CHAPTER-05

PNEUMATIC TRANSPORT SYSTEM AT MEDANTA (MEDICITY) GURUGRAM

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INTRODUCTION

For many decades, pneumatic tube systems have served various purposes and have proven to be the most dependable means of transporting crucial supplies for hospitals. Despite its reliability, this mode of transportation has not garnered sufficient attention. The concept of pressurized air transportation was initially conceived by Otto Von Guericke in the 1660s, with his artificial vacuum laying the foundation for pneumatic tubing design. Engineer Josiah Latimer Clark developed the world's first operational system in the 1850s, implemented at the London Telegraph Office in 1853. This system facilitated the transportation of letters, telegrams, and parcels through tubes enclosed in cylindrical containers. Pneumatic tube systems found applications in retail trade, banks, and various industries, such as chemicals and automobiles, primarily for conveying samples to laboratories. Individual shipments were distinguished using colored markings, ensuring high-quality transportation. Throughout the 19th and 20th centuries, pneumatic tube systems expanded to other cities beyond London. Notably, the Prague tube network continued to deliver mail until 2002, marking the lengthiest period during which an air system was utilized for mail delivery. However, as time progressed, the challenges associated with transporting mail through underground pneumatic systems increased [1,2].

"Pneumatics" denotes a fluid power system utilizing air as a medium for generating, transmitting, controlling, and applying power. The term originates from the Greek word "pneuma," representing air, wind, or breath. Pneumatics involves the examination of air flow and related phenomena. Imagining contemporary manufacturing without the automation facilitated by pneumatics is inconceivable. Pneumatics finds application in various industrial sectors, and its utilization in real-world manufacturing settings commenced around 1950 [3].

The Pneumatic Tube System (PTS) is an internal logistics solution in hospitals, utilizing carriers resembling capsules to swiftly transport small items and documents through an air-pressurized tube network. This efficient system, crucial for paperwork, supplies, and

medication transport, consists of key components like carriers, stations, diverters, blowers, linear couplers, and a sophisticated control system. Carriers, with leak-resistant features, move securely through tubes, while strategically placed stations facilitate sending and receiving. Diverter mechanisms and powerful blowers ensure carriers travel at around 25 feet per second. The linear coupler prevents congestion by coupling multiple lines. The comprehensive control system manages the entire PTS, offering features like authorized access, track-and-trace, simulation mode, and diagnostics. The user-initiated process involves carriers moving through virtual queues, blowers, and diverters. The system maintains transaction records and manages carrier inventory for optimized efficiency [4].

RESEARCH QUESTIONS

1. What did the implementation of Pneumatic Transport Systems (PTS) entail?
2. How did staff members perceive the advantages of Pneumatic Transport Systems (PTS) compared to human-based transport?
3. What factors contributed to the unavailability of carriers deployed through the Pneumatic Tube System in different departments?

RESEARCH OBJECTIVES

1. To describe the implementation of Pneumatic Transport Systems (PTS) in the hospital.
2. To evaluate staff opinions regarding the advantages of Pneumatic Transport Systems (PTS) compared to human-based transport.
3. To investigate the factors causing the absence of carriers deployed through the Pneumatic Tube System in different departments.

RESEARCH METHODOLOGY

The research strategy employed for the feasibility study involved conducting surveys and questionnaires to gather quantitative data, obtaining information, feedback, and opinions from respondents. The study followed an observational cross-sectional descriptive approach,

focusing on hospital employees categorized as system users. The research explored their preferences, satisfaction levels, and perceptions regarding object transportation systems, including their impact on service delivery speed and overall effectiveness. Interviews were planned with staff members who favored messenger-based transport to gain insights into their perspectives. The study population included system vendors for technical information and hospital employees for viewpoints and feedback. A convenience sampling technique was applied, and data collection involved interviews, questionnaires, and observational audits. The sample size consisted of users from 40 Pneumatic Tube stations on all 14 floors of Medanta- The Medicity Gurugram, with data analyzed using descriptive statistics. The entire process adhered to ethical considerations, obtaining verbal consent, ensuring confidentiality, and maintaining the privacy of survey responses. The study duration spanned 12 weeks, from March 23, 2022, to June 17, 2022

RESULTS & DISCUSSION

The data analysis reveals valuable insights into the perceptions and preferences of staff regarding the Pneumatic Tube System (PTS) at Medanta- The Medicity Gurugram. The comparative time analysis demonstrates a significant time saving of 68.0 minutes in the entire sample transportation process when utilizing PTS as opposed to Human Based Transport (HBT). The demographic distribution indicates that the majority of system users are female (72%) with an age range primarily between 23-27 years. Nurses constitute the largest user group (56%), followed by Team Leaders (23%), senior nurses (10%), GDAs (7%), and pharmacists (4%).

Staff opinions on different aspects of the PTS system are overwhelmingly positive. The majority (82%) prefer the PTS for day-to-day sample transportation, citing its efficiency in speeding up services. Respondents find the system easy to use (58%) and believe it significantly reduces mishandling, damage, and loss of items (36%). The system's usefulness is acknowledged by 82%, while 17% still express a preference for both PTS and HBT. When assessing the level of

confidentiality, 91% of respondents believe that PTS offers better confidentiality compared to HBT. The perception of the system's ability to speed up medical support services is overwhelmingly positive, with 91% agreeing that PTS accelerates the process.

In terms of accuracy, 87% of respondents believe that PTS outperforms the messenger-based system. The majority (61%) find the on-site service of the PTS system to be quick, emphasizing its reliability. Concerns related to system usage primarily revolve around speed, budget, and confidentiality. Users' express worries about the time taken for maintenance and replacement of parts, potential delays in case of high transaction volumes, substantial maintenance expenses, and the perceived accessibility of transferred objects within the department.

CONCLUSION

In conclusion, the pneumatic transport system (PTS) emerges as a valuable and efficient alternative to traditional human-dependent transportation methods within hospital settings. This study aimed to compare the functions and outcomes of object transportation systems, focusing on enhancing medical support services. The analysis indicates a significant reduction in both labor requirements and travel time, amounting to almost 68 minutes, emphasizing the potential of PTS in streamlining and expediting hospital operations.

Hospitals, in their pursuit of increased client satisfaction and competitiveness, are increasingly turning to innovative approaches to enhance service efficiency. Logistic systems, such as the PTS examined in this study, play a crucial role in achieving these goals by facilitating the swift and secure transportation of goods, documents, and samples. The observed reduction in travel time and labor usage underscores the tangible benefits that such systems bring to modern healthcare facilities.

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