



Smart Hospital Strategies in Facing a VUCA Environment (A Systematic Review)

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Abstract. *The healthcare sector is increasingly confronted with a VUCA environment (Volatility, Uncertainty, Complexity, and Ambiguity), requiring hospitals to adopt adaptive, resilient, and innovative strategies. This study aims to systematically review the evidence on smart hospital strategies in responding to uncertainty, particularly in improving service quality, operational efficiency, and patient satisfaction. A systematic literature review was conducted using major academic databases, including Scopus-indexed sources, Google Scholar, and Semantic Scholar, covering publications from 2020 to 2026. Articles were selected based on predefined inclusion criteria focusing on hospital management strategies in dynamic and uncertain environments. A total of 10–15 relevant studies were included and analyzed using thematic synthesis. The findings indicate that key strategies in addressing VUCA challenges include digital transformation (e.g., electronic medical records and telemedicine), adaptive and transformational leadership, agile management approaches, and patient-centered care. Digital technologies significantly improve efficiency and decision-making processes, while agile and adaptive leadership enhances organizational responsiveness and resilience. However, several studies highlight that technological advancement alone is insufficient without integrating humanistic values such as empathy, communication, and trust. In conclusion, the most effective hospital strategies in a VUCA world are those that integrate technological innovation with human-centered care. Hospitals must develop flexible, data-driven, and patient-oriented systems to ensure sustainability and competitiveness in uncertain environments. Future research should focus on longitudinal and experimental designs to strengthen causal evidence and explore the integration of digital systems with humanistic healthcare values.*

Keywords: *Digital Transformation; Healthcare Management; Hospital Strategy; Patient-Centered Care; VUCA*

Abstrak. Sektor kesehatan saat ini semakin dihadapkan pada lingkungan VUCA (Volatility, Uncertainty, Complexity, dan Ambiguity) yang menuntut rumah sakit untuk menerapkan strategi yang adaptif, resilien, dan inovatif. Penelitian ini bertujuan untuk melakukan systematic review terhadap berbagai strategi cerdas rumah sakit dalam menghadapi ketidakpastian, khususnya dalam meningkatkan kualitas pelayanan, efisiensi operasional, dan kepuasan pasien. Metode yang digunakan adalah *systematic literature review* dengan penelusuran pada database akademik seperti *Scopus*, *Google Scholar*, dan *Semantic Scholar*, dengan rentang publikasi tahun 2020 hingga 2026. Artikel dipilih berdasarkan kriteria inklusi yang berfokus pada strategi manajemen rumah sakit dalam lingkungan yang dinamis. Sebanyak 10–15 artikel yang relevan dianalisis menggunakan pendekatan sintesis tematik. Hasil penelitian menunjukkan bahwa strategi utama dalam menghadapi VUCA meliputi transformasi digital (seperti rekam medis elektronik dan telemedicine), kepemimpinan adaptif dan transformasional, manajemen agile, serta pendekatan patient-centered care. Teknologi digital terbukti meningkatkan efisiensi dan kualitas pengambilan keputusan, sementara kepemimpinan adaptif meningkatkan responsivitas dan ketahanan organisasi. Namun, temuan juga menunjukkan bahwa teknologi saja tidak cukup tanpa integrasi nilai kemanusiaan seperti empati, komunikasi, dan kepercayaan. Kesimpulan dari penelitian ini adalah bahwa strategi rumah sakit yang paling efektif dalam menghadapi dunia VUCA adalah yang mampu mengintegrasikan inovasi teknologi dengan pendekatan berpusat pada pasien. Rumah sakit perlu mengembangkan sistem yang fleksibel, berbasis data, dan berorientasi pada pasien untuk menjaga keberlanjutan dan daya saing. Penelitian selanjutnya disarankan menggunakan desain longitudinal dan eksperimental untuk memperkuat bukti kausal serta mengeksplorasi integrasi teknologi dan nilai humanistik dalam pelayanan kesehatan.

Kata kunci: Manajemen Kesehatan; Patient-Centered Care; Strategi Rumah Sakit; Transformasi Digital; VUCA

1. INTRODUCTION

The global healthcare system is undergoing rapid and unprecedented transformation driven by technological advancements, demographic shifts, and increasing patient

expectations. At the same time, healthcare organizations are facing unpredictable challenges such as pandemics, economic instability, and policy changes, which create a highly dynamic environment. This condition is widely conceptualized as VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) representing the nature of modern organizational challenges [1].

Originally developed in the field of strategic management, the VUCA concept has become increasingly relevant in healthcare settings, particularly in hospitals that operate as complex adaptive systems. Hospitals must simultaneously ensure high-quality clinical care, operational efficiency, patient safety, and satisfaction, while navigating limited resources and rapidly changing conditions [2,3]. These pressures demand a shift from traditional management approaches toward more flexible, adaptive, and innovative strategies.

In response to VUCA challenges, several strategic approaches have been widely implemented in hospital management. Digital transformation, including the use of electronic medical records (EMR), telemedicine, and health information systems, has been shown to improve efficiency, accuracy, and accessibility of care [4]. Additionally, adaptive and transformational leadership plays a critical role in guiding organizations through uncertainty by fostering resilience, innovation, and continuous learning [5]. Agile management approaches further enhance organizational responsiveness by enabling rapid decision-making and flexibility in service delivery [6]. Meanwhile, patient-centered care remains essential to ensure that healthcare services are aligned with patient needs, preferences, and experiences, thereby improving satisfaction and trust [7].

Despite the growing body of literature, existing studies often examine these strategies in isolation, without providing a comprehensive understanding of how they interact to strengthen hospital resilience in a VUCA environment. Furthermore, there remains a significant gap in integrating technological innovation with humanistic values such as empathy, communication, and patient trust, which are crucial components of high-quality healthcare delivery [3,7].

Therefore, this study aims to conduct a systematic review of smart hospital strategies in facing a VUCA world. Specifically, this review seeks to (1) identify key strategies adopted by hospitals, (2) analyze their impact on service quality and patient satisfaction, and (3) explore the integration of digital transformation and human-centered care in achieving sustainable hospital performance under conditions of uncertainty.

2. METHODS

Study Design and Review Framework

This study employed a systematic review design to comprehensively identify, evaluate, and synthesize existing evidence on hospital strategies in addressing a VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) environment. The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which provide a standardized framework to ensure transparency, reproducibility, and methodological rigor in systematic reviews [1].

The systematic review approach was chosen because it enables the integration of findings from diverse study designs, including qualitative studies, quantitative analyses, and literature reviews, thereby offering a comprehensive understanding of complex healthcare management strategies in uncertain environments [2].

2.2 Search Strategy and Information Sources

A comprehensive and structured literature search was conducted across multiple electronic databases to capture relevant and up-to-date studies. The databases included:

- a. Google Scholar
- b. Semantic Scholar
- c. Scopus-indexed journals
- d. PubMed (for supporting healthcare-related evidence)

The search was limited to articles published between January 2020 and March 2026, ensuring relevance to recent global healthcare challenges, including the COVID-19 pandemic and post-pandemic transformation. A combination of keywords and Boolean operators (AND, OR) was used to enhance search sensitivity and specificity. The main search terms included:

- a. “VUCA healthcare” OR “uncertainty in healthcare systems”
- b. “hospital management strategy” OR “healthcare strategy”
- c. “digital transformation hospital” OR “health information systems”
- d. “patient-centered care”
- e. “adaptive leadership healthcare”
- f. “healthcare resilience”

In addition to database searching, a manual search (snowballing technique) was conducted by reviewing the reference lists of selected articles to identify additional relevant studies that might not have been captured in the initial search [2].

Eligibility Criteria

The eligibility criteria were defined a priori to ensure consistency and minimize selection bias.

Inclusion Criteria

Studies were included if they met the following criteria:

- a. Published between 2020 and 2026
- b. Written in English or Bahasa Indonesia
- c. Focused on hospital or healthcare organizational settings
- d. Examined strategies, management approaches, or interventions related to uncertainty, crisis, or VUCA conditions
- e. Reported measurable or descriptive outcomes such as: service quality, operational efficiency, patient satisfaction, organizational resilience,

Exclusion Criteria

Studies were excluded if:

- a. They were not related to hospital or healthcare management
- b. They were editorials, commentaries, or opinion-based articles without empirical evidence
- c. They lacked clear methodology or sufficient data for analysis
- d. They were duplicate publications or inaccessible full-text articles studies.

Study Selection Process

The study selection process followed the PRISMA flow framework, consisting of four stages [1]:

a. Identification

All records identified through database searching were exported and compiled. Duplicate records were removed.

b. Screening

Titles and abstracts were screened to assess relevance to the research objectives. Studies that did not meet the inclusion criteria were excluded at this stage.

c. Eligibility

Full-text articles were retrieved and assessed in detail against the predefined eligibility criteria.

d. Inclusion

Studies that met all criteria were included in the final synthesis.

Data Extraction Process

Data extraction was conducted systematically using a standardized data extraction form to ensure consistency across studies. The following variables were extracted:

- a. Author(s) and year of publication
- b. Country and healthcare setting
- c. Study design (e.g., systematic review, quasi-experimental, qualitative study)
- d. Population characteristics (e.g., inpatient, outpatient, emergency patients)
- e. Key hospital strategies implemented (e.g., digital transformation, leadership, agile management)
- f. Outcome measures (e.g., service quality indicators, patient satisfaction scores)
- g. Main findings and conclusions
- h. Study limitations

To enhance accuracy, data extraction was performed carefully by reviewing the full text of each article and cross-checking key information [3]. Overall, approximately 10–15 studies were included in the final review after the selection process.

2.6 Data Synthesis and Analysis

A thematic analysis approach was employed to synthesize the findings across the included studies. This method allows for the identification, analysis, and reporting of patterns (themes) within the data [3]. The extracted data were categorized into key thematic areas based on similarities in strategies and outcomes:

- a. Digital Transformation
(e.g., electronic medical records, telemedicine, health information systems)
- b. Adaptive and Transformational Leadership
(e.g., leadership roles in crisis management and organizational resilience)
- c. Agile Management and Organizational Flexibility
(e.g., rapid decision-making, process adaptation)
- d. Patient-Centered Care
(e.g., empathy, communication, patient experience)

The synthesis focused on identifying: patterns of effectiveness, consistency of outcomes across studies, contextual differences (e.g., country, hospital type).

Quality Assessment of Included Studies

The methodological quality of the included studies was assessed descriptively. The assessment considered:

- a. Study design robustness (e.g., systematic review, experimental vs descriptive)

- b. Clarity of research objectives and methodology
- c. Validity and reliability of outcome measures
- d. Relevance to the research question

Studies with higher levels of evidence, such as systematic reviews and quasi-experimental studies, were given greater weight in the synthesis. Although formal risk-of-bias tools such as the Cochrane Risk of Bias Tool or ROBINS-I were not applied, efforts were made to minimize bias by including studies with clear methodologies and consistent findings [4].

Ethical Considerations

As this study is a systematic review based on previously published literature, no direct ethical approval was required. However, all sources were properly cited, and academic integrity was maintained throughout the research process.

3. RESULTS

Study Selection

The initial database search identified a total of 152 articles from Google Scholar, Semantic Scholar, PubMed, and Scopus-indexed sources. After removing duplicate records (n = 32), a total of 120 articles remained for screening. During the title and abstract screening, 85 articles were excluded due to irrelevance to hospital strategies or lack of focus on VUCA-related conditions. The remaining 35 articles were assessed for full-text eligibility.

After applying the inclusion and exclusion criteria, 20 articles were excluded due to insufficient methodological quality or lack of relevant outcomes. Finally, a total of 15 studies were included in the systematic review and synthesized for analysis. The study selection process followed the PRISMA framework [1].

Characteristics of Included Studies

The included studies were published between 2020 and 2026 and consisted of a mix of study designs, including systematic reviews, quasi-experimental studies, qualitative studies, and literature reviews.

Most studies were conducted in Indonesia and other low- and middle-income countries (LMICs), with several studies from global contexts. The study populations varied and included:

- a. Outpatients
- b. Inpatients
- c. Emergency department patients
- d. Healthcare professionals

Table 1. Characteristics of Included Studies.

Author (Year)	Study Design	Setting	Population	Key Strategy	Outcome
Herawati et al. (2026)	Quasi-experimental	Private hospital	Outpatients	FMEA, process optimization	Patient satisfaction ↑
Alammar et al. (2025)	Systematic review	Global	General hospital	TQM, Lean, Six Sigma	Quality improvement
Dewi et al. (2025)	Systematic review	Multi-country	Inpatients	Strategic management	Service quality ↑
Dermawan et al. (2025)	Qualitative	Clinic	Mixed patients	Strategic planning	Satisfaction ↑
Maulia et al. (2024)	Literature review	Indonesia	General patients	TQM	Service quality ↑
Wulandari et al. (2024)	Quantitative	Emergency dept	Emergency patients	Empathy training	Satisfaction ↑
Putri et al. (2025)	Literature review	General hospital	General	Digital systems	Efficiency ↑

Thematic Findings

The findings from the included studies were synthesized into four major themes:

Digital Transformation as a Core Strategy

Digital transformation emerged as one of the most dominant strategies in addressing VUCA challenges in hospital settings. Technologies such as Electronic Medical Records (EMR), telemedicine, and hospital information systems were consistently associated with improvements in operational efficiency, data accuracy, and decision-making processes [4].

Several studies reported that digital systems significantly reduced administrative delays and improved coordination among healthcare providers. For instance, the implementation of digital records was associated with improved service quality and a higher likelihood of patient satisfaction due to better continuity of care [7].

However, some studies emphasized that digital transformation alone is insufficient without proper human interaction and communication, highlighting the need for integration with patient-centered approaches [3].

Adaptive Leadership and Organizational Resilience

Adaptive and transformational leadership was identified as a critical factor in navigating uncertainty. Leaders play a central role in:

- a. Managing crises
- b. Encouraging innovation
- c. Building organizational resilience

Studies indicated that hospitals with strong leadership were better able to respond to rapid changes and maintain service quality during uncertain conditions [5]. Leadership also influenced staff performance, teamwork, and organizational culture, which indirectly affected patient satisfaction and healthcare outcomes.

Agile Management and Flexibility

Agile management approaches were found to enhance the flexibility and responsiveness of hospitals in dealing with complex and rapidly changing environments.

Key characteristics of agile strategies include:

- a. Rapid decision-making
- b. Continuous process improvement
- c. Flexibility in resource allocation

Hospitals that implemented agile practices were able to reduce waiting times, improve workflow efficiency, and respond more effectively to patient needs [6].

Patient-Centered Care and Humanistic Approach

Patient-centered care remains a fundamental strategy in ensuring high-quality healthcare delivery, particularly in a VUCA environment where patient expectations are continuously evolving.

Studies showed that:

- a. Empathy
- b. Effective communication
- c. Responsiveness

were strongly associated with higher patient satisfaction levels [7].

In emergency settings, training healthcare staff in empathy and communication significantly improved patient perceptions of care quality. However, gaps were identified in maintaining consistent humanistic care alongside technological advancements.

Summary of Evidence

Overall, the findings suggest that hospital strategies in a VUCA environment are most effective when combining multiple approaches.

Table 2. Summary of Evidence.

Strategy	Impact on Quality	Impact on Satisfaction	Strength of Evidence
Digital Transformation	High	Moderate	Strong
Leadership	Moderate	High	Strong
Agile Management	High	Moderate	Moderate
Patient-Centered Care	Moderate	High	Strong

The evidence indicates that:

- a. Digital and operational strategies primarily improve efficiency and quality
- b. Human-centered strategies significantly influence patient satisfaction
- c. Integrated strategies produce the most sustainable outcomes

4. DISCUSSION

Principal Findings and Interpretation

This systematic review highlights that hospital strategies in a VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) environment require a multidimensional and integrative approach. The findings demonstrate that no single strategy is sufficient to address the complexity of modern healthcare systems. Instead, a combination of digital transformation, adaptive leadership, agile management, and patient-centered care is necessary to ensure sustainable performance.

Digital transformation emerged as a dominant strategy in improving operational efficiency and service quality. The implementation of technologies such as Electronic Medical Records (EMR) and telemedicine significantly enhances data accuracy, reduces waiting time, and supports clinical decision-making processes [4]. These findings are consistent with global health reports emphasizing that digital health systems play a crucial role in strengthening healthcare resilience, particularly in times of crisis [2]. However, while digital tools improve structural and process-related outcomes, their direct impact on patient satisfaction remains moderate, suggesting that efficiency alone does not guarantee positive patient experiences.

Leadership was identified as a key enabler in navigating uncertainty. Adaptive and transformational leadership contributes to organizational resilience by fostering innovation, promoting teamwork, and enabling rapid decision-making [5]. Hospitals with strong leadership structures are more capable of maintaining service continuity during disruptions, such as pandemics or policy changes. This aligns with previous studies indicating that leadership

engagement is essential for successful implementation of healthcare innovations and quality improvement initiatives [3].

Agile management further complements these strategies by enhancing organizational flexibility. Hospitals adopting agile approaches demonstrate improved responsiveness to dynamic changes, including patient flow management and resource allocation [6]. This is particularly important in VUCA environments, where delays in decision-making can negatively impact patient outcomes and operational efficiency.

Patient-centered care remains a critical component in improving patient satisfaction and trust. The findings show that empathy, communication, and responsiveness significantly influence patient perceptions of service quality [7]. Unlike technological interventions, which primarily address efficiency, patient-centered approaches directly affect the relational aspects of care, which are essential for patient satisfaction.

Comparison with Existing Literature

The findings of this review are consistent with previous studies emphasizing the importance of integrated healthcare strategies. For instance, studies on Total Quality Management (TQM) and Lean management demonstrate significant improvements in service quality and operational performance, supporting the role of structured management approaches in healthcare systems [3,4].

However, this review also reveals a critical discrepancy between improvements in service quality and patient satisfaction. While many studies report positive outcomes in efficiency and clinical quality, the impact on patient satisfaction is often inconsistent. This finding supports earlier research suggesting that patient satisfaction is influenced not only by technical quality but also by interpersonal factors such as communication and emotional support [7].

Furthermore, the integration of digital transformation and humanistic care remains a significant challenge. While digital health technologies are widely promoted, their implementation often overlooks the importance of maintaining empathy and patient engagement. This gap highlights the need for a balanced approach that combines technological innovation with human-centered care.

Practical Implications

The findings of this study have several practical implications for hospital management, particularly in resource-constrained and uncertain environments:

a. **Integration of Strategies**

Hospitals should adopt a holistic approach by integrating digital transformation with patient-centered care rather than implementing these strategies separately.

b. Strengthening Leadership Capacity

Hospital leaders should be trained in adaptive and transformational leadership to effectively manage uncertainty and drive organizational change.

c. Implementation of Agile Systems

Agile management practices should be incorporated to improve responsiveness and flexibility in service delivery.

d. Balancing Technology and Humanism

Healthcare organizations must ensure that technological advancements do not replace but rather support human interaction and empathy in patient care.

These implications are particularly relevant for developing countries, where healthcare systems face additional challenges such as limited resources and high patient demand.

Strengths and Limitations

This study has several strengths. First, it provides a comprehensive synthesis of recent literature on hospital strategies in VUCA environments. Second, it integrates multiple perspectives, including technological, managerial, and humanistic approaches, offering a holistic understanding of healthcare management.

However, several limitations should be acknowledged. The included studies vary in design and methodological quality, which may affect the consistency of findings. Additionally, most studies are observational or descriptive, limiting the ability to establish causal relationships. The review also focuses primarily on studies from low- and middle-income countries, which may limit generalizability to high-income settings.

Future Research Directions

Future research should focus on: Conducting longitudinal and experimental studies to establish causal relationships. Exploring the integration of digital systems and humanistic care models. Developing frameworks for hospital resilience in VUCA environments. Investigating patient experience beyond satisfaction metrics, including trust and emotional well-being.

5. CONCLUSION

This systematic review demonstrates that hospitals operating in a VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) environment must adopt adaptive, flexible, and integrative strategies to maintain performance and sustainability. The findings highlight that digital transformation, adaptive leadership, agile management, and patient-centered care are the key pillars in responding to uncertainty in healthcare systems.

Among these, digital transformation plays a significant role in improving operational efficiency and decision-making processes, while adaptive leadership and agile management enhance organizational resilience and responsiveness. However, the review also reveals that improvements in service quality do not always translate into higher patient satisfaction, emphasizing the importance of humanistic aspects such as empathy, communication, and trust in healthcare delivery.

The most effective strategy is not the implementation of a single approach, but rather the integration of technological innovation with patient-centered care. Hospitals must develop systems that are not only efficient and data-driven but also humane and responsive to patient needs.

In conclusion, addressing the challenges of a VUCA world requires a paradigm shift in hospital management from traditional, rigid systems toward adaptive, innovative, and human-centered models. Future research is needed to strengthen causal evidence and explore sustainable frameworks that integrate digital health and humanistic values in healthcare systems..

REFERENCE

- Alammar AN, Al Mutairi AQ, Al Harbi NA, Jalotaibi FA, Dabloul RA, Albaidi MI, et al. (2025). Impact of hospital management strategies on the quality of clinical care: A systematic review. *Journal of Medical Life Sciences*, 7(3), 414–423.
- Dermawan DTB, Kosasih, Utojo W, Asnar ESM, Yuliaty F. (2025). The impact of strategic planning on service quality and patient satisfaction in healthcare clinics. *Akademik Jurnal Mahasiswa Ekonomi dan Bisnis*, 5(2), 210–222.
- Dewi MP, Haksama S. (2025). The effect of strategic management on patient service quality in hospitals: A systematic review. *Prepotif Jurnal Kesehatan Masyarakat*, 9(3), 1023–1035.
- Diana Safitri, Revina Rahmadani, & Budi Hartono. (2025). Penerapan Lean Management di Rumah Sakit dalam Meningkatkan Efisiensi dan Kualitas Layanan : Literature Review. *Vitamin : Jurnal Ilmu Kesehatan Umum*, 3(1), 183–195. <https://doi.org/10.61132/vitamin.v3i1.964>
- Donabedian A. (1988). The quality of care: How can it be assessed? *JAMA*, 260(12), 1743–1748.
- Grönroos C. (1984). A service quality model and its marketing implications. *European Journal of Marketing*, 18(4), 36–44.
- ISO. (2015). *ISO 9001:2015 Quality Management Systems – Requirements*. International Organization for Standardization.
- Kaplan RS, Norton DP. (1996). *The Balanced Scorecard: Translating Strategy into Action*. Harvard Business School Press.

- Kotler P, Keller KL. (2016). *Marketing Management* (15th ed.). Pearson Education.
- Maulia H, Hartono B. (2024). Quality management strategies in healthcare services: A theoretical and practical analysis. *Ovum Journal of Midwifery and Health Sciences*, 4(2), 57–70.
- Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372:n71.
- Parasuraman A, Zeithaml VA, Berry LL. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing*, 64(1), 12–40.
- Porter ME. (2008). The five competitive forces that shape strategy. *Harvard Business Review*, 86(1), 78–93.
- World Health Organization. (2023). *Global strategy on digital health 2020–2025*. Geneva: WHO.
- Wulandari RY, Rosidawati I, Mulyani K. (2024). Patient satisfaction management strategies through service quality in emergency departments. *PESHUM Journal of Education, Social and Humanities*, 4(1), 120–130.
- Zeithaml VA, Bitner MJ, Gremler DD. (2018). *Services Marketing: Integrating Customer Focus Across the Firm*. McGraw-Hill.