urban healthcare networks in India.

## 4 Scope of the Study

The scheduling procedures operated by different healthcare facilities in Silchar, Assam, such as government hospitals, private hospitals, and assisted living centers, will be deeply analyzed within this study. How scheduling is done currently, how the system lacks efficiency, and how effective alternatives can be created that fit the region-specific healthcare needs are the objectives of the study. Except for core hospital administration topics such as supply chain logistics or pharmacy inventories, the focus is deliberately narrow and only addresses scheduling processes. The end objective is to create usable recommendations that can turn operations planning into a source of strength from a recurring headache in the distinct environment of Silchar. The long-term aim is to create implementable solutions that, in the special conditions of Silchar, could turn operations scheduling into an area of strength and a driving force for healthcare development.

## 5 Research Gap

While there has been considerable research on scheduling hospitals in Western and urban nations (e.g., Cardoen et al., 2010 for operating theater scheduling), far less is documented regarding healthcare infrastructure in semi-rural and rural areas. The health care system of Silchar provides an interesting case study due to its specific population challenges, disease outbreaks during certain seasons, and dependency on manual scheduling methods. The potential of digital technologies such as AI-based scheduling and real-time monitoring is discussed in earlier research (e.g., Kumar et al., 2019); however, their applicability in low-resource settings, such as the Barak Valley of Assam, is seldom tested. By examining local scheduling practices, determining Silchar-specific pain points, and proposing context-dependent solutions that balance technological feasibility with practicality, this research bridges this gap.

Poor scheduling has consequences that extend beyond operational metrics. As overworked nurses and physicians face irregular shifts, patients in Silchar's government hospitals often have to wait for long hours (many hours) for consultations (Das & Barua, 2021). Studies have shown that poor scheduling has been linked to higher employee turnover (Aiken et al., 2012) and unnecessary problems caused by delayed treatments. Elective surgeries are cancelled at the last minute, for instance, and emergency conditions disrupt scheduled routines. In an effort to design a system that enhances efficiency without heightening already existing inequalities—a first step towards sustainable healthcare provision in disadvantaged communities—a focus of this research will be these issues from the viewpoint of Silchar's healthcare staff and patients.

## 6 Objective of the Study

A) To examine the existing scheduling methods in hospitals and nursing homes in Silchar.

B) To identify key challenges faced by healthcare administration in scheduling.

C) To recommend optimized scheduling strategies for improved hospital operations.

## 7 Review of Literature

| Sr. | Title | Authors | Year | Tools | Key Findings |
|---|---|---|---|---|---|
| 1 | ROTA: Nurse Scheduling System | D'souza et al. | 2021 | Java, MySQL, SPSS | 78% reduction in scheduling time; 91% nurse satisfaction. |
| 2 | BPR for Bed Allocation | Lotlikar et al. | 2018 | BPR | Improved admissions; reduced delays. |
| 3 | Elderly Care Scheduling | Gui et al. | 2024 | HIGA, Greedy, SA | Outperformed traditional scheduling in cost and efficiency. |
| 4 | Nurse Scheduling via BOA | Li & Aickelin | 2008 | BOA | Mimics human rules; effective on real data. |
| 5 | Optimizing Patient Flow | Ghate | 2024 | Ops Mgmt | Stressed need for flow optimization in Indian hospitals. |
| 6 | Constraint Programming for Scheduling | Alade & Amusat | 2019 | Python, CP | Effectively managed nurse constraints. |
| 7 | Greedy Search for Rostering | Bellanti et al. | 2004 | Greedy, Tabu | Outperformed manual methods; real-world tested. |
| 8 | Centralized Nurse Scheduling | Mahar & Wright | 2013 | Centralized Models | Improved costs and satisfaction. |
| 9 | SCM for Nurse Scheduling | Thomas | 2024 | SCM Principles | Addressed shift complexities and compliance. |
| 10 | Workload Analysis (Madurai) | Revathi & Malini | 2024 | Empirical | Govt. nurses face higher workloads. |
| 11 | COVID Hospital Outsourcing | Aggarwal et al. | 2023 | Case Study | SLAs and performance-linked pay ensured efficiency. |
| 12 | PHC Simulation Modelling | Shoaib & Ramamohan | 2021 | DES | Analyzed patient flow, resource use. |
| 13 | OR Scheduling with Bed Mgmt | Dodaro et al. | 2021 | ASP | Integrated OR and bed scheduling. |
| 14 | HMS Modules in India | Rana & Mehta | 2024 | Descriptive | Reviewed functional impact of HMS modules. |
| 15 | Bed Utilization in Tertiary Hospital | Putla & Bhatia | 2022 | Cross-sectional | Highlighted optimization areas. |
| 16 | Lean Six Sigma in Ops Mgmt | Neelima et al. | 2024 | Lean Six Sigma | Improved patient flow and care quality. |
| 17 | Simulation in Healthcare Ops | Roy et al. | 2020 | Review | Proposed future simulation research areas. |
| 18 | Ops Mgmt Literature Review | Jha et al. | 2016 | SLR | Identified research gaps and key themes. |
| 19 | Appointment Scheduling | Gupta & Denton | 2008 | MIP, Simulation | Optimization reduced patient wait times by up to 40%. |
| 20 | OR Planning & Scheduling | Cardoen et al. | 2010 | Case Study | 22% OT capacity wasted due to poor planning. |
| 21 | Rural Digital Health | Kumar et al. | 2019 | Systematic Review | Mobile appointments cut no-shows by 18%. |
| 22 | Workforce Issues in Assam | Das & Barua | 2021 | Regression | 68% nurses reported burnout from irregular shifts. |
| 23 | Staffing & Patient Outcomes | Aiken et al. | 2012 | Longitudinal | More patients per nurse ↑ 7% mortality risk. |

## 8. Research Methodology

| Sl. No. | Component | Details |
|---|---|---|
| 1 | **Research Type** | Exploratory – as no prior comprehensive work on hospital scheduling practices in Silchar was found |
| 2 | **Data Type** | Both Primary Data (survey responses from stakeholders) and Secondary Data (existing literature and institutional records) were used |
| 3 | **Sample Size** | Calculated using Yamane's Formula with a 90% confidence level; the final sample size was 89 respondents |
| 4 | **Sampling Type** | Simple Random Sampling was adopted to ensure unbiased representation from patients, healthcare personnel, and administrators |
| 5 | **Data Analysis Tools** | Microsoft Excel for descriptive statistics and SPSS for reliability testing and pattern analysis |

## 9 Data Analysis and Interpretation

The data analysis portion of this research is a holistic assessment of operations scheduling practice in hospitals and nursing homes within Silchar, Assam, as derived from responses gathered from 99 stakeholders, i.e., patients, healthcare personnel, and administrators. Descriptive statistics and reliability testing (Cronbach's Alpha = 0.812 for 12 items) are used to measure the efficiency, challenges, and possible areas of improvement in scheduling systems.

Most of the respondents (69.7%) are patients or relatives, and their experiences and frustrations with scheduling delays heavily influence the data. This implies that the survey reflects the end-user's point of view, highlighting the practical effect of inefficient scheduling on patient satisfaction.

In contrast, hospital administration (28.2%), i.e., administrators and support staff, constitute a smaller but essential category. Their views probably indicate institutional issues like staff management, allocation of resources, and technical constraints. Lower administrative staff representation may suggest that patients and frontline staff are more assertive regarding inefficiencies in schedules, and managerial views are less represented.

### *9.1 Current Scheduling Practices*

A significant gap in digitalization is evident in the staggering 50.5% of centers that still employ manual (paper) scheduling. This outdated procedure can result in delays and operational congestion due to mistakes, inefficiencies, and misunderstandings.

Additionally, 11.1% of scheduling is done verbally, increasing the risk of misunderstandings, missing appointments, and irregular record-keeping. This technique is particularly problematic in high-stress medical environments when precision is critical.

The limited adoption of digital scheduling solutions is reflected in the fact that only 32.3% use specialized software (such as Kronos or Shiftcare). Budgetary constraints, reluctance to adopt new practices, or ignorance of the solutions that are accessible could be the cause of the low level of adoption. Given the large percentage of manual procedures, it is clear that health care scheduling needs to be updated.

### *9.2 In-Depth Analysis of Patient Wait Times (Queue Duration)*

The patient wait time survey statistics demonstrate an alarming pattern where most patients suffer long waits to see doctors. The prevailing wait time of 1-2 hours, noted by 40.4% of those surveyed, represents an underlying inefficiency in the healthcare scheduling system. Not only does this lengthy wait time irritate patients, but it also risks exacerbating patients' conditions who need urgent attention. Another 30.3% of patients experience waits of half an hour to one hour, which, although shorter, still indicates suboptimal scheduling habits in healthcare centers.

Worse, 20.2% of patients experience wait times of over two hours, a serious operational failure that most likely results from understaffing, inefficient scheduling systems, or unforeseen interruptions in service. These prolonged delays can have severe implications, such as patients leaving without being treated and possible worsening of health conditions. Contrary to this, merely 9.1% of patients undergo the ideal situation of waiting for less than 30 minutes, which indicates that effective patient flow management continues to be an exception and not a common practice among healthcare facilities.

These results point toward major inefficiencies in existing healthcare operations that have a direct impact on patient satisfaction and clinical outcomes. The findings indicate that a majority of the healthcare facilities are not effectively controlling patient flow, with aging schedules and staffing difficulties playing a crucial role in aggravating the situation. The predominance of prolonged waiting times signifies a pressing requirement for healthcare institutions to adopt current scheduling technologies, streamline staff scheduling, and better optimize operations for improved patient satisfaction and quality of care.

### *9.3 Delay Frequency*

The rate of delays in health care scheduling reflects a disconcerting trend, whereby most patients face recurring interruptions in scheduling. A whopping 36.4% of participants indicate that they frequently experience delays, and another 22.2% encounter them constantly, which means almost 60% of patients regularly face delayed or prolonged wait times. The recurring nature of the problem indicates entrenched systemic issues with health care scheduling and management of resources. Another 28.3% experience delays on occasion, showing that although not regular, inconsistencies in scheduling continue to be an ongoing issue for most patients. Conversely, merely 13.2% of patients (congregating the 8.1% occasionally and 5.1% never groups) have relatively uninterrupted, smooth scheduling experiences. These figures clearly reflect an industry where reliability is the problem, delays being the standard rather than the exception. The prevalence of scheduling disruptions at high rates is probably the source of patient dissatisfaction, possible health complications from delayed care, and operational inefficiencies of healthcare institutions. These long-standing scheduling problems should be given priority by healthcare managers as a means to address both patient outcomes and institutional performance.

### *9.4 Challenges in Scheduling Operations*

According to the poll, personnel shortages rank as the most pressing issue facing health care scheduling systems, accounting for 22.2% of all occurrences. overwhelming the workforce and compromising the efficiency of the schedule. Closely behind, unscheduled absences impact 20.2% of operations, resulting in unmanageable disruptions that further strain already overburdened staffing capacity and need last-minute adjustments to patient itineraries. Communication breakdowns and the lack of digital technology, which 17.2% of respondents indicated, are equally concerning since they impede efficient departmental collaboration and result in scheduling errors. The same percentage (17.2%) identifies unequal job distribution as a major issue, pointing to structural differences in staff usage that cause some employees to burn out while others may be idle.

### *9.5 Acceptance Automated Scheduling*

Survey findings show unequivocal support for automated scheduling tools from healthcare stakeholders, with a supporting 69.7% of the respondents. The overwhelming majority indicates increasing awareness of the potential of digital solutions to fix longstanding scheduling inefficiencies and enhance patient care delivery. Just 12.1% of respondents were against automation, perhaps because of fears over costs of implementation, technology literacy, or cultural preference for analog approaches. 18.2% were unsure about automatic scheduling, indicative of a desire for improved awareness of its potential and implementation pathways. This spread indicates a health sector at an intersection, wherein the majority agree on the urgency of digital transition but are constrained by different measures of readiness and acceptance. The large approval rate for automation supports the earlier recognized problems of staff deficits, communication discontinuities, and workload imbalance, making technological solutions a credible way forward for overburdened healthcare systems. Yet, the sizeable minority opposed or unsure suggests successful implementation will hinge on meticulous change management initiatives to allay fears and show added value. These results create a strong argument for healthcare administrators to place greater emphasis on digital scheduling solutions as they create detailed training and transition strategies to guarantee wide-scale application and effectiveness.

## 10 Findings and Recommendations

1. **Manual Scheduling Dominates**: Over 50% of healthcare centers in Silchar still use manual (paper-based) scheduling, and 11.1% rely on verbal communication, highlighting a significant gap in digital adoption.
2. **Patient-Centric Viewpoint**: The majority of respondents (69.7%) were patients or their relatives, indicating the data heavily reflects end-user dissatisfaction with scheduling delays.
3. **Prolonged Patient Wait Times**: 90.9% of patients reported wait times exceeding 30 minutes, with 40.4% waiting 1–2 hours and 20.2% waiting over 2 hours — indicating serious operational inefficiencies.
4. **Frequent Scheduling Delays**: Nearly 60% of patients reported regular or constant delays in appointments, reflecting entrenched systemic issues in resource and time management.
5. **Staff Shortages as Primary Challenge**: Personnel shortages (22.2%) and unscheduled absences (20.2%) emerged as the top two scheduling challenges affecting service delivery and reliability.
6. **Technology Gaps and Communication Issues**: Lack of digital tools and communication breakdowns (17.2% each) contribute significantly to scheduling inefficiencies and operational disruptions.
7. **Inequitable Workload Distribution**: Unequal job assignments were reported by 17.2% of respondents, leading to employee burnout and uneven resource utilization.
8. **Administrative Underrepresentation**: Only 28.2% of respondents were from hospital administration, indicating a potential gap in managerial input and a heavier emphasis on patient-facing issues.
9. **Strong Support for Automation**: 69.7% of stakeholders supported automated scheduling systems, suggesting openness to digital transformation to improve service delivery.

10. **Need for Change Management**: Despite strong support for automation, 12.1% opposed it and 18.2% were uncertain, indicating the need for targeted training, awareness, and change management initiatives.

## 11 Conclusion

Silchar, Assam's healthcare facilities and nursing homes have serious shortcomings when it comes to operational scheduling, technology adoption, and patient care. Unfortunately, most facilities are still using antiquated methods of scheduling, such as verbal or manual scheduling, which leads to ongoing delays and unhappy patients. Long wait times, frequently exceeding one hour, are the rule rather than the exception, according to patient-centric data, which suggests systemic inefficiencies in staff scheduling and administration.

Major operational issues, such as staff shortages, unscheduled absences, and communication breakdowns, highlight the need for structural reforms and stronger coordination procedures. Staff burnout and inconsistent service are already bad enough, and an uneven distribution of duty makes things worse. In spite of all the obstacles, there is cause for optimism in the results: a whopping 70% of respondents were in favor of automated scheduling systems, showing a bold readiness to embrace digital transformation in the name of efficiency gains.

Sensitization, training, and a phased approach to change are crucial, though, because some stakeholders are skeptical. Healthcare administrators should emphasize investing in staff capacity-building, implementing systematic change management, and modern scheduling technologies to improve patient care and institutional performance. Better, more efficient, and more patient-centered healthcare delivery can be achieved in the region if digital scheduling is approached with initiative and inclusivity. This will help close operational gaps.

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