International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 24s, 2025
https://www.theaspd.com/ijes.php

Demand-Based Capacity Planning in The Emergency Department of The Hospital - Leader's Perspective

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Abstract: *The Emergency Department (ED) is widely recognized as a critical component of healthcare systems globally. It serves as the first point of entry for individuals experiencing urgent or life-threatening medical conditions, ranging from traumatic injuries to acute medical emergencies like heart attacks, strokes, and severe infections. The ED's essential role in stabilizing patients and providing immediate medical attention makes it a cornerstone of the healthcare system. Its ability to manage a diverse range of conditions and provide life-saving interventions underpins the broader function of the hospital. However, despite its importance, the ED often faces significant operational challenges that make achieving operational efficiency difficult. One of the primary strategies to address these challenges is demand-based capacity planning, a dynamic and flexible approach designed to align hospital resources, staffing, and infrastructure with the fluctuating needs of the ED.*

Demand-based capacity planning is a strategic process that aims to optimize the allocation of resources in the ED based on real-time patient demand. This method involves anticipating patient needs and continuously adjusting staffing, medical equipment, and bed availability to match these demands. As healthcare leaders have come to realize, the ability to efficiently manage ED capacity is essential not only to reduce wait times and improve patient outcomes but also to ensure that the ED operates effectively and efficiently under a wide range of circumstances (Jones, R., & Lee, S. 2022). Unlike traditional capacity planning models that often rely on historical data and fixed resource allocation, demand-based capacity planning takes a more proactive and dynamic approach. It enables hospitals to respond quickly to changes in patient volumes, which are often unpredictable and highly variable. By embracing such an approach, hospitals can minimize bottlenecks, reduce overcrowding, and enhance overall care delivery (Smith & Brown, 2023).

INTRODUCTION

The importance of effective demand-based capacity planning has grown considerably in recent years due to several factors. Overcrowding in EDs has become a persistent and growing problem, particularly during peak periods such as flu seasons or public health emergencies like the COVID-19 pandemic. As patient volumes surge during these times, the strain on EDs increases exponentially. Hospitals must navigate the delicate balance between providing timely and high-quality care while managing limited resources. The unpredictability of demand in emergency care settings often leads to prolonged wait times, delayed treatment, and compromised patient care, all of which negatively affect patient outcomes and overall satisfaction (White, T., & Thompson, G. 2020). In response, hospital administrators and emergency department leaders are under increasing pressure to develop strategies that can help mitigate these issues, optimize resource utilization, and ensure that patients receive the care they need when they need it most. Traditional methods of capacity planning in the ED have primarily focused on historical data and past trends to forecast patient volumes and allocate resources accordingly. While these approaches can offer valuable insights, they fail to account for the inherent unpredictability and variability that define emergency care. Emergency departments are frequently confronted with sudden surges in patient volume due to unforeseen events, such as accidents, mass casualty incidents, or natural disasters. These fluctuations in demand make it difficult to rely solely on historical data, as the past may not always be indicative of future trends. As a result, traditional capacity planning methods are often inadequate for addressing the immediate needs of an ED, especially in situations where patient volumes exceed expectations. Demand-based capacity planning, by contrast, offers a more flexible and responsive approach, using predictive analytics and real-time data to adjust staffing levels and resource allocation to meet current and anticipated demand.

The role of hospital leaders, particularly those in charge of emergency department operations, is critical in ensuring the success of demand-based capacity planning. Leaders such as ED directors, healthcare administrators, and strategic planners are responsible for making key decisions regarding staffing levels, the integration of new technologies, and the allocation of limited resources (Patel, S., & Williams, M. 2021). Their expertise and ability to make informed decisions can have a significant impact on the overall

functioning of the ED. Hospital leaders must navigate a range of competing priorities, balancing the need to manage patient volumes effectively with the financial constraints and logistical challenges that often accompany resource allocation. Furthermore, they must collaborate with other hospital departments and external stakeholders to implement coordinated strategies that can enhance capacity planning across the entire hospital system.

This paper aims to explore demand-based capacity planning in the context of the emergency department, focusing on the perspectives of hospital leaders who are directly involved in shaping capacity management strategies. The research will delve into the specific challenges that emergency departments face when managing fluctuating patient volumes, including issues related to overcrowding, staffing shortages, and resource limitations. Additionally, the paper will examine the strategies that hospital leaders use to address these challenges and the technological innovations that are transforming the way emergency care is delivered. By exploring the views of ED leaders and healthcare experts, this study seeks to identify best practices for managing demand-based capacity planning and to provide actionable recommendations for improving the efficiency and resilience of emergency departments. Understanding the complex dynamics of ED capacity planning is critical to ensuring that hospitals are adequately prepared to meet both expected and unexpected surges in patient demand.

The role of the ED within a hospital system extends far beyond the immediate care it provides to patients. EDs are often the first line of defense in managing critical conditions, offering rapid diagnostic capabilities, life-saving interventions, and comprehensive care coordination with other departments such as intensive care units (ICUs) and specialized medical teams. EDs are also designed to provide 24/7 availability, ensuring that care is always accessible, regardless of the time of day or night. This round-the-clock operation is a fundamental characteristic of the ED, as patients facing emergencies require immediate medical attention that cannot wait for regular office hours. In addition to emergency care, EDs play a key role in triaging patients, prioritizing those with the most urgent needs while managing the flow of patients with less critical conditions. The triage system, which classifies patients based on the severity of their conditions, is essential for ensuring that limited resources are allocated in a way that maximizes patient survival and minimizes harm.

However, despite the essential functions of EDs, they often struggle with a number of operational challenges. Overcrowding is a persistent issue, particularly during peak periods or in areas with high patient volumes. The problem is exacerbated by factors such as staffing shortages, the increasing complexity of patient needs, and limitations in the availability of medical resources. Overcrowding not only affects patient care but also places significant strain on hospital staff, leading to burnout and fatigue. Another challenge is the increasing demand for intensive care services, which often competes with ED capacity, making it difficult to transfer critically ill patients from the ED to appropriate care settings. As hospitals continue to experience these challenges, the importance of effective demand-based capacity planning becomes even more apparent.

This paper will explore how hospitals can address these challenges through a combination of strategic resource allocation, technological innovations, and collaborative efforts across healthcare institutions. By focusing on the views of hospital leaders, the research will provide valuable insights into the strategies that can help optimize capacity management in the ED and improve patient outcomes. Ultimately, the goal is to offer practical recommendations for enhancing the efficiency and resilience of emergency departments, ensuring that they can continue to provide high-quality care in the face of fluctuating patient demand.

METHODOLOGY

Research Design

This research utilizes a qualitative approach to explore the views of hospital leaders and subject experts regarding demand-based capacity planning in Emergency Departments (EDs). The aim is to gain insights into the challenges, factors affecting capacity planning, and potential solutions, especially through new technologies. The methodology is designed to gather in-depth, subjective perspectives from those directly involved in hospital management and operations, focusing on the factors influencing capacity planning and the role of new technology.

DATA COLLECTION METHOD: SEMI-STRUCTURED INTERVIEWS

The primary method of data collection in this research is through **semi-structured interviews** with leaders from different hospitals and subject experts were done during 15 September 2024 to 15 November 2024 time period. Semi-structured interviews allow for a more flexible and open-ended approach to collecting

data while still ensuring consistency across interviews. This method is ideal for exploring complex topics such as capacity planning in EDs, where responses may vary and require deeper probing.

PARTICIPANTS AND SAMPLE SELECTION

The participants for this study include:

- **Hospital Leaders**: These are senior managers and directors responsible for the strategic planning, operations, and resource management within the hospital, especially those involved with ED capacity planning. Participants may include Chief Executive Officers (CEOs), Chief Operating Officers (COOs), ED Directors, and senior hospital managers.
- **Subject Matter Experts (SMEs)**: These are experts with a deep understanding of healthcare operations, ED logistics, and capacity planning, such as healthcare consultants, hospital planners, and professionals with expertise in emergency care management and capacity optimization.

The sample will be purposive, meaning that participants will be selected based on their roles and expertise, ensuring that those interviewed have relevant and informed perspectives on the topic. Approximately 10 to 15 hospital leaders and experts from a range of hospital sizes (small, medium, and large) and types (public and private) will be targeted for interviews.

QUESTIONNAIRE DEVELOPMENT

The research employs a set of open-ended questions, derived from the primary research goals, to guide the semi-structured interviews. The questions focus on the following themes:

- **Challenges in Capacity Planning**: Understanding the complexities involved in forecasting patient demand and balancing available resources.
- **Factors Affecting Capacity Planning**: Exploring the external and internal factors that influence capacity decisions, including inter-hospital coordination and external healthcare trends.
- **Alternatives to Capacity Constraints**: Discussing strategies or interventions for mitigating capacity overloads, such as process optimization, resource reallocation, or alternative care pathways.
- **Role of Technology**: Investigating how technological innovations, such as electronic health records (EHR), telemedicine, artificial intelligence (AI), and predictive analytics, can help improve capacity planning and decision-making.

The following is the set of interview questions:

1. **Do you think demand-based capacity planning is a challenging factor in an Emergency Department?**
   - This question seeks to identify the general perception of the leaders and experts regarding the difficulty of managing demand in the ED. Their answers will help assess the perceived complexity of forecasting and adjusting to fluctuating patient needs.
2. **What is the most challenging factor in resource planning for the hospital's Emergency Department, in your view?**
   - This question aims to explore specific challenges that leaders face in resource allocation and management, such as staffing shortages, equipment limitations, or space constraints.
3. **What is the best alternative for emergency capacity constraints or capacity overload, in your view?**
   - Here, the objective is to identify potential solutions or strategies for overcoming capacity bottlenecks in EDs, such as expanding capacity, optimizing workflows, or implementing alternative care models.
4. **Do you think that diversification can help in managing capacity in an emergency?**
   - This question addresses the possibility of diversifying services or patient flow management strategies to optimize ED capacity, such as using urgent care centers or telemedicine services to handle less acute cases.
5. **What are inter-hospital factors affecting the capacity planning of an Emergency Department of the hospital?**
   - This question aims to examine factors that extend beyond the individual hospital, such as regional collaboration, patient transfers, and shared resources between hospitals, and their impact on ED capacity.
6. **How does new technology help in managing the capacity of an Emergency Department, in your view?**

- The objective here is to explore how current and emerging technologies (e.g., AI, machine learning, data analytics) can aid in better planning and management of ED resources, helping to improve patient flow and reduce overcrowding.

DATA ANALYSIS METHOD

The interviews will be transcribed and analyzed using a **thematic analysis** approach. This qualitative method involves identifying and interpreting patterns or themes within the interview data. The following steps will be followed:

Transcription and Familiarization: All interviews will be recorded, transcribed verbatim, and reviewed multiple times to familiarize the researcher with the data.

Coding: Initial codes will be developed by systematically reviewing the transcriptions to capture key concepts and phrases. These codes will be applied to all relevant sections of the interviews to identify recurring ideas.

Theme Development: Once the coding is complete, the researcher will group similar codes into broader themes. Themes will emerge around central issues such as capacity constraints, technological interventions, and strategies for overcoming challenges.

Interpretation and Comparison: The thematic analysis will focus on understanding commonalities and differences between participants' views. This will allow the researcher to identify consensus or variation on key topics like the impact of demand-based capacity planning and the role of technology in improving ED capacity management.

Reporting Results: The findings will be presented in a narrative format, providing a synthesis of key themes identified through the interviews. Special attention will be paid to summarizing the perspectives of hospital leaders on challenges and solutions for capacity planning.

LIMITATIONS

The study's limitations include:

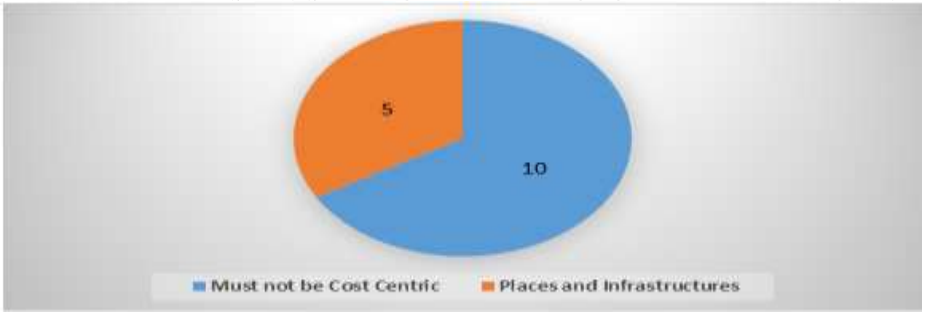
- **Sample Size**: While a purposive sample allows for detailed insights, the small number of participants may limit the generalizability of the findings to all hospital types or geographic regions.
- **Self-Reported Data**: The research relies on subjective, self-reported data, which may be influenced by personal biases or recall issues.
- **Variety in Hospital Contexts**: The diverse range of hospitals (e.g., public vs. private, large vs. small) may lead to varying perspectives, requiring careful consideration when analyzing and comparing responses.

This research methodology aims to provide a comprehensive understanding of demand-based capacity planning in EDs through interviews with hospital leaders and subject experts. By examining the challenges, factors, and technological interventions in capacity planning, this study will contribute valuable insights for improving ED operations and patient care. The findings will help hospitals and healthcare systems better prepare for fluctuating demand, optimize resource allocation, and implement effective strategies to enhance the quality of emergency care.

RESULTS

The interviews were held with the COOs, Directors, Operations, and Strategic heads of the different hospitals and healthcare centres and also with educational leaders who train managers for their strategic planning. It was a delightful experience to know the ideas and views and understand how they plan their strategies.

Do you think Demand-based capacity planning is the challenging factor in an emergency Department?



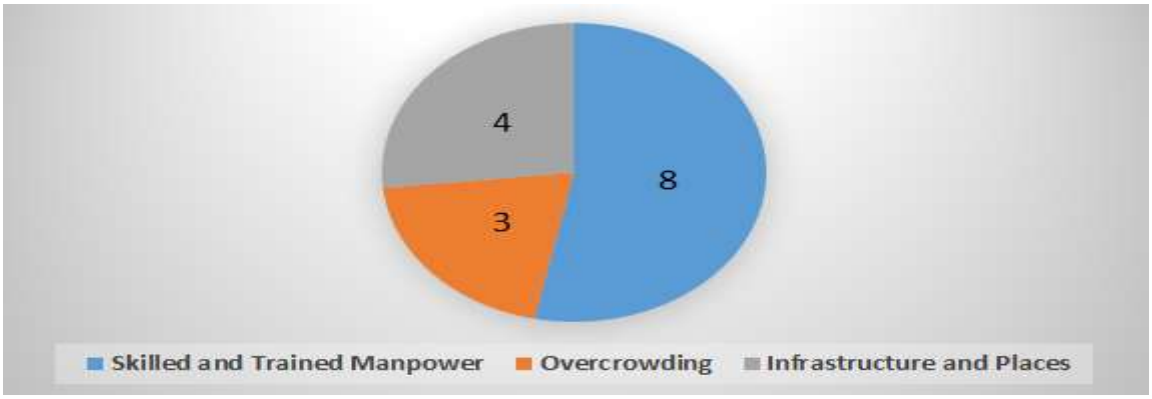
Graph1: Demand Based Capacity Planning Challenging Factor?

Most of the leaders agreed that demand-based capacity planning in the emergency department is a very

challenging factor for any leader. Some leaders think that ED must not be viewed as cost-centric, but it is a potential department that leads to revenue generation for other departments and ultimately the organization. Some leaders found that it is challenging given places and infrastructures. (See Graph 1)

What is the most challenging factor in resource planning for the hospital's emergency department, in your view?

Most of the leaders agreed that skilled and trained manpower planning in an emergency is the most challenging part for any hospital. Organizations cannot afford to put this skilled manpower at rest. The manpower sharing between ICUs and ED is the best alternative for the organizations these both are the critical care units and need skilled manpower. For this purpose, hospitals must plan their ICU near to the ED. Some leaders also think that overcrowding is also one of the factors affecting ED capacity. In this case, most of the time, unnecessary footfalls are the major reason for overcrowding. Effective protocols for ED footfall can help in ED capacity planning. Some leaders think that ER capacity is greatly challenging in view of Infrastructure and place. It must be easily accessible to all other areas like diagnostics, ICU and main entrance etc. to plan the capacity and reduce the stay time in ER. (See Graph 2)



Graph 2. Challenging Factor in Resource Planning in ED

CHALLENGES IN DEMAND-BASED CAPACITY PLANNING

Leaders consistently emphasized that demand-based capacity planning in the ED is an extremely challenging factor. The main challenges identified include:

- **Fluctuating Demand**: The unpredictable nature of emergency care, where patient volumes can spike unexpectedly, makes it difficult to plan for resource allocation and capacity.
- **Infrastructure Limitations**: Several leaders noted that the physical infrastructure and layout of EDs are often not conducive to efficient capacity management. For instance, EDs must be strategically located close to critical care units, diagnostics, and the main entrance to facilitate patient flow and reduce stay times.
- **Skilled Manpower**: A critical challenge highlighted by most leaders is the need for skilled and trained staff in the ED. Given the specialized nature of emergency care, ensuring an adequate workforce is essential. Moreover, these trained professionals should not remain idle, as their skills are highly valuable and should be used effectively to manage capacity constraints.

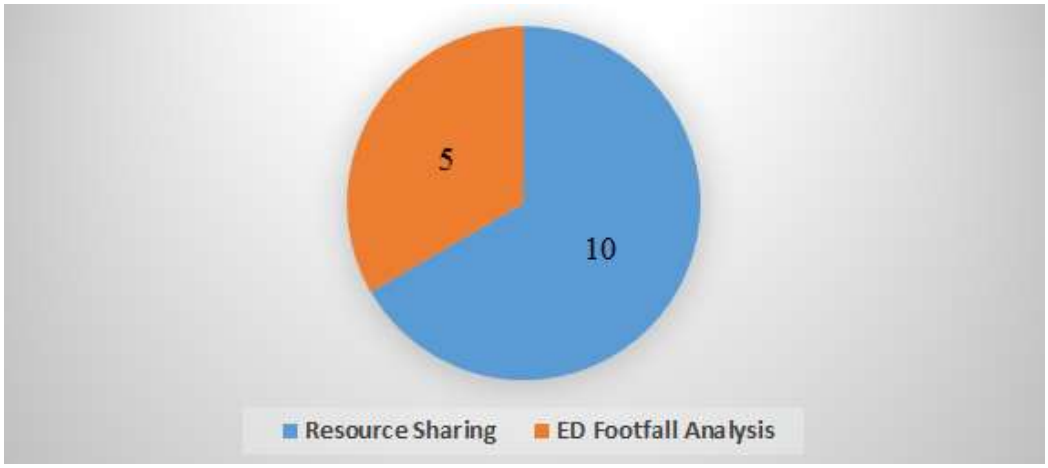
What is the best alternative for emergency capacity constraint or capacity overload, in your view?

In case of capacity overload or capacity constraint, the organization must have a defined plan for resource sharing or resource transfer. All staff must be trained for the defined plan so in case of mass casualty, only one call can make staff understand the process and work accordingly in fractions of the time. As the events in ED and ICU both are time sensitive. Understanding ED footfall is also one of the alternative to plan the ED resources effectively. Analysis of time frames and Seasonal changes in ED footfall can help to plan resources according to the demand. (See Graph 3)

ALTERNATIVES FOR MANAGING CAPACITY CONSTRAINTS

When addressing the issue of capacity overload, leaders proposed several strategies:

- **Resource Sharing**: Many leaders suggested the need for resource sharing between the ED and ICU, especially when both departments require skilled critical care staff. Hospitals should plan their infrastructure in a way that facilitates seamless transfer of staff between these units.

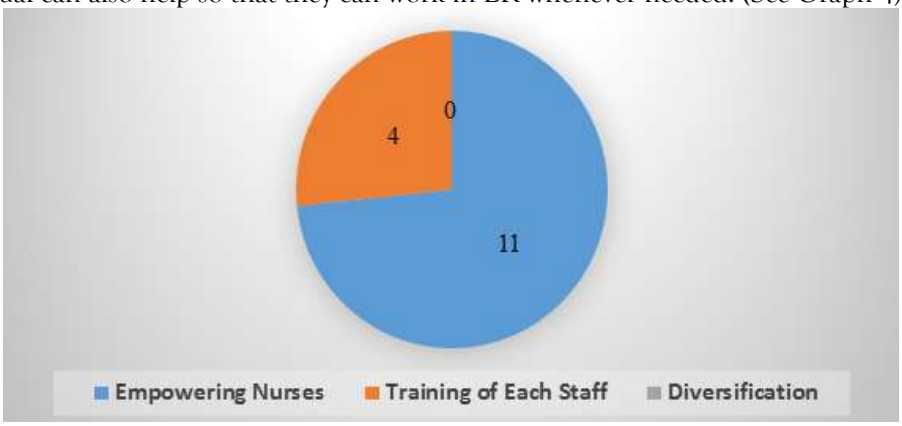


Graph 3: Alternatives for Capacity Constrain or Overload

- **Footfall Management**: Overcrowding, often caused by unnecessary footfalls, was identified as a significant problem. Leaders emphasized the importance of developing effective protocols to manage patient flow and minimize unnecessary visits to the ED. This includes filtering non-urgent cases away from the emergency setting, which could help to free up resources for critical care.
- **Defined Resource Transfer Plans**: Leaders stressed the importance of having a well-defined plan for resource sharing and transfer during capacity overloads, such as in mass casualty situations. Ensuring that all staff members are trained in this plan would allow for quick response times and effective utilization of resources during emergencies.
- **Empowering Nurses**: Another recommendation was to empower trained nurses in the ED. Some leaders suggested that nurses should be equipped with the necessary training to handle critical situations, reducing the burden on doctors and other specialized staff. Cross-training all hospital staff so they can be deployed as needed also emerged as a potential solution.

Do you think that diversification can help in managing capacity in an emergency?

Most of the leaders do not agree that diversifying the Footfall can help in capacity planning. Diversification can lead to the event in a crucial stage, as it is time-sensitive and might lead to a life-and-death situation for the patients. However, some leaders think that empowering nurses to certain trained nurses can help in managing capacity, and they are the best capacity alternative for the ER. Training of every individual can also help so that they can work in ER whenever needed. (See Graph 4)



Graph 4: Diversification in ED

What are inter-hospital factors affecting the capacity planning of an emergency department of the hospital?

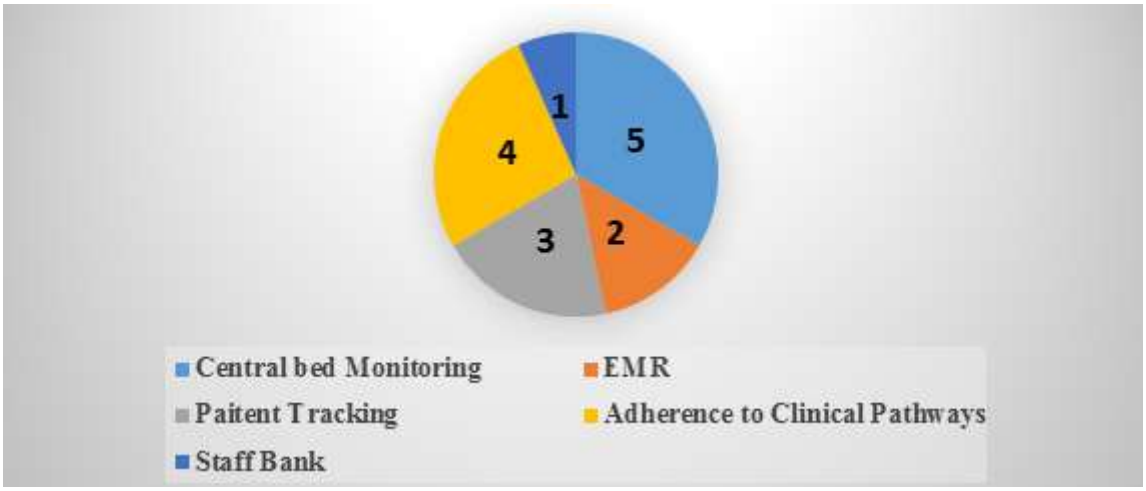
In the case of the inter-hospital factors affecting capacity, some of the leaders think that the Scope of the services offered by the organization is a major factor, and some think that Staff management and availability of resources are the major factors. Others think that the fear of the physician of missing the emergency and Out of time OPDs leads to the overload in the ER. This greatly affects the ER Capacity. It also diverts the attention of ER-trained staff to the non-urgent care patients which greatly affects the utilization of the resources. (See Graph 5)

Graph 5: Inter-hospital factor affecting ED capacity

INTER-HOSPITAL FACTORS AFFECTING ED CAPACITY

A few leaders pointed out that inter-hospital dynamics also influence ED capacity. Key factors include:

- **Scope of Services**: Hospitals with a broader scope of services tend to experience higher patient volumes in their EDs, as they attract patients for various specialized treatments.
- **Staff Management**: Effective staff management and resource availability were highlighted as critical to managing capacity. A shortage of skilled professionals can lead to overburdened staff, impacting the quality of care and increasing patient wait times.
- **Physician Concerns**: Some leaders mentioned that physicians' fear of missing out on potential emergency cases or out-of-time outpatient appointments leads to the overload in the ED. This can result in non-urgent patients being directed to the ED, consuming resources meant for critical cases.
- **How does the new technology help in managing the capacity of an emergency department, in your view?**



Graph 6: Technology to Help in Capacity Planning

In view of the technology, all the leaders agree to the use of technology for minimizing stay in the ED for better patient care and also managing ED capacity effectively. Central monitoring and quick availability of the investigation and medical records through EMR can help in reducing the stay of the patient in the ED. Patient tracking in ambulances and Better communication before reaching the hospital can also help in the planning of resources as well as minimizing ED stays. Some leaders also suggested that the Digital monitoring of the bed occupancy can help in managing bed occupancy in the ER. Strict adherence to the clinical pathways can help in timely discharge from the ER. One of the insightful thought is to have centralized shared resources between the Nearby hospitals, Like a staff bank, which can be utilized when needed. However, the data must be digitalized to check for the credentials of the staff. It can lead to new research or a new product which can be path-changing in resource management. (See Graph 6)

THE ROLE OF TECHNOLOGY IN CAPACITY MANAGEMENT

Across the board, leaders recognized the pivotal role technology plays in managing ED capacity more effectively:

- **Central Monitoring and EMR Systems**: Implementing centralized monitoring systems and using Electronic Medical Records (EMR) can significantly reduce patient stay times in the ED. Quick access to investigation results and medical history can expedite decision-making and treatment.

- **Patient Tracking and Communication**: Leaders suggested that better communication with ambulances and real-time tracking of patients before their arrival can assist in preparing ED staff for incoming patients and help manage resources better.
- **Bed Management and Digital Tools**: Digital monitoring of bed occupancy was identified as a valuable tool for managing the capacity of the ED. Centralized systems can help track bed availability in real time, allowing for quicker allocation of resources. Strict adherence to clinical pathways can also ensure timely discharge and reduce delays in patient flow.
- **Shared Resources Between Hospitals**: An innovative suggestion from a leader was the concept of a centralized shared resource bank between nearby hospitals. This **"staff bank"** could be used during peak times or emergencies, with digital verification of staff credentials to ensure proper utilization.

Some leaders also suggested overlooking the other resources like overstocking of drugs, Electricity expense, Breakdown cost of the equipment, etc so that the Life dependent resources can be spared in cost-effectiveness.

The interviews conducted with leaders from hospitals, healthcare centers, and educational institutions have provided rich insights into the challenges and strategies involved in demand-based capacity planning for Emergency Departments (ED). These leaders, including COOs, Directors, Operations Managers, Strategic Heads, and experts in hospital management training, offered valuable perspectives on how they approach capacity planning and resource management in the ED. The key findings and recommendations, derived from their viewpoints, emphasize critical strategies that could enhance the efficiency of ED operations.

SUGGESTIONS FOR COST-EFFECTIVE RESOURCE MANAGEMENT

When asked about managing resources cost-effectively, several key suggestions were made:

- Analysis of previous records of footfall
- Real-time resource allocation
- Central monitoring of beds
- Strict adherence to the Clinical pathways
- Promoting Students for backend support
- Minimizing Non-Essential resource cost

Historical Data Analysis: Analyzing previous records of footfall and seasonal changes in patient demand could help forecast resource needs and plan capacity more accurately.

Real-Time Resource Allocation: Real-time allocation of resources based on current ED capacity and patient volume was recommended to ensure that the right staff and equipment are available when needed.

Central Monitoring of beds: Central monitoring of beds for quick discharge and bed allocation as well as quick transfer can help in managing ED capacity effectively.

Strict Adherence to clinical pathways: Strict adherence to clinical pathways helps to move patients fast from ED to needed units and also reduce unnecessary footfalls in ED.

Promoting Student Involvement: Some leaders suggested promoting students in healthcare management for backend support roles. This can provide cost-effective staffing solutions while also allowing students to gain hands-on experience.

Minimizing Non-Essential Resource Costs: Focusing on essential life-dependent resources, such as staffing and critical care equipment, while reducing expenditure on non-essential areas (e.g., overstocking of drugs or excessive energy consumption), can help hospitals maintain financial sustainability while ensuring capacity in the ED.

In conclusion, demand-based capacity planning in Emergency Departments remains a complex issue, but with strategic leadership, effective workforce management, the integration of technology and collaboration between hospitals, healthcare providers can better manage ED capacity and improve patient care outcomes. Future research could explore the development of predictive models using data analytics to enhance demand forecasting and resource allocation in the ED.

DISCUSSION

The findings from interviews with hospital leaders, including COOs, Directors, Operations Heads, and Strategic Planners, provide valuable insights into the challenges and strategies associated with demand-based capacity planning in Emergency Departments (ED). These perspectives underscore the complex nature of managing ED capacity, emphasizing the necessity for a flexible workforce, strategic use of

technology, and effective infrastructure planning.

Complexities Of Demand-Based Capacity Planning

A recurring theme among leaders was the recognition that demand-based capacity planning is one of the most challenging tasks in the ED. The unpredictable and fluctuating nature of emergency care demand makes planning difficult but essential. Leaders highlighted that no single approach fits all situations, as an ED's ability to manage varying patient volumes depends on factors such as infrastructure, staffing, and resource availability. Traditional resource planning models, while useful, fall short of addressing the unique challenges of emergency care, such as the unpredictability of patient arrival and the lack of clear data regarding peak times and seasonal trends. These uncertainties make it difficult for hospitals to make informed decisions, requiring continuous adjustments and refinements in capacity management strategies (Wilson et al., 2021).

Skilled Workforce As A Central Element Of Capacity Planning

Workforce planning emerged as the most significant challenge across all interviews. Hospital leaders emphasized the importance of a skilled workforce—comprising emergency doctors, nurses, and critical care staff—in managing ED capacity effectively. A shortage of trained professionals can result in delayed treatment, longer wait times, and strain on hospital resources. To address this, leaders advocated for the sharing of manpower between EDs and ICUs, particularly during periods of high demand. This approach reflects a growing recognition of the need for flexible staffing arrangements, given the high-acuity nature of both ED and ICU cases. Leaders also stressed the importance of strategic scheduling and location planning, ensuring that ICUs are located near EDs for rapid staff and patient transfers when necessary.

Overcrowding And Resource Utilization

Overcrowding in the ED was another major concern raised by the leaders. Non-urgent cases, often contributing to unnecessary footfalls, exacerbate ED congestion and strain resources. One of the key strategies identified to reduce overcrowding was the establishment of clear and efficient patient triage protocols, combined with community outreach to better manage patient expectations. This aligns with broader healthcare literature, which highlights how overcrowding leads to longer wait times, patient dissatisfaction, and compromised care quality (Forster et al., 2019). Minimizing unnecessary ED visits not only improves capacity planning but also enhances patient outcomes. Footfall management strategies, such as integrating primary care services and educating the public, could prove essential in addressing this issue.

The Role Of Technology In Capacity Planning

A significant takeaway from the interviews was the unanimous support for technology in enhancing ED capacity planning. Leaders emphasized that technology—ranging from centralized bed monitoring to electronic medical records (EMR)—can streamline ED operations, reduce wait times, and improve resource allocation. The ability to access patient information quickly and accurately via EMR systems was seen as essential for providing timely care. Additionally, technologies like patient tracking systems and real-time communication platforms with ambulances were recommended to improve patient flow and prepare ED staff for incoming patients. The integration of predictive analytics and real-time data can significantly enhance operational efficiency and capacity management in hospitals, as shown by existing research.

The concept of a "staff bank" or a shared resource pool across hospitals was also discussed as an innovative strategy. By using a digital platform to manage staff resources, hospitals could more effectively allocate personnel during high-demand periods. This system would also foster collaboration between healthcare facilities, ensuring that staff credentials are verified in real-time and minimizing risks associated with temporary staffing.

Cost-Effectiveness And Resource Optimization

Hospital leaders also highlighted the importance of cost-effectiveness in managing ED capacity. Financial pressures necessitate strategies that prioritize critical resources while cutting back on non-essential expenses. Leaders suggested approaches like analyzing historical footfall data, real-time resource allocation, and centralized monitoring of bed occupancy to adopt more data-driven, proactive resource management strategies. Interestingly, some leaders emphasized the need to focus on optimizing life-dependent resources—such as skilled staff and critical care equipment—while reducing non-essential resources. This shift in perspective highlights the growing trend of prioritizing resource optimization over simple cost-cutting, with an emphasis on improving patient outcomes.

Furthermore, promoting student involvement in non-clinical tasks, such as administrative roles, was seen as a cost-effective solution to address staff shortages. This approach not only helps meet immediate staffing

needs but also offers valuable training and experience to future healthcare professionals, reinforcing the importance of workforce development.

Inter-Hospital Dynamics And Collaborative Strategies

The interviews also revealed that inter-hospital dynamics significantly influence ED capacity planning (Gorman et al., 2020). Factors such as the availability of resources, physician concerns about missing emergencies, and the scope of services offered can put additional pressure on individual EDs. Some leaders suggested that collaborative resource-sharing arrangements—such as shared staff pools or centralized resources across multiple hospitals—could alleviate some of this pressure. Such collaboration could drive efficiencies, reduce costs, and enhance the quality of care across hospitals, particularly in regions with fluctuating patient volumes and limited resources.

The idea of pooling resources across a network of hospitals ensures that each ED can access the appropriate staffing levels during peak demand periods. This collaborative approach could lead to better resource allocation, cost reductions, and improved patient care.

CONCLUSION

This research provides valuable insights into the complexities and challenges associated with demand-based capacity planning in the Emergency Department (ED) from the perspective of hospital leaders. The findings highlight that effective capacity planning is critical to ensure that EDs can meet the unpredictable and often overwhelming demand for emergency care while maintaining high standards of patient care and operational efficiency.

From the leaders' perspectives, the most significant challenges revolve around workforce management, overcrowding, and infrastructure limitations. The need for a skilled, flexible workforce, the difficulty in managing patient footfall, and the constraints of physical space within the ED are recurring themes. The shared consensus is that effective resource allocation, including the strategic use of technology, plays a pivotal role in addressing these challenges.

The integration of technology, such as electronic medical records (EMR), real-time patient tracking, and centralized bed management, emerged as a key enabler in optimizing ED capacity. Additionally, one of the most promising insights for future research was the idea of creating a "staff bank" for resource sharing between hospitals. This concept could be transformative in managing staffing challenges during peak times and should be explored further to determine its feasibility and potential impact on capacity planning.

Furthermore, while diversifying footfall was generally seen as unfeasible due to the time-sensitive nature of emergency care, alternative strategies such as enhancing triage protocols, real-time resource allocation, and promoting collaboration between hospitals could significantly reduce pressure on EDs.

In conclusion, the findings suggest that a holistic approach to demand-based capacity planning, which includes a blend of workforce flexibility, strategic technology implementation, cost-effective resource management, and inter-hospital collaboration, is essential for managing ED capacity effectively. Future research should explore the practical application of these strategies in diverse hospital settings to further refine capacity planning frameworks and ensure that EDs can continue to provide timely, high-quality care to patients in need. By embracing these strategies, hospitals can enhance their ability to respond to emergency care demands and improve patient outcomes, ultimately creating a more resilient healthcare system.

AUTHOR CONTRIBUTION

KK: Literature review and research framework, Data collection and analysis, Writing of paper. RP: Guiding for methodology, Inputs in analysis and conclusions, Proofreading of paper and changes needed

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