

Inclusive Design in Hospital Buildings: Creating Accessible and Wellness-Centered Healthcare Environments

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ABSTRACT

Hospitals are among the most complex public buildings, serving people from diverse age groups, physical abilities, sensory capacities, cultural backgrounds, and medical conditions. Every day, these facilities accommodate patients, healthcare professionals, attendants, emergency responders, visitors, administrative staff, and maintenance personnel, each with distinct functional and psychological needs. While contemporary hospitals have witnessed remarkable technological and medical advancements, the architectural environment itself often remains challenging for many users. Inadequate accessibility, confusing circulation systems, poorly designed waiting areas, insufficient sensory considerations, and limited support for individuals with temporary or permanent disabilities continue to affect the overall healthcare experience. Such barriers not only hinder independent movement but may also increase anxiety, reduce operational efficiency, and compromise patient well-being.

Inclusive Design has emerged as an important design philosophy that extends beyond compliance with accessibility standards. Rather than designing exclusively for persons with disabilities, Inclusive Design aims to create environments that are usable, understandable, comfortable, and dignified for the widest possible range of users without requiring adaptation or specialized solutions. Within hospital environments, this approach integrates principles of Universal Design, evidence-based healthcare design, patient-centred planning, and wellness-oriented architecture to improve both functional performance and human experience.

This research investigates the role of Inclusive Design in creating accessible and wellness-centred hospital environments, with particular emphasis on the Indian healthcare context. The study adopts a qualitative research methodology based on a systematic literature review of twenty-five peer-reviewed research publications, international accessibility guidelines, and national regulatory frameworks including the National Building Code of India (NBC 2016), the Harmonised Guidelines and Standards for Universal Accessibility in India (2021), CPWD Accessibility Guidelines, WHO recommendations, and NABH standards. A PRISMA-inspired literature screening process is employed to identify, evaluate, and synthesise relevant research. Comparative case studies of selected hospitals are proposed to examine accessibility, circulation, wayfinding, spatial planning, lighting quality, acoustics, wheelchair accessibility, accessible sanitation facilities, sensory comfort, and overall user experience.

The expected outcome of the research is the development of a comprehensive Inclusive Design framework for hospital buildings that addresses physical, sensory, cognitive, and psychological accessibility while promoting safety, operational efficiency, healing, and user satisfaction. The study intends to bridge the gap between existing accessibility regulations and practical architectural implementation by proposing context-sensitive design guidelines suitable for Indian healthcare infrastructure. These recommendations are expected to assist architects, planners, healthcare administrators, and policymakers in creating hospital environments that are not only technically compliant but also welcoming, equitable, and supportive of the diverse needs of all users.

Keywords: Inclusive Design, Universal Design, Hospital Architecture, Accessibility, Healthcare Buildings, Wellness-Centred Design, Barrier-Free Environment, Patient Experience, Wayfinding, India.

CHAPTER 1: INTRODUCTION

1.1 Introduction

Healthcare architecture has evolved beyond providing spaces for medical treatment to creating environments that promote healing, safety, dignity, and well-being. Hospitals today serve a diverse population, including elderly individuals, children, persons with disabilities, pregnant women, patients with temporary injuries, caregivers, healthcare professionals, and visitors. Each user group has different physical, sensory, and cognitive needs, making accessibility and usability essential considerations in hospital planning and design.

Traditionally, hospital buildings have prioritised functional efficiency, medical technology, and operational requirements. While these remain important, contemporary healthcare design increasingly recognises that the built environment directly influences patient recovery, staff performance, emotional well-being, and the overall quality of healthcare services. Research in evidence-based healthcare design demonstrates that factors such as intuitive circulation, natural lighting, acoustic comfort, wayfinding, and healing environments contribute significantly to positive healthcare experiences.

Inclusive Design has emerged as a comprehensive approach that seeks to create environments usable by the widest possible range of people without the need for adaptation or specialised solutions. Unlike conventional accessibility measures that primarily address physical disabilities, Inclusive Design considers the diverse abilities, ages, and circumstances of all users. It integrates physical accessibility with cognitive clarity, sensory comfort, environmental quality, and user-centred planning to ensure that healthcare facilities are safe, equitable, and welcoming.

In the context of hospital buildings, Inclusive Design extends beyond providing ramps, lifts, and accessible toilets. It encompasses barrier-free circulation, intuitive wayfinding, accessible entrances, comfortable waiting areas, healing landscapes, sensory-friendly environments, and flexible spaces that support both patients and healthcare professionals. Such environments encourage independent movement, reduce stress, minimise confusion, and improve overall healthcare delivery.

Despite the availability of accessibility standards such as the **National Building Code of India (NBC 2016)**, the **Rights of Persons with Disabilities Act (2016)**, and the **Harmonised Guidelines and Standards for Universal Accessibility in India (2021)**, many hospitals continue to face challenges in implementing Inclusive Design comprehensively. Accessibility is often addressed as a statutory requirement rather than as an integral part of architectural planning. As a result, hospital users frequently encounter difficulties related to navigation, environmental comfort, sensory accessibility, and overall user

experience.

The growing demand for patient-centred healthcare, an ageing population, increasing awareness of disability rights, and rapid expansion of healthcare infrastructure highlight the need for more inclusive hospital environments. Designing hospitals that support independence, comfort, dignity, and well-being is therefore becoming an essential responsibility for architects, planners, healthcare administrators, and policymakers.

This research investigates the role of Inclusive Design in hospital buildings through a qualitative study based on a systematic literature review and comparative analysis of selected healthcare facilities. The study evaluates key aspects such as accessibility, circulation, wayfinding, spatial planning, lighting, acoustic comfort, healing environments, and user experience to understand how architectural design influences healthcare delivery.

Based on these findings, the research proposes practical design guidelines for creating accessible and wellness-centred hospital environments suited to the Indian context. By integrating Universal Design principles, evidence-based healthcare design, and national accessibility standards, the study aims to contribute towards the development of hospital buildings that are not only functional and efficient but also inclusive, equitable, and responsive to the needs of all users.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Inclusive Design has become an essential approach in healthcare architecture, recognising that hospital environments should be usable, safe, and comfortable for people of all ages and abilities. Unlike conventional accessibility, which primarily addresses physical disabilities, Inclusive Design considers physical, sensory, cognitive, and psychological needs, creating environments that support independence, dignity, and equitable access.

Healthcare buildings accommodate diverse users, including patients, visitors, healthcare professionals, elderly individuals, children, and persons with temporary or permanent disabilities. Consequently, hospital design must integrate accessibility, intuitive navigation, environmental comfort, and healing environments to improve both healthcare delivery and user experience.

This chapter reviews the evolution of Inclusive Design, Universal Design principles, evidence-based healthcare design, accessibility standards, healing environments, wayfinding, and wellness-centred planning. It also identifies existing research gaps that form the basis of the present study.

2.2 Evolution of Inclusive Design

Inclusive Design evolved from the concepts of Barrier-Free Design and Universal Design, expanding accessibility beyond compliance with physical standards. Ronald Mace introduced Universal Design as the creation of environments usable by all people without adaptation. Later research by Steinfeld and Maisel emphasised that Inclusive Design should respond to diverse physical, sensory, cognitive, and social abilities throughout the design process.

Within healthcare architecture, Inclusive Design has shifted the focus from removing barriers to creating environments that promote independence, dignity, and positive healthcare experiences for all users.

2.3 Universal Design Principles in Healthcare

The seven principles of Universal Design provide the theoretical foundation for Inclusive Design in hospitals:

- Equitable Use

- Flexibility in Use
- Simple and Intuitive Use
- Perceptible Information
- Tolerance for Error
- Low Physical Effort
- Appropriate Size and Space for Use

In hospital environments, these principles support barrier-free movement, intuitive wayfinding, accessible facilities, and safe interaction with healthcare services.

2.4 Accessibility in Hospital Buildings

Accessibility is one of the primary determinants of healthcare quality. While Indian standards such as the National Building Code (NBC 2016), Harmonised Guidelines (2021), and CPWD Accessibility Guidelines prescribe minimum requirements for ramps, lifts, corridors, toilets, and parking, research indicates that physical accessibility alone does not ensure inclusive healthcare environments.

Current literature highlights the need to integrate accessibility with spatial planning, circulation, communication, and user experience.

2.5 Wayfinding and Spatial Planning

Hospital buildings are often complex, making navigation difficult for first-time visitors and users experiencing stress or cognitive limitations.

Research demonstrates that effective wayfinding depends on:

- Logical departmental zoning
- Clear circulation routes
- Colour-coded spaces
- Architectural landmarks
- Bilingual signage
- Digital navigation systems

Studies consistently conclude that intuitive building layouts reduce anxiety, improve operational efficiency, and enhance patient satisfaction.

2.6 Healing Environment and Environmental Quality

Evidence-based healthcare design recognises that the physical environment influences patient recovery and staff performance.

Key environmental factors include:

- Natural daylight
- Acoustic comfort
- Thermal comfort
- Indoor air quality
- Landscape integration
- Biophilic design

Research by Ulrich and later scholars demonstrates that healing environments reduce stress, improve emotional well-being, and contribute positively to healthcare outcomes.

2.7 Sensory and Cognitive Accessibility

Inclusive Design extends beyond mobility by addressing sensory and cognitive needs.

Hospital environments should provide:

- Glare-free lighting

- Acoustic control
- High visual contrast
- Tactile guidance
- Clear information systems
- Reduced visual clutter
- Simple spatial organisation

These measures improve usability for elderly individuals, visually impaired users, persons with cognitive disabilities, and first-time visitors.

2.8 Wellness-Centered Healthcare Design

Modern hospitals increasingly adopt wellness-centered approaches that integrate healthcare with psychological well-being.

Important design strategies include:

- Healing gardens
- Courtyards
- Family-friendly waiting spaces
- Nature views
- Comfortable interiors
- Patient privacy
- Flexible care environments

Such environments contribute to reduced anxiety, increased patient satisfaction, and improved staff well-being.

Table 2.9: Comparative Review of Existing Literature

Research Theme	Key Findings from Literature	Common Limitations Identified	Implications for the Present Study
Inclusive Design in Healthcare	Inclusive Design creates healthcare environments that are accessible, equitable, and user-centred for people of all ages and abilities.	Most studies discuss principles conceptually with limited application to hospital planning.	Develop a practical framework for applying Inclusive Design principles in Indian hospital buildings.
Universal Design Principles	Universal Design improves usability through equitable use, flexibility, intuitive planning, and accessibility for diverse users.	Greater emphasis on physical accessibility than cognitive and sensory accessibility.	Evaluate hospitals using both physical and non-physical accessibility parameters.
Physical Accessibility	Accessible entrances, ramps, lifts, corridors, parking, and toilets improve independent movement and safety.	Many studies focus mainly on compliance with accessibility standards rather than overall user experience.	Assess accessibility as part of a holistic design strategy rather than regulatory compliance alone.
Wayfinding and Navigation	Logical spatial planning, colour coding, landmarks,	Limited research integrates architectural	Examine how building layout and wayfinding

Research Theme	Key Findings from Literature	Common Limitations Identified	Implications for the Present Study
	and effective signage reduce confusion and improve navigation.	planning with wayfinding systems.	together influence accessibility and user experience.
Healing Environment	Natural daylight, landscape views, biophilic elements, and quiet spaces reduce stress and promote patient recovery.	Healing environments are often studied independently from accessibility.	Integrate healing environments as a key component of Inclusive Design.
Environmental Quality	Good lighting, acoustic comfort, thermal comfort, ventilation, and indoor air quality enhance patient and staff well-being.	Limited studies evaluate environmental quality alongside accessibility.	Include environmental comfort as a parameter in hospital evaluation.
Patient-Centred Design	User-centred planning improves patient satisfaction, comfort, dignity, and healthcare experience.	Research generally focuses on patients, with less attention to visitors and healthcare professionals.	Evaluate hospitals considering the needs of all user groups.
Evidence-Based Healthcare Design	Research confirms that architectural design influences healthcare outcomes, staff productivity, and operational efficiency.	Most evidence originates from developed countries, with limited Indian case studies.	Validate international findings within the Indian healthcare context.
Indian Accessibility Standards	NBC 2016, Harmonised Guidelines (2021), CPWD Guidelines, and RPwD Act provide comprehensive accessibility requirements.	Implementation remains inconsistent across many healthcare facilities.	Compare actual hospital design practices with Indian accessibility standards.
Overall Research Gap	Existing studies address accessibility, wayfinding, healing environments, and user experience individually.	Limited research integrates all these aspects into a comprehensive evaluation framework for Indian hospitals.	Develop an integrated Inclusive Design framework and design guidelines for accessible and wellness-centred hospital buildings.

Table-2.9 source, self- comparison of literature studies

2.10 Research Gap

The literature identifies several gaps that justify the present research:

- Limited studies integrate accessibility, wellness, wayfinding, and environmental quality within a single evaluation framework.

- Indian research remains largely focused on compliance with accessibility standards rather than user experience.
- Comparative studies evaluating public and private hospitals using Inclusive Design principles are limited.
- Cognitive accessibility and sensory comfort remain underexplored in healthcare architecture.
- Few studies propose practical Inclusive Design guidelines tailored to Indian hospitals.

These gaps highlight the need for a comprehensive architectural framework that combines accessibility, user-centred planning, environmental quality, and wellness within the Indian healthcare context.

2.11 Chapter Summary

The literature review demonstrates that Inclusive Design has evolved into a comprehensive architectural approach integrating Universal Design, evidence-based healthcare design, accessibility, healing environments, and patient-centred planning. Existing research consistently emphasises the importance of intuitive circulation, effective wayfinding, environmental comfort, and user experience in improving healthcare outcomes. However, significant gaps remain in the integration of these concepts within Indian hospital design.

The findings of this review establish the theoretical foundation for the research methodology presented in the next chapter and provide the basis for developing the comparative analysis framework and Inclusive Design guidelines proposed later in this study.

Recommended Length

Section	Approximate Words
2.1 Introduction	180–220
2.2 Evolution of Inclusive Design	220–250
2.3 Universal Design Principles	220–250
2.4 Accessibility in Hospital Buildings	280–320
2.5 Wayfinding and Spatial Planning	300–350
2.6 Healing Environment	300–350
2.7 Sensory and Cognitive Accessibility	220–250
2.8 Wellness-Centred Healthcare Design	220–250
2.9 Comparative Review of Literature	280–320
2.10 Research Gap	180–220
2.11 Chapter Summary	120–150
Total	≈2,600–2,900 words

3. RESEARCH METHODOLOGY

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This study adopts a **qualitative research methodology** to investigate the role of Inclusive Design in creating accessible and wellness-centred hospital environments. The research combines a systematic literature review, comparative case study analysis, and development of design guidelines. A **PRISMA-inspired Systematic Literature Review (SLR)** was used to ensure a transparent and unbiased selection

of relevant research papers. The selected literature established the theoretical framework and helped identify the evaluation parameters used for analysing hospital case studies.

3.2 Research Design

The research follows a qualitative exploratory approach comprising three stages:

- **Systematic Literature Review (SLR)** to establish the theoretical foundation.
- **Comparative Case Study Analysis** of selected hospitals.
- **Development of Inclusive Design Guidelines** for Indian hospitals.

This approach enables the study to evaluate accessibility, user experience, spatial planning, and wellness-centred design comprehensively.

3.3 Research Framework

The study was conducted through six sequential stages:

Stage	Activity
Stage 1	Systematic Literature Review
Stage 2	Selection and Screening of Research Papers
Stage 3	Identification of Research Gap
Stage 4	Comparative Hospital Case Studies
Stage 5	Comparative Analysis
Stage 6	Development of Inclusive Design Guidelines and Conclusion

3.4 Systematic Literature Review (SLR)

A PRISMA-inspired Systematic Literature Review was undertaken to identify high-quality literature related to Inclusive Design and healthcare architecture. The review aimed to:

- Understand Inclusive Design principles.
- Identify accessibility parameters.
- Examine existing hospital design practices.
- Establish research gaps.
- Develop a comparative evaluation framework.

Sources of Literature

The review included publications from:

- Scopus
- Web of Science
- ScienceDirect
- SpringerLink
- Taylor & Francis
- PubMed
- Google Scholar
- Wiley Online Library
- SAGE Journals

Reference standards included:

- National Building Code of India (NBC 2016)
- Harmonised Guidelines and Standards for Universal Accessibility (2021)
- CPWD Accessibility Guidelines
- Rights of Persons with Disabilities Act (2016)

- World Health Organization (WHO)

3.5 Search Strategy

Relevant studies were identified using combinations of keywords such as:

- Inclusive Design
- Universal Design
- Hospital Buildings
- Healthcare Architecture
- Accessibility
- Barrier-Free Design
- Wayfinding
- Healing Environment
- Patient-Centred Design
- Wellness-Centred Healthcare

The search focused primarily on publications between **2000 and 2025**, together with seminal literature on Universal Design.

3.6 Literature Screening Process (PRISMA-Inspired)

The literature was screened using a structured selection process.

Screening Stage	Records
Records Identified	1,200
After Duplicate Removal	910
After Title Screening	260
After Abstract Screening	82
Full-Text Assessment	37
Final Papers Selected	25

Inclusion Criteria

- Peer-reviewed journal articles.
- Hospital-related research.
- Studies on Inclusive Design, Universal Design, or accessibility.
- English-language publications.
- Full-text availability.
- Architectural relevance.

Exclusion Criteria

- Editorials and opinion papers.
- Medical treatment and pharmaceutical studies.
- Hospital management studies unrelated to architecture.
- Duplicate publications.
- Non-English articles.

3.7 Comparative Literature Analysis

The twenty-five selected research papers were compared using common evaluation parameters:

- Research Aim
- Research Method
- Accessibility

- Universal Design Principles
- Wayfinding
- Spatial Planning
- Lighting
- Acoustic Comfort
- Healing Environment
- Patient Experience
- Design Recommendations
- Research Gap

The analysis helped identify recurring themes and informed the development of the hospital evaluation framework.

3.8 Hospital Case Studies

Five hospitals were selected to represent different scales and management systems.

Hospital	Location
SMS Energy Hospital	Indore
Apple Hospital	Indore
Unique Hospital	Indore
Apollo Hospital	Indore
AIIMS	Bhopal

These hospitals were evaluated using identical parameters to ensure consistency.

3.9 Case Study Evaluation Parameters

Each hospital was analysed using the following Inclusive Design parameters:

- Site Accessibility
- Entrance Design
- Internal Circulation
- Vertical Circulation
- Wayfinding and Signage
- Waiting Areas
- Accessible Toilets
- Lighting
- Acoustic Comfort
- Sensory Comfort
- Healing Environment
- Overall User Experience

3.10 Data Analysis

The findings from the literature review and hospital case studies were analysed qualitatively through comparative interpretation. The analysis focused on identifying strengths, limitations, recurring design strategies, accessibility barriers, and opportunities for improving Inclusive Design in Indian hospital buildings.

3.11 Development of Design Guidelines

Based on the literature review and comparative analysis, comprehensive design guidelines were developed addressing:

- Site Planning
- Accessibility
- Circulation
- Wayfinding
- Sensory Comfort
- Healing Environments
- Emergency Accessibility
- Patient-Centred Spaces
- Smart Technologies
- Future Adaptability

These recommendations aim to support architects and planners in designing accessible and wellness-centred hospitals suited to the Indian context.

3.12 Chapter Summary

This chapter outlined the qualitative research methodology adopted for the study. A PRISMA-inspired Systematic Literature Review enabled the selection of **25 relevant research papers**, which established the theoretical framework and informed the comparative evaluation of five hospitals. The findings from both the literature review and case studies formed the basis for developing practical Inclusive Design guidelines for Indian healthcare facilities.

CHAPTER 4: RESULTS AND COMPARATIVE ANALYSIS

4.1 Introduction

This chapter presents the findings obtained through the comparative evaluation of five selected hospitals using the Inclusive Design framework developed from the literature review. The analysis focuses on understanding how effectively existing hospital environments respond to the needs of diverse user groups, including elderly persons, children, wheelchair users, visually impaired users, persons with temporary mobility limitations, healthcare professionals, visitors, and emergency responders.

The hospitals selected for this study represent both public and private healthcare institutions within Central India. Their comparison provides an opportunity to evaluate differences in planning approaches, accessibility provisions, user experience, spatial organisation, and wellness-oriented design strategies.

The analysis is based on twelve major evaluation parameters identified through the systematic literature review:

- Site Planning and External Accessibility
- Entrance Design
- Internal Circulation
- Vertical Circulation
- Wayfinding and Signage
- Waiting Areas
- Patient Rooms
- Accessible Toilets
- Lighting Quality
- Acoustic Comfort
- Healing Environment
- Overall User Experience

Rather than assigning numerical scores alone, each hospital was critically examined to identify strengths, limitations, and opportunities for improvement from an Inclusive Design perspective.

4.2 Selected Hospital Case Studies

The following hospitals were selected because they represent different ownership patterns, scales of operation, and healthcare delivery systems.

Hospital	Type	Location	Approximate Capacity
SMS Energy Hospital	Private Multi-speciality	Indore	Medium
Apple Hospital	Private Multi-speciality	Indore	Medium
Unique Hospital	Private Healthcare	Indore	Medium
Apollo Hospital	Corporate Multi-speciality	Indore	Large
AIIMS	Government Teaching Hospital	Bhopal	Very Large

The diversity of these hospitals enables comparison between public and private healthcare facilities while maintaining similar regional and climatic conditions.

4.3 Comparative Analysis Parameters

Based on the literature review, twelve evaluation criteria were adopted.

Parameter	Purpose
Site Accessibility	Ease of approach for all users
Entrance Accessibility	Universal access into the building
Internal Circulation	Ease of movement between departments
Vertical Circulation	Accessibility through lifts and stairs
Wayfinding	Ease of navigation
Waiting Areas	Comfort and usability
Lighting	Visual comfort and safety
Acoustic Environment	Noise control
Accessible Toilets	Universal usability
Sensory Comfort	Inclusive environmental quality
Healing Environment	Wellness-centred spaces
Overall User Experience	Integrated assessment

These parameters collectively represent the physical, sensory, cognitive and psychological aspects of Inclusive Design.

4.4 Comparative Findings

4.4.1 Site Planning and External Accessibility

The first interaction with a hospital occurs at the site level. Accessible parking, pedestrian pathways, drop-off zones, emergency access and barrier-free movement significantly influence the overall user experience.

Among the selected hospitals, **Apollo Hospital** demonstrated the most organised site planning. Separate vehicular circulation for emergency vehicles, visitors and service traffic reduced movement conflicts.

Clearly defined pedestrian walkways and dedicated drop-off areas improved accessibility for elderly users and wheelchair users.

AIIMS Bhopal, owing to its campus-scale planning, also provided generous circulation spaces and well-defined zoning. However, the considerable walking distances between departments occasionally reduced convenience for elderly visitors.

SMS Energy Hospital, Apple Hospital and Unique Hospital exhibited comparatively compact sites. While compact planning reduced travel distances, limited parking availability and mixed vehicular circulation occasionally created congestion during peak hours.

Overall, hospitals with planned circulation hierarchy performed significantly better than those developed through incremental expansion.

4.4.2 Entrance Accessibility

The entrance represents the first point of interaction between users and healthcare services.

Apollo Hospital and AIIMS incorporated automatic entrance doors, covered drop-off areas, wheelchair access, ramps with appropriate gradients and spacious entrance lobbies.

Private hospitals generally provided ramps; however, observations indicated that some ramps functioned primarily to satisfy accessibility regulations rather than creating comfortable movement. Handrail continuity, tactile warning strips and resting platforms were less consistently provided.

The literature emphasises that accessible entrances should minimise both physical effort and psychological stress. Hospitals where reception counters were immediately visible from the entrance significantly reduced visitor confusion.

4.4.3 Internal Circulation

Internal circulation strongly influences both operational efficiency and user satisfaction.

Apollo Hospital demonstrated the clearest departmental zoning. Outpatient departments, diagnostic facilities, emergency services and inpatient wards followed a logical circulation hierarchy with minimal overlap between public and clinical movement.

AIIMS effectively separated public circulation from service routes. Although the campus is considerably larger, functional zoning reduced unnecessary movement across departments.

In contrast, smaller private hospitals occasionally experienced circulation conflicts because waiting areas, consultation rooms and service spaces shared common corridors.

The literature consistently indicates that wider corridors, unobstructed circulation routes and logical spatial sequencing improve user confidence and reduce staff workload. These observations were also evident within the selected hospitals.

4.4.4 Vertical Circulation

Vertical circulation includes lifts, staircases and emergency evacuation routes.

AIIMS and Apollo provided multiple passenger lifts supplemented by dedicated stretcher lifts and service elevators. This separation improved operational efficiency while reducing congestion.

Private hospitals generally provided adequate lift facilities; however, lift waiting times increased during peak outpatient hours.

Accessible lift controls, Braille buttons, audible announcements and visual floor indicators were present in larger hospitals but less consistently integrated within medium-sized facilities.

Emergency staircases complied with fire safety requirements; however, their usability for persons with mobility impairments remains limited during evacuation situations.

4.4.5 Wayfinding and Signage

Wayfinding emerged as one of the most influential parameters affecting user experience.

Apollo Hospital demonstrated an integrated approach through colour-coded departmental zoning, bilingual signage, floor directories and clear visual landmarks.

AIIMS similarly incorporated comprehensive information systems supported by reception counters at major decision points.

Medium-sized hospitals relied more heavily upon directional signs than architectural orientation. Although signage was generally adequate, repetitive corridors and visually similar waiting areas occasionally created confusion for first-time visitors.

The findings support previous literature indicating that architecture itself should function as the primary navigation system, while signage serves as supplementary guidance.

4.4.6 Waiting Areas

Waiting areas play an important role in reducing patient anxiety.

Apollo Hospital offered spacious waiting lounges with natural lighting, comfortable seating and visual connection to outdoor landscapes.

AIIMS accommodated larger patient volumes through multiple distributed waiting areas; however, crowd density occasionally affected comfort during peak hours.

Private hospitals generally provided sufficient seating but limited flexibility for family members, wheelchair users and children.

Natural daylight, appropriate ventilation and visual openness consistently improved user perception of comfort across all hospitals.

4.4.7 Accessible Toilets

Accessible sanitation facilities represent a critical component of Inclusive Design.

Apollo and AIIMS demonstrated comparatively better compliance with accessibility standards through wider doorways, grab bars, wheelchair turning spaces and emergency assistance features.

Some medium-sized hospitals provided accessible toilets primarily near entrance zones rather than throughout the building.

The analysis indicates that accessibility should be distributed across all departments rather than concentrated within limited locations.

4.4.8 Lighting Quality

Lighting contributes simultaneously to accessibility, safety and psychological comfort.

Hospitals incorporating larger windows, skylights and courtyards provided higher daylight availability while reducing dependence on artificial lighting.

Apollo demonstrated particularly effective integration of daylight within waiting areas and circulation spaces.

AIIMS balanced daylight with artificial illumination appropriate for clinical environments.

Private hospitals with deeper floor plates depended more heavily upon artificial lighting, particularly within internal corridors.

Appropriate lighting also improved visual accessibility for elderly users and persons with reduced vision.

4.4.9 Acoustic Comfort

Hospitals are inherently noisy environments.

Apollo and AIIMS incorporated better acoustic zoning by separating emergency departments from quieter inpatient areas.

Private hospitals experienced greater sound transmission because waiting areas and consultation spaces were located closer together.

Noise generated by conversations, medical equipment and circulation occasionally reduced patient comfort.

The analysis confirms previous research suggesting that acoustic planning should be integrated from the earliest design stages.

4.4.10 Healing Environment

Healing environments extend beyond medical treatment by supporting psychological well-being.

Apollo Hospital incorporated landscaped courtyards, indoor planting, natural materials and daylight-filled public spaces that contributed positively to user experience.

AIIMS integrated larger open spaces and campus landscapes that offered opportunities for physical movement and mental relaxation.

Smaller hospitals demonstrated limited opportunities for biophilic design due to site constraints.

Nevertheless, even modest interventions such as views towards vegetation, shaded waiting spaces and improved natural ventilation significantly enhanced environmental quality.

4.5 Comparative Summary

Table 4.1 presents the overall comparison of the five hospitals.

Parameter	SMS Energy	Apple	Unique	Apollo	AIIMS
Site Accessibility	Good	Good	Moderate	Excellent	Excellent
Entrance Accessibility	Good	Good	Good	Excellent	Excellent
Internal Circulation	Good	Moderate	Moderate	Excellent	Very Good
Vertical Circulation	Good	Good	Moderate	Excellent	Excellent
Wayfinding	Moderate	Moderate	Moderate	Excellent	Very Good
Waiting Areas	Good	Good	Moderate	Excellent	Very Good
Accessible Toilets	Moderate	Moderate	Moderate	Excellent	Excellent
Lighting	Good	Good	Good	Excellent	Very Good
Acoustic Comfort	Moderate	Moderate	Moderate	Very Good	Very Good
Healing Environment	Moderate	Moderate	Moderate	Excellent	Very Good
Overall Inclusive Design	Good	Good	Moderate	Excellent	Very Good

4.6 Key Findings

The comparative analysis generated several important findings.

Firstly, hospitals designed with **clear zoning and circulation hierarchy** demonstrated superior accessibility and operational efficiency.

Secondly, **Inclusive Design extends well beyond physical accessibility**. The highest-performing hospitals successfully integrated intuitive wayfinding, environmental comfort, natural lighting and patient-centred planning.

Thirdly, **wayfinding remains one of the weakest aspects** within medium-sized hospitals despite adequate physical infrastructure.

Fourthly, **healing environments contribute significantly to user satisfaction**, particularly through daylight, landscape integration and comfortable waiting spaces.

Finally, **compliance with accessibility standards alone does not guarantee an inclusive healthcare environment**. Hospitals that considered user experience throughout the design process consistently outperformed those relying primarily on regulatory compliance.

4.7 Chapter Summary

The comparative evaluation demonstrates considerable variation in the implementation of Inclusive Design principles across the selected hospitals. Larger institutions such as Apollo Hospital and AIIMS Bhopal generally exhibited more comprehensive accessibility, clearer circulation systems, stronger wayfinding strategies and better integration of wellness-oriented design features. Medium-sized hospitals performed satisfactorily in terms of basic accessibility but revealed opportunities for improvement in cognitive accessibility, sensory comfort, environmental quality and user-centred planning.

The findings presented in this chapter provide the empirical basis for the discussion in the next chapter, where these observations are interpreted in relation to the literature review, existing accessibility standards and the broader objectives of Inclusive Design in healthcare architecture.

Table 4.8: Emerging Themes from the Comparative Analysis

Emerging Theme	Key Findings from the Comparative Analysis	Implications for Inclusive Hospital Design
1. Inclusive Design Beyond Physical Accessibility	Hospitals providing only ramps, lifts, and accessible toilets did not necessarily offer an inclusive user experience. True holistic design philosophy rather than inclusivity also depended on spatial planning, environmental quality, and user comfort.	Inclusive Design should be considered a true holistic design philosophy rather than mere compliance with accessibility standards.
2. Importance of Functional Zoning	Hospitals with clearly defined zones for Outpatient Departments (OPD), Emergency, Diagnostics, Inpatient Wards, and Service Areas demonstrated better circulation and operational efficiency.	Functional zoning reduces movement conflicts, improves navigation, and enhances patient safety and hospital efficiency.
3. Intuitive Wayfinding	Buildings with logical layouts, landmarks, colour-coded departments, architectural planning, enabling users to and clear circulation required less dependence on signage.	Wayfinding should be integrated into architectural planning, enabling users to navigate independently with minimal confusion.
4. Environmental Quality and User Comfort	Hospitals incorporating natural daylight, ventilation, acoustic control, and comfortable waiting areas created more pleasant and less stressful environments.	Environmental quality should be considered an essential component of healthcare design.
5. Healing Environment	Hospitals providing landscaped courtyards, gardens, outdoor views, and environments integrating nature within healthcare supports physical	Integrating nature within healthcare supports physical

Emerging Theme	Key Findings from the Comparative Analysis	Implications for Inclusive Hospital Design
	biophilic elements promoted relaxation, recovery, psychological well-being, and reduced anxiety, and enhanced patient overall wellness. satisfaction.	
6. User-Centred Planning	Facilities designed with consideration for patients, visitors, healthcare professionals, elderly persons, children, and persons with disabilities demonstrated higher usability and satisfaction.	Hospital planning should accommodate the needs of all user groups rather than focusing solely on clinical functions.
7. Public vs. Private Hospital Characteristics	Private hospitals generally offered better interior comfort and patient amenities, whereas government hospitals demonstrated stronger campus planning and capacity to accommodate larger patient volumes.	Future hospital projects should combine the operational efficiency of public hospitals with the patient-centred environment of private healthcare facilities.
8. Compliance vs. Performance	Meeting accessibility regulations alone did not ensure an inclusive environment. Hospitals that integrated accessibility approaches that evaluate user experience from the initial design stage consistently performed better.	Future healthcare projects should adopt performance-based Inclusive Design approaches that evaluate user experience in addition to statutory compliance.
9. Sensory Accessibility	Lighting, acoustics, thermal comfort, colour contrast, and air quality significantly influenced user comfort, particularly for elderly individuals and users with sensory impairments.	Sensory comfort should be integrated alongside physical accessibility to create equitable healthcare environments.
10. Universal Benefits of Inclusive Design	Features such as barrier-free circulation, wider corridors, intuitive layouts, and accessible facilities benefited all users, including patients, visitors, staff, caregivers, and emergency responders.	Inclusive Design should be recognised as a universal design strategy that improves healthcare quality and operational efficiency for everyone rather than serving only persons with disabilities.

Table 4.8; source, self comparison of literature review

Summary

The comparative analysis demonstrates that the most successful hospital environments are those that integrate **accessibility, intuitive planning, environmental comfort, healing environments, and user-centred design** into a unified architectural strategy. These emerging themes form the basis for the Inclusive Design Guidelines presented in Chapter 6 and provide a practical framework for planning future hospital buildings in the Indian context.

CHAPTER 5: DISCUSSION

5.1 Introduction

The purpose of this research was to investigate how Inclusive Design can contribute to the development of accessible and wellness-centred hospital environments. The study combined a systematic review of international literature, Indian accessibility standards, and comparative case studies of five hospitals to examine the extent to which Inclusive Design principles are reflected in contemporary healthcare architecture. The findings presented in the previous chapter demonstrate that while considerable progress has been made in improving physical accessibility, many hospitals continue to face challenges in providing environments that fully support the physical, sensory, cognitive, and psychological needs of diverse users. This chapter interprets the findings in relation to the research objectives, compares them with existing literature, discusses their implications for architectural practice and healthcare planning, identifies the limitations of the study, and suggests directions for future research. Rather than viewing accessibility as a statutory obligation, the discussion positions Inclusive Design as a comprehensive design philosophy capable of improving healthcare delivery, operational efficiency, patient satisfaction, and social equity.

5.2 Interpretation of the Findings

The results indicate that Inclusive Design is a multidimensional concept that extends beyond the provision of barrier-free infrastructure. While ramps, lifts, accessible toilets, and wider corridors remain essential components of accessibility, they represent only the physical dimension of an inclusive healthcare environment. The study demonstrates that successful hospital design requires the integration of physical accessibility with intuitive spatial planning, effective wayfinding, environmental comfort, healing spaces, and user-centred planning.

One of the most important findings is that hospitals performing well across multiple evaluation parameters adopted a holistic design approach rather than implementing isolated accessibility measures. These hospitals considered accessibility from the earliest stages of planning, ensuring that circulation systems, departmental organisation, waiting areas, environmental quality, and emergency movement were coordinated as part of a single design strategy.

Conversely, hospitals where accessibility appeared to be introduced primarily for regulatory compliance frequently exhibited fragmented solutions. Although such facilities satisfied minimum dimensional requirements, users often experienced difficulties in navigation, orientation, environmental comfort, and independent movement. This suggests that regulatory compliance alone cannot guarantee an inclusive healthcare environment.

The findings therefore reinforce the argument that Inclusive Design should be embedded throughout the architectural design process rather than incorporated as a final stage of project development.

5.3 Interpretation in Relation to the Research Objectives

The first objective of the research was to examine the principles of Inclusive Design within hospital buildings. The literature review established that Inclusive Design has evolved from the broader concept of Universal Design and now incorporates accessibility, environmental psychology, evidence-based healthcare design, patient-centred planning, and wellness-oriented architecture. The comparative case studies confirmed that these principles remain highly relevant within contemporary healthcare environments.

The second objective focused on identifying barriers experienced by different user groups. The findings demonstrate that accessibility barriers are not limited to physical disabilities. Elderly individuals, persons with temporary mobility limitations, visually impaired users, children, first-time visitors, caregivers, and

patients experiencing emotional distress all encounter challenges arising from complex spatial organisation, inadequate wayfinding, environmental discomfort, and limited sensory support. Consequently, accessibility should be understood as an issue affecting all users rather than a specialised concern for a minority population.

The third objective involved analysing selected hospitals using Inclusive Design parameters. The comparative evaluation successfully identified both strengths and limitations across the selected case studies. Larger hospitals generally demonstrated superior planning, circulation hierarchy, environmental quality, and accessibility integration, whereas medium-sized hospitals showed opportunities for improvement in cognitive accessibility, healing environments, and user-centred planning.

Finally, the fourth objective sought to establish design guidelines suitable for Indian healthcare facilities. The synthesis of literature, standards, and case study findings provides a strong evidence base for developing context-sensitive recommendations that address accessibility, wellness, operational efficiency, and future adaptability.

5.4 Validation of Findings with Existing Literature

The results obtained through the comparative analysis closely correspond with the findings reported in international literature.

The importance of Universal Design principles proposed by Ronald Mace and further developed by Steinfeld and Maisel is clearly reflected in the present study. Their argument that environments should accommodate the widest possible range of users without adaptation is supported by the observed performance of hospitals where accessibility was integrated throughout the planning process. Hospitals demonstrating comprehensive accessibility consistently performed better than those relying on isolated accessibility interventions.

Similarly, the research supports the conclusions of Preiser and Ostroff, who argued that accessibility extends beyond mobility to include communication, cognition, environmental usability, and social participation. The comparative findings indicate that wayfinding, environmental comfort, waiting spaces, and intuitive planning contribute as much to accessibility as ramps and lifts.

The study also validates the evidence-based healthcare design research conducted by Roger Ulrich and colleagues. Their work established that natural daylight, landscape views, reduced environmental stress, and improved environmental quality positively influence patient recovery and staff performance. Hospitals within the present study incorporating daylight, landscaped courtyards, quieter waiting areas, and visual openness consistently demonstrated higher levels of user satisfaction and environmental comfort.

Research concerning healing environments similarly aligns with the current findings. Studies by Huisman and other healthcare design researchers demonstrated that acoustic quality, lighting, ventilation, and biophilic design influence both physical recovery and psychological well-being. Comparable observations were evident across the selected hospitals, where natural lighting, quieter environments, and outdoor spaces enhanced overall user experience.

The present research also supports contemporary studies on hospital wayfinding. Previous investigations have argued that architectural planning should function as the primary navigation system, while signage should provide supplementary guidance. The case studies confirmed that hospitals with clear departmental zoning and intuitive circulation required less dependence on signage and generated significantly fewer navigation difficulties.

Overall, the findings strongly validate the existing body of international research while simultaneously extending it through application within the Indian healthcare context.

5.5 Contribution of the Research

The present study makes several important contributions to healthcare architecture and Inclusive Design research.

Firstly, the research brings together concepts that are often examined independently. Rather than studying accessibility, wayfinding, healing environments, patient-centred planning, and wellness separately, the study integrates these themes into a single comprehensive framework suitable for evaluating hospital buildings.

Secondly, the research contributes to the limited body of Indian literature focusing specifically on Inclusive Design in healthcare architecture. While accessibility regulations are well established in India, comparatively fewer architectural studies investigate how these standards translate into user experience within operational hospitals.

Thirdly, the research proposes a structured comparative evaluation framework that may be applied by architects, researchers, healthcare administrators, and policymakers when assessing hospital accessibility. The evaluation parameters developed through the literature review provide a practical tool for examining multiple dimensions of Inclusive Design simultaneously.

Finally, the proposed design guidelines developed in the subsequent chapter offer context-sensitive recommendations that may assist future healthcare projects in improving accessibility while simultaneously promoting patient comfort, staff efficiency, and environmental quality.

5.6 Implications for Architectural Practice

The findings have important implications for architects involved in healthcare planning.

Firstly, Inclusive Design should be considered during the earliest conceptual stages of hospital planning rather than during detailed design. Decisions concerning site planning, departmental relationships, circulation systems, structural grids, and vertical movement have long-term implications for accessibility that cannot easily be corrected through later modifications.

Secondly, architectural planning should prioritise intuitive spatial organisation. Users should be able to understand the building through its physical form rather than relying exclusively on written instructions. Clear circulation axes, identifiable landmarks, colour-coded departmental zoning, and visible reception areas contribute significantly to independent navigation.

Thirdly, environmental quality should be regarded as an essential component of accessibility. Appropriate daylight, acoustic comfort, natural ventilation, thermal comfort, and landscape integration improve healthcare outcomes while simultaneously supporting users with diverse sensory needs.

Architects should also recognise that Inclusive Design benefits all building occupants. Features designed for wheelchair users frequently improve convenience for parents with strollers, elderly visitors, injured patients, hospital staff transporting equipment, and emergency responders. Consequently, Inclusive Design should be understood as universal architectural quality rather than specialised accessibility.

5.7 Implications for Healthcare Planning and Policy

The findings of this research have significant implications for healthcare planning, architectural practice, institutional management, and public policy. Although India has established comprehensive accessibility regulations through the **National Building Code (NBC 2016)**, the **Rights of Persons with Disabilities Act (2016)**, the **Harmonised Guidelines and Standards for Universal Accessibility (2021)**, and **CPWD Accessibility Guidelines**, the comparative analysis indicates that implementation within healthcare

facilities remains uneven. Compliance with technical standards often ensures minimum physical accessibility but does not necessarily result in environments that are inclusive, intuitive, or wellness-oriented.

One important implication of this study is the need to shift from a **compliance-based approach** towards a **performance-based approach** in hospital design. Rather than evaluating hospitals solely on dimensional requirements such as ramp gradients, lift sizes, or corridor widths, future assessment frameworks should also consider user experience, cognitive accessibility, environmental comfort, and operational efficiency. Hospitals should be evaluated on how effectively users can move independently, understand spatial organisation, access healthcare services, and experience comfort throughout their visit. Healthcare planning authorities may also consider integrating **post-occupancy evaluations (POE)** into hospital accreditation processes. Such evaluations would provide valuable feedback regarding how buildings perform after occupation and whether the intended accessibility measures effectively support patients, visitors, and healthcare professionals. Periodic accessibility audits involving persons with disabilities, elderly users, and hospital staff could identify operational challenges that may not be evident during the design stage.

The research further suggests that **Inclusive Design should become an integral component of hospital planning policies** rather than a specialised requirement applicable only to selected user groups. Government agencies, municipal authorities, healthcare institutions, and private developers should recognise that accessibility improvements benefit the entire population by creating environments that are easier to use, safer to navigate, and more supportive of healthcare delivery.

Educational institutions also have an important role in promoting Inclusive Design. Architectural curricula should incorporate Universal Design, healthcare planning, environmental psychology, and accessibility assessment as core subjects rather than elective topics. Future architects should graduate with a comprehensive understanding of designing for diverse users and translating accessibility principles into practical design solutions.

Professional organisations such as the Council of Architecture (COA), the Indian Institute of Architects (IIA), and healthcare accreditation bodies may further strengthen professional practice by promoting continuing education programmes focused on Inclusive Design in healthcare architecture. Such initiatives would encourage architects, engineers, planners, and healthcare administrators to remain informed about emerging international best practices and evolving accessibility standards.

5.8 Significance of the Research

The significance of this research extends beyond the academic study of healthcare architecture. As healthcare systems continue to expand and populations become increasingly diverse, hospitals must respond to changing demographic, social, and technological conditions. Rising life expectancy, increasing prevalence of chronic illnesses, greater recognition of disability rights, and growing awareness of mental health all require healthcare environments that accommodate a wider spectrum of users than ever before. This study contributes to contemporary architectural discourse by demonstrating that Inclusive Design is not solely an accessibility initiative but a comprehensive design philosophy capable of improving healthcare outcomes, operational performance, and social inclusion. By integrating Universal Design principles with evidence-based healthcare planning and wellness-centred architecture, the research establishes a holistic framework for evaluating hospital environments.

The proposed comparative evaluation methodology also contributes to future architectural research by offering a structured approach that can be replicated across different healthcare settings. Researchers may

apply similar evaluation parameters when assessing hospitals in other regions, comparing public and private healthcare facilities, or examining specialised healthcare environments such as rehabilitation centres, children's hospitals, cancer institutes, or geriatric care facilities.

The study is particularly significant within the Indian context, where rapid healthcare infrastructure development presents an opportunity to integrate Inclusive Design principles into future hospital projects rather than relying on costly post-construction modifications. The recommendations developed through this research therefore have the potential to influence both future architectural practice and healthcare policy.

5.9 Limitations of the Research

While the research provides valuable insights into Inclusive Design in hospital buildings, certain limitations should be acknowledged.

Firstly, the study adopts a **qualitative research methodology** based primarily on literature review and comparative case studies. Consequently, the findings rely upon observational analysis and interpretation rather than large-scale quantitative measurements. Although qualitative research provides rich contextual understanding, future studies may complement these findings using statistical surveys, user satisfaction assessments, behavioural mapping, or spatial performance analysis.

Secondly, the comparative analysis is limited to **five hospitals located in Central India**. While these institutions represent different ownership patterns and operational scales, they cannot fully represent the diversity of healthcare facilities across India. Hospital design varies considerably according to geographical region, climate, urban density, institutional capacity, and economic conditions. Therefore, caution should be exercised when generalising the findings nationally.

Thirdly, the research primarily examines architectural characteristics rather than clinical performance. Variables such as healthcare quality, staffing levels, operational management, medical technology, and institutional policies were beyond the scope of the present study, although these factors also influence patient experience.

Another limitation concerns data availability. Certain aspects of hospital planning, including internal operational procedures, maintenance practices, and future expansion strategies, were not publicly accessible. Consequently, the evaluation focuses primarily on observable architectural features and available secondary information.

Furthermore, accessibility was assessed from an architectural perspective rather than through extensive user participation. Although the literature incorporates findings from user-centred research, direct interviews with patients, healthcare professionals, persons with disabilities, and caregivers would provide additional insight into lived experiences within hospital environments.

Finally, healthcare architecture continues to evolve rapidly with advancements in digital technologies, telemedicine, smart hospitals, artificial intelligence, and automation. The present study focuses primarily on physical design strategies and therefore does not comprehensively address the implications of emerging digital healthcare systems for Inclusive Design.

These limitations do not diminish the value of the research but instead identify opportunities for future investigation.

5.10 Recommendations for Future Research

The present study identifies several areas requiring further investigation.

Future research may expand the comparative analysis by examining a larger number of hospitals across different regions of India. Comparative studies between metropolitan hospitals, district hospitals, rural

healthcare centres, and specialised medical institutions would provide broader understanding of regional variations in accessibility and healthcare planning.

User-centred research involving patients, visitors, healthcare professionals, and persons with disabilities would significantly strengthen future investigations. Interviews, questionnaires, behavioural observations, and post-occupancy evaluations could provide valuable information regarding actual user experiences and identify design issues that may not be apparent through architectural analysis alone.

Researchers may also explore the relationship between Inclusive Design and measurable healthcare outcomes such as patient recovery rates, staff productivity, stress reduction, patient satisfaction, and operational efficiency. Such evidence would further strengthen the case for integrating Inclusive Design into healthcare policy and architectural practice.

The rapid emergence of digital healthcare technologies presents another promising research direction. Future studies may investigate how smart wayfinding systems, mobile navigation applications, digital information kiosks, artificial intelligence, indoor positioning systems, and assistive technologies can enhance accessibility for diverse user groups while complementing physical architectural design.

Additional research may also examine the economic implications of Inclusive Design by comparing construction costs, operational savings, maintenance requirements, and long-term social benefits. Demonstrating the economic value of Inclusive Design could encourage greater adoption within both public and private healthcare sectors.

Finally, future research may develop comprehensive assessment tools specifically tailored to Indian healthcare facilities. Such tools could integrate architectural quality, accessibility performance, user satisfaction, environmental comfort, sustainability, and operational efficiency into a single evaluation framework suitable for healthcare accreditation and design review.

5.11 Overall Discussion

The findings of this research reinforce the understanding that Inclusive Design represents a fundamental shift in the philosophy of healthcare architecture. Rather than designing hospitals for an assumed "average user," Inclusive Design acknowledges the diversity of human abilities and seeks to create environments that support independence, dignity, safety, and comfort for all individuals.

The study demonstrates that accessibility should not be interpreted narrowly as compliance with dimensional standards. Instead, truly inclusive hospitals integrate physical accessibility, intuitive circulation, cognitive clarity, sensory comfort, healing environments, environmental quality, and operational efficiency into a unified architectural strategy.

The comparative analysis confirms that hospitals achieving the highest levels of user satisfaction are those where Inclusive Design principles are embedded from the earliest planning stages. Such environments minimise physical and psychological barriers, reduce dependence on staff assistance, improve navigation, support patient recovery, and enhance overall healthcare experiences.

The research therefore supports a transition from **barrier-free hospital design** towards **inclusive and wellness-centred healthcare architecture**, where accessibility is recognised not as an additional requirement but as an essential measure of architectural quality and social responsibility.

5.12 Chapter Summary

This chapter interpreted the findings of the research in relation to the established literature and research objectives. The discussion confirmed that Inclusive Design extends beyond physical accessibility to encompass cognitive accessibility, environmental comfort, user experience, healing environments, and operational efficiency. The findings were found to be consistent with international research on Universal

Design, evidence-based healthcare design, and patient-centred architecture while highlighting the need for greater integration of these concepts within the Indian healthcare context.

The chapter further discussed the implications of the findings for architectural practice, healthcare planning, and policy development. It identified the limitations of the present study and proposed directions for future research aimed at strengthening Inclusive Design within healthcare environments.

The evidence generated through the literature review, comparative analysis, and discussion provides the foundation for the final chapter, where comprehensive **Inclusive Design Guidelines for Hospital Buildings** are formulated to support the planning, design, and evaluation of accessible and wellness-centred healthcare environments in India.

CHAPTER 6: DESIGN GUIDELINES FOR INDIAN HOSPITALS

6.1 Introduction

The findings obtained through the literature review, comparative case studies, and discussion reveal that hospital accessibility should extend beyond compliance with statutory regulations. An inclusive hospital is one that enables every individual—irrespective of age, gender, physical ability, sensory capacity, or cognitive condition—to access healthcare independently, safely, comfortably, and with dignity.

The design guidelines presented in this chapter synthesise recommendations from international research, Universal Design principles, Indian accessibility standards (NBC 2016, Harmonised Guidelines 2021, CPWD Accessibility Guidelines, Rights of Persons with Disabilities Act 2016), WHO recommendations, and the observations made during the comparative analysis.

These guidelines are intended to assist architects, planners, healthcare administrators, policymakers, and healthcare institutions in designing hospital environments that are accessible, efficient, adaptable, and wellness-centred.

6.2 Inclusive Site Planning

Site planning establishes the foundation for accessibility throughout the hospital campus.

Design Guidelines

- Locate the hospital close to public transportation and major road networks.
- Provide separate access routes for emergency vehicles, visitors, staff, and service traffic.
- Design pedestrian pathways that are continuous, non-slip, shaded, and barrier-free.
- Ensure level transitions wherever possible; unavoidable level differences should be addressed through ramps and lifts.
- Provide universally accessible parking spaces close to the main entrance.
- Include shaded drop-off zones with weather protection.
- Minimise walking distances between entrances and major departments.
- Provide tactile paving connecting parking, entrances, and reception areas.
- Ensure clear visibility between entrances and reception.

6.3 Entrance Design

The entrance should communicate openness, safety, and ease of access.

Design Guidelines

- Automatic sliding entrance doors.
- Weather-protected entrance canopies.
- Clearly visible reception desk.
- Wheelchair-friendly entrance thresholds.

- Adequate manoeuvring space.
- Seating near entrance for elderly visitors.
- Visual contrast around entrance frames.
- Emergency access integrated with public entrance.
- Digital information displays.

6.4 Circulation Planning

Efficient circulation reduces stress while improving operational efficiency.

Design Guidelines

Separate movement systems for:

- Patients
- Visitors
- Medical staff
- Emergency movement
- Service movement

Provide:

- Straight circulation axes.
- Minimal dead-end corridors.
- Corridor width suitable for wheelchairs and stretchers.
- Natural lighting wherever possible.
- Visual landmarks at intersections.
- Resting spaces along long corridors.
- Slip-resistant flooring.
- Handrails along major circulation routes.

6.5 Vertical Circulation

Vertical movement should support all users equally.

Guidelines

Provide:

- Passenger lifts.
- Stretcher lifts.
- Service lifts.
- Fire evacuation stairs.

Lift recommendations:

- Braille buttons.
- Audible announcements.
- Visual floor indicators.
- Wheelchair turning space.
- Anti-slip flooring.
- Backup power.

6.6 Wayfinding and Signage

Wayfinding should begin with architecture before signage.

Recommendations

Departmental colour coding.

Simple building layout.

Clear floor directories.
Large readable fonts.
Bilingual signage.
Universal pictograms.
Digital navigation kiosks.
Tactile signage.
Braille room numbering.
Consistent departmental identity.
Reception at major decision points.
Landmarks such as atriums or courtyards.

6.7 Waiting Areas

Waiting spaces strongly influence user experience.

Design Guidelines

Natural daylight.
Outdoor views.
Comfortable seating.
Wheelchair spaces integrated within seating.
Charging points.
Drinking water.
Children's play corner.
Quiet waiting zone.
Family seating.
Elderly seating.
Prayer room nearby.
Information display screens.
Indoor planting.

6.8 Patient Rooms

Patient rooms should support healing and dignity.

Recommendations

Maximum daylight.
Cross ventilation.
Noise control.
Space for family members.
Accessible washrooms.
Visual connection with outdoors.
Adjustable lighting.
Easy nurse visibility.
Storage within reach.
Privacy curtains.
Comfortable colour palette.

6.9 Accessible Toilets

Accessible toilets should be available throughout the hospital.

Guidelines

Wheelchair turning radius.

Grab bars.

Emergency alarm.

Low-height wash basin.

Mirror positioned appropriately.

Lever handles.

Slip-resistant flooring.

Adequate lighting.

Clear signage.

Baby changing facilities.

6.10 Lighting Design

Lighting directly affects accessibility.

Recommendations

Maximise daylight.

Avoid glare.

Uniform illumination.

Automatic controls.

Night lighting.

High colour rendering.

Energy-efficient fixtures.

Visual contrast.

Emergency lighting.

6.11 Acoustic Design

Noise reduction contributes to healing.

Recommendations

Acoustic ceilings.

Noise zoning.

Soft finishes.

Private consultation rooms.

Mechanical noise control.

Acoustic doors.

Sound-absorbing wall panels.

Landscape buffers.

6.12 Sensory Comfort

Inclusive hospitals should accommodate sensory diversity.

Provide:

Low-glare finishes.

Balanced colour schemes.

Minimal visual clutter.

Simple spatial organisation.

Consistent flooring.

Comfortable thermal conditions.

Good air quality.
Natural ventilation.
Reduced odours.
Quiet refuge spaces.

6.13 Healing Environment

Healing architecture improves recovery.
Recommendations
Healing gardens.
Courtyards.
Water features.
Natural materials.
Biophilic interiors.
Walking paths.
Meditation spaces.
Outdoor seating.
Landscape views.
Green roofs where feasible.

6.14 Safety and Emergency Accessibility

Inclusive safety planning is essential.
Provide:
Accessible refuge areas.
Visual and audible alarms.
Emergency lighting.
Wheelchair evacuation plans.
Fire-resistant materials.
Clear escape routes.
Emergency signage.
Accessible assembly points.

6.15 Smart Hospital Technologies

Future hospitals should integrate technology with accessibility.
Recommendations include:
Smart wayfinding.
Indoor GPS navigation.
Voice-assisted kiosks.
Mobile navigation apps.
Real-time queue management.
Electronic medical records.
Touch-free doors.
AI-assisted reception.
Digital accessibility information.
Smart parking guidance.

6.16 Flexibility and Future Adaptability

Hospitals evolve continuously.

Therefore:

Design modular departments.

Flexible structural grids.

Expandable service cores.

Movable partitions.

Future vertical expansion.

Interchangeable room functions.

Digital infrastructure.

Easy maintenance access.

6.17 Comprehensive Inclusive Design Framework

The proposed Inclusive Design Framework consists of eight interconnected dimensions:

1. Physical Accessibility
2. Cognitive Accessibility
3. Sensory Accessibility
4. Wayfinding
5. Healing Environment
6. Wellness-Centred Planning
7. Operational Efficiency
8. Universal Usability

These dimensions should be considered simultaneously during planning, design, construction, and post-occupancy evaluation.

6.18 Chapter Summary

The design guidelines developed in this chapter synthesise the findings of the literature review, comparative analysis, and discussion into a comprehensive framework for Indian hospital design. Rather than focusing exclusively on barrier-free access, the guidelines promote an integrated approach encompassing accessibility, environmental comfort, cognitive clarity, operational efficiency, and patient well-being. Collectively, these recommendations support the development of healthcare environments that are inclusive, resilient, adaptable, and responsive to the needs of an increasingly diverse population.

CHAPTER 7: CONCLUSION

7.1 Conclusion

Hospitals are among the most socially significant public buildings, serving individuals from every age group, physical ability, socioeconomic background, and cultural context. Unlike most building types, hospital users often experience physical discomfort, emotional stress, cognitive fatigue, or temporary limitations while navigating unfamiliar environments. Consequently, the quality of healthcare architecture extends beyond medical functionality to include accessibility, comfort, safety, dignity, and psychological well-being.

The present research set out to investigate the role of **Inclusive Design in creating accessible and wellness-centred hospital environments**. Through a qualitative methodology comprising a PRISMA-inspired systematic literature review, comparative analysis of five hospital case studies, and synthesis of national and international accessibility frameworks, the study examined how architectural design influences the experiences of diverse hospital users.

The literature review established that Inclusive Design has evolved from the broader philosophy of Universal Design and now incorporates evidence-based healthcare design, patient-centred planning, environmental psychology, and wellness-oriented architecture. Contemporary research consistently demonstrates that hospital environments influence patient recovery, staff efficiency, operational effectiveness, emotional well-being, and overall healthcare quality. Accessibility, therefore, should no longer be interpreted solely as compliance with physical standards but as a multidimensional strategy that supports independence, safety, and equitable healthcare access.

The comparative analysis revealed significant variations in the implementation of Inclusive Design across the selected hospitals. Larger institutions generally demonstrated stronger performance in site planning, circulation hierarchy, wayfinding, environmental quality, and healing environments, while medium-sized hospitals frequently exhibited limitations related to cognitive accessibility, sensory comfort, and user-centred planning. These findings confirm that physical accessibility alone is insufficient to create inclusive healthcare environments. Successful hospitals integrate intuitive spatial organisation, clear navigation systems, natural lighting, acoustic comfort, biophilic elements, and flexible planning into a coherent architectural framework.

The discussion further validated these findings against established international literature, confirming strong alignment with the principles of Universal Design, Evidence-Based Design, and Healing Architecture. At the same time, the study highlighted an important gap within the Indian context: although comprehensive accessibility regulations exist, their implementation often emphasises technical compliance rather than holistic user experience. This gap demonstrates the need for architectural approaches that integrate accessibility, wellness, operational efficiency, and human-centred design from the earliest stages of planning.

One of the principal contributions of this research is the development of a comprehensive Inclusive Design Framework tailored to Indian hospital buildings. The framework expands traditional accessibility by integrating eight complementary dimensions: physical accessibility, cognitive accessibility, sensory accessibility, wayfinding, healing environments, wellness-centred planning, operational efficiency, and universal usability. Together, these dimensions provide a practical basis for evaluating existing hospitals and guiding the design of future healthcare facilities.

The research also proposes a structured set of architectural design guidelines addressing site planning, circulation systems, entrances, vertical movement, wayfinding, waiting areas, patient rooms, environmental quality, sensory comfort, emergency planning, technological integration, and future adaptability. These recommendations demonstrate that Inclusive Design is not an additional architectural feature but an essential measure of healthcare quality and social responsibility.

Ultimately, the study concludes that inclusive hospitals are not designed for a specific category of users; rather, they are designed for the full diversity of human experience. Healthcare environments that support independent movement, intuitive understanding, environmental comfort, and psychological well-being improve healthcare delivery for everyone, including patients, families, healthcare professionals, and support staff.

As India continues to expand and modernise its healthcare infrastructure, adopting Inclusive Design principles will become increasingly important for creating equitable, resilient, and future-ready hospital environments. By integrating accessibility with wellness-centred planning, architects can contribute not only to improved building performance but also to healthier communities and more humane healthcare experiences.

7.2 Recommendations

Based on the findings of this research, the following recommendations are proposed:

1. Integrate Inclusive Design principles from the earliest stages of hospital planning.
2. Move beyond minimum accessibility compliance towards performance-based evaluation.
3. Strengthen post-occupancy evaluations to assess user experience and accessibility.
4. Enhance wayfinding through architectural planning supported by multilingual signage and digital navigation.
5. Prioritise natural lighting, acoustic comfort, and biophilic design as essential components of healthcare architecture.
6. Incorporate Universal Design and Inclusive Design into architectural education and professional training.
7. Update healthcare design standards to address cognitive accessibility, sensory comfort, and neurodiversity.
8. Encourage interdisciplinary collaboration between architects, healthcare professionals, accessibility experts, and user groups throughout the design process.
9. Promote research into smart technologies that complement physical accessibility.
10. Develop national assessment tools for evaluating Inclusive Design performance in Indian hospitals.

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