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Supply Chain Risk Management for Pharmaceutical Distribution in Conflict-Affected Regions: Part I – A Tri-Method MCDM Approach for Risk Prioritization

Medical Family Pharmacy Case – Libya

Walid Mohamed Bub[1], Dr. Saber Khaled Elmabrouk[2]

Department of Engineering Project Management, Libyan Academy for Postgraduate Studies, Tripoli, Libya
saber.elmabrouk@academy.edu.ly

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Abstract

Pharmaceutical distribution in developing and conflict-affected environments is exposed to operational, transportation, infrastructure, information-system and regulatory disruptions that can threaten medicine availability and continuity of care. This paper constitutes Part I of a two-part Supply Chain Risk Management (SCRM) study and focuses on identifying and prioritizing distribution risks in Medical Family Pharmacy, a Libyan pharmacy chain operating a centralized hub-and-spoke model. A structured two-phase expert process involving 25 practitioners identified 15 risks and evaluated them against Cost, Quality, Delivery Time and Reliability. AHP was used to establish criterion priorities, while TOPSIS and VIKOR were applied as complementary ranking methods. The audited criterion weights were 0.160762 for Cost, 0.277293 for Quality, 0.466125 for Delivery Time and 0.095819 for Reliability, with a criteria consistency ratio of 0.0097. The triangulated analysis identifies A1 Delays in Shipment, A4 IT System Failures, A8 Power Outages and A13 Regulatory Non-compliance as the principal risks requiring strategic attention. The paper deliberately reports the complete risk set but concentrates the detailed results on the leading risks, providing a concise conference-paper format while preserving the analytical logic of the underlying study. Part II uses these findings as the input for a phased mitigation framework.

Keywords: Supply Chain Risk Management; Pharmaceutical Supply Chain; Multi-Criteria Decision Making; AHP; TOPSIS; VIKOR; Supply Chain Resilience; Libya

1. Introduction

Pharmaceutical supply chains are critical components of healthcare systems because disruption in procurement, storage, transportation, information flow or regulatory processes can directly affect medicine availability and quality. In developing and fragile environments, these vulnerabilities may be intensified by infrastructure limitations, institutional volatility and

transportation constraints. The resulting problem is therefore a supply-chain problem rather than a single logistics problem.

Medical Family Pharmacy provides a relevant case because its centralized distribution structure can concentrate the consequences of localized disruption. A failure affecting transport, electricity, information systems or regulatory processes may propagate to several branches. A systematic SCRM approach is therefore required to identify the risks that deserve priority before mitigation resources are allocated.

This paper forms Part I of a two-part study. Its objective is to establish a defensible diagnostic baseline by identifying the risk universe, weighting the decision criteria and comparing risk priorities through AHP, TOPSIS and VIKOR. Part II translates the resulting priorities into practical mitigation and implementation actions.

2. Literature Review

2.1 Supply Chain Risk Management in Pharmaceutical Distribution

Supply Chain Risk Management has developed from a mainly reactive approach to disruption toward a proactive capability concerned with risk identification, assessment, mitigation, monitoring and resilience. This development is particularly important in pharmaceutical supply chains because disruption consequences extend beyond financial loss. Shipment delays may cause stockouts, quality failures may affect medicines, and regulatory failures may prevent legitimate movement even when physical inventory and transportation capacity remain available.

Jaberidoost et al. demonstrated the usefulness of structured multi-criteria methods for pharmaceutical supply-chain risk assessment by applying AHP and SAW. Their work supports the use of expert-based prioritization where risks span several functions and cannot be meaningfully compared through cost alone. Resilience research further emphasizes that supply chains must develop capabilities to absorb disruption and recover while maintaining essential flows.

For fragile operating environments, this resilience perspective is especially important. Power and IT failures can act as systemic risks because they may interrupt several processes simultaneously. A power outage, for example, can affect warehouse operations, servers and order processing; therefore, its importance cannot be understood solely as the cost of electricity interruption. Supply-chain risk assessment must capture these interdependencies.

2.2 MCDM and Supply Chain Risk Prioritization

Risk prioritization is inherently a multi-criteria decision problem. Cost, quality, delivery time and reliability can conflict, and a risk that appears moderate under one dimension may become critical when several dimensions are considered simultaneously. MCDM methods provide a transparent structure for handling these trade-offs.

AHP is useful for deriving relative criterion weights through pairwise comparisons and for testing the consistency of expert judgments. TOPSIS evaluates alternatives according to their relative distance from positive and negative ideal solutions, while VIKOR provides a compromise-oriented ranking that considers overall utility and individual regret. Their different mathematical structures make them complementary rather than interchangeable.

Karunathilake et al. show the increasing role of MCDM in supply-chain risk management and highlight the value of systematic approaches for complex risk decisions. The present study extends this perspective to pharmaceutical distribution by applying AHP, TOPSIS and VIKOR to the same expert-derived decision structure.

2.3 Research Gap and Contribution

Although individual MCDM methods are well established in supply-chain decision research, their integrated comparative application to pharmaceutical distribution in fragile operating contexts remains comparatively limited. The contribution of this study is therefore not a new algorithm; it is the integration of three established decision perspectives into one SCRM assessment and the direct connection of the diagnostic results to a second implementation paper.

The study consequently addresses two linked managerial needs: identifying which distribution risks deserve strategic attention and providing a defensible evidence base for subsequent mitigation planning. This distinction is important because risk prioritization without an implementation pathway can remain a purely analytical exercise.

3. Methodology

3.1 Case Study and Expert Process

The study uses a single-case design focused on Medical Family Pharmacy. The organization operates a centralized hub-and-spoke distribution structure. Twenty-five experts from logistics management, IT, regulatory affairs, senior management, logistics operations, pharmacy supervision and main-store operations participated in the structured assessment. Data collection was conducted in two phases: risk identification and definition of criteria, followed by quantitative expert judgments for the MCDM model.

3.2 Identified Risk Set

The expert process produced 15 distribution risks. The complete set is presented once at the beginning of the analytical section, allowing the conference paper to remain concise without reproducing the full thesis-level decision matrices.

ID	Distribution risk
A1	Delays in Shipment
A2	Demand Fluctuation
A3	Delays in Internal Processing
A4	IT System Failures
A5	Theft or Loss of Goods
A6	Incorrect Order Fulfillment
A7	Inadequate Training of Staff
A8	Power Outages
A9	Damage to Goods During Transit
A10	Poor Transportation Conditions
A11	Environmental Hazards
A12	Traffic Congestion
A13	Regulatory non-compliance
A14	Changes in Regulatory Requirements
A15	Regulatory Audits

The risk set covers transportation, internal processing, information systems, order fulfillment, infrastructure, environmental exposure and regulatory governance. This breadth is important because it frames the problem as Supply Chain Risk Management rather than a narrow transport-risk assessment.

3.3 Decision Criteria and AHP

Four criteria were used: Cost, Quality, Delivery Time and Reliability. Experts used Saaty's 1–9 fundamental scale for pairwise comparisons. The resulting normalized weights were:

Criterion	AHP weight
Cost	0.160762
Quality	0.277293
Delivery Time	0.466125
Reliability	0.095819

Delivery Time is the dominant criterion, followed by Quality. Together they account for approximately 74% of the total decision weight. This indicates that the expert panel viewed timely and quality-sensitive medicine distribution as substantially more important than cost alone.

The criteria consistency ratio is CR = 0.0097, while the alternative-level consistency ratios are 0.0848 for Cost, 0.0952 for Quality, 0.0836 for Delivery Time and 0.0721 for Reliability. All are below 0.10, supporting acceptable consistency in the expert judgments.

3.4 TOPSIS and VIKOR

The AHP-derived criterion weights were carried into TOPSIS and VIKOR. TOPSIS uses vector normalization, weighted normalization, positive and negative ideal solutions and the closeness coefficient. VIKOR provides a compromise ranking. The methods were deliberately used as complementary lenses so that strategic priorities could be distinguished from rankings that depend strongly on one mathematical structure.

The supplied VIKOR calculation reports 1−Q rather than conventional Q. Because conventional VIKOR minimizes Q, the present study interprets the reported value as a Risk Priority Index (RPI = 1−Q), where a higher value means higher treatment priority. This avoids reversing the meaning of the results.

4. Results

4.1 Strategic Priority Risks

The complete 15-risk universe is retained in Table 1, but the conference paper concentrates the detailed results on four risks that emerge as the strategic treatment set in the audited study: A1, A4, A8 and A13.

Risk	AHP	TOPSIS	VIKOR	Interpretation
A1 – Delays in Shipment	1	3	3	High operational/service-continuity priority
A4 – IT System Failures	5	9	7	Systemic information-continuity priority
A8 – Power Outages	2	2	1	Critical infrastructure-continuity priority
A13 – Regulatory Non-compliance	10	1	2	Critical governance/compliance priority

The table is intentionally limited to the four risks carried into Part II. It does not imply that the remaining risks are irrelevant; rather, it reflects the purpose of a research paper to identify the principal findings and discuss their managerial meaning without reproducing every thesis-level calculation.

4.2 A1 – Delays in Shipment

A1 is ranked first by AHP and remains within the leading group under TOPSIS and VIKOR. Its prominence is consistent with the high weight assigned to Delivery Time. In pharmaceutical distribution, shipment delays can propagate into branch-level shortages and create pressure for emergency replenishment. The result therefore identifies transportation continuity as a core resilience requirement.

4.3 A8 – Power Outages

A8 is consistently prominent: second under AHP and TOPSIS and first under VIKOR. Its importance is systemic because power interruptions can simultaneously affect warehouse operations, information infrastructure and order processing. The convergence of the methods supports treating backup power as a supply-chain resilience capability rather than merely a facilities expenditure.

4.4 A13 – Regulatory Non-compliance

A13 produces the strongest TOPSIS result and the second VIKOR position, although its AHP position is lower. This divergence is analytically useful. A regulatory failure can interrupt the

legal flow of medicines even when stock and transportation capacity are available. The convergence of TOPSIS and VIKOR therefore elevates regulatory capability to a strategic priority.

4.5 A4 – IT System Failures

A4 has a lower exact rank than A1, A8 and A13 in the individual methods, but it remains part of the strategic four-risk treatment set because information continuity underpins inventory visibility, order processing and distribution coordination. Its relationship with A8 is also important: power instability can directly increase IT vulnerability. Part II therefore treats the two risks as interconnected rather than isolated.

4.6 Methodological Convergence and Divergence

The three methods do not produce identical internal rankings, and this is an informative result. AHP emphasizes operational risks such as shipment delays, whereas TOPSIS and VIKOR make systemic vulnerabilities such as power and regulatory compliance more prominent. The audited analysis reports strong agreement between TOPSIS and VIKOR (Spearman's rho approximately 0.92), indicating broadly similar ranking patterns.

The practical implication is that a risk should not be treated as strategically important solely because one method places it first. Risks that remain prominent across different methods provide stronger evidence for resource allocation. In this study, A1, A8 and A13 receive particularly strong cross-method support, while A4 is retained because of its systemic role in continuity.

5. Discussion

The findings reinforce the importance of a supply-chain rather than a silo-based view of pharmaceutical risk. Delivery Time is the dominant criterion, yet the strongest systemic vulnerabilities extend beyond transport. Power, information systems and regulatory compliance can all interrupt the same distribution flow through different mechanisms. This supports a resilience-oriented SCRM perspective.

The methodological differences also have theoretical implications. AHP is compensatory and can favor risks with balanced performance across criteria. TOPSIS emphasizes relative distance from ideal states, while VIKOR incorporates compromise and regret. The prominence of A8 and A13 in TOPSIS and VIKOR suggests that systemic failure modes become more visible when the ranking structure places stronger emphasis on ideal-distance and worst-regret characteristics.

For management, the principal implication is that prioritization should lead directly to resource allocation. Part I therefore serves as the diagnostic stage. Part II operationalizes the four priority risks through a phased implementation framework, including continuity measures for power, regulatory capability, shipment continuity and IT resilience.

6. Limitations

The study is based on a single organizational case and purposive expert judgments, which limits statistical generalization. The findings should therefore be interpreted as a context-specific decision-support framework rather than a universal ranking. The priorities should be periodically reassessed as operating conditions, infrastructure and the branch network change.

7. Conclusion

Part I developed a concise MCDM-based assessment of pharmaceutical distribution risks in a fragile Libyan context. Fifteen risks were identified and evaluated against Cost, Quality, Delivery Time and Reliability. AHP established the criterion weights, while TOPSIS and VIKOR provided complementary ranking perspectives. Delivery Time was the dominant criterion, and the triangulated interpretation identified A1 Delays in Shipment, A4 IT System Failures, A8 Power Outages and A13 Regulatory Non-compliance as the strategic treatment set.

The main contribution is the direct connection between diagnosis and action. Instead of reproducing the full thesis dataset, the paper presents the complete risk universe once and concentrates the results on the risks that drive managerial decisions. Part II continues the same analytical chain by converting these priorities into a phased and measurable SCRM implementation framework.

Part II – Operationalizing a Pragmatic Implementation Framework

Part II converts the diagnostic findings of Part I into a practical Supply Chain Risk Management (SCRM) implementation framework for Medical Family Pharmacy in Libya. Building directly on the four priority risks established through the AHP–TOPSIS–VIKOR assessment—A1 Delays in Shipment, A4 IT System Failures, A8 Power Outages, and A13 Regulatory Non-compliance—the study evaluates feasible mitigation actions in terms of implementation cost, complexity, time, expected impact, and operational KPIs. A structured strategy-selection workshop using the Nominal Group Technique involved 12 subject-matter experts drawn from the original panel. The resulting interventions are sequenced into short-, medium-, and long-term phases, with explicit attention to dependencies between infrastructure, information, compliance, and continuity measures. The framework is proposed as the practical treatment layer of the two-part study rather than as an empirical evaluation of realized outcomes.

Keywords: Supply Chain Risk Management; Pharmaceutical Distribution; Risk Mitigation; Supply Chain Resilience; Implementation Framework; MCDM; Libya

1. Introduction

Risk identification and prioritization create value only when decision-makers can translate analytical findings into feasible action. Part I of this two-part study identified and prioritized 15

pharmaceutical distribution risks and selected A1, A4, A8, and A13 as the principal treatment set. Part II addresses the implementation gap by converting these priorities into a phased and measurable SCRM roadmap.

The Libyan pharmaceutical environment requires solutions that are resilient but also realistic under infrastructure volatility. The implementation problem is therefore not simply to select the theoretically strongest intervention. It is to determine which actions can be implemented within the organization's operational constraints, which should be implemented first, and how their effectiveness can be monitored.

Accordingly, Part II links each priority risk to concrete mitigation actions, feasibility characteristics, an implementation horizon, expected impact, and a measurable KPI. The result is a pragmatic treatment layer that completes the diagnostic work of Part I.

2. Literature Review: From Risk Assessment to Implementation

Supply Chain Risk Management (SCRM) is increasingly viewed as a continuous managerial process that extends beyond the identification of individual risks to include risk assessment, mitigation, monitoring, and continuous improvement. This perspective is consistent with the broader supply-chain resilience literature, which emphasizes an organization's ability to anticipate disruptions, absorb their effects, adapt its operations, and recover critical supply-chain functions. Pettit, Fiksel, and Croxton [9] conceptualize resilience in terms of the balance between supply-chain vulnerabilities and the capabilities developed to withstand disruption, while Tukamuhabwa et al. [10] highlight the importance of organizational and supply-chain capabilities in preparing for and recovering from disruptive events. Accordingly, identifying and prioritizing a high-risk area represents only the diagnostic stage of SCRM; effective risk management requires the subsequent development of appropriate mitigation and resilience capabilities.

This requirement is particularly important in pharmaceutical distribution, where disruptions may simultaneously affect product availability, service continuity, information visibility, and regulatory compliance. A transportation disruption can delay the delivery of essential medicines, an information-system failure can reduce inventory visibility and interrupt order processing, while a regulatory failure can prevent the lawful movement or distribution of pharmaceutical products. Therefore, mitigation strategies should not be designed as isolated responses to individual risks. Instead, they should address the interdependencies among logistics, infrastructure, information systems, and regulatory processes. This systems-oriented view is consistent with the resilience perspective adopted in supply-chain risk management, where the effectiveness of one capability may depend on the availability of other supporting capabilities.

The implementation of risk-treatment strategies becomes even more challenging in infrastructure-constrained and volatile operating environments. In such contexts, the theoretically

most effective mitigation measure may not necessarily be the most immediately feasible because its implementation can depend on financial resources, technical expertise, organizational readiness, infrastructure availability, and implementation time. Consequently, resilience-oriented SCRM should consider not only the expected effectiveness of a mitigation strategy but also its feasibility, implementation sequence, resource requirements, and measurable performance outcomes. This is particularly relevant to pharmaceutical distribution in fragile environments, where infrastructure and operational conditions may change over time. The framework developed in this study therefore evaluates mitigation strategies according to cost, complexity, implementation time, expected impact, and key performance indicators (KPIs).

Building directly on the findings of Part I, Part II adopts an implementation-oriented SCRM perspective. Part I provides the diagnostic foundation by identifying and prioritizing the principal distribution risks through AHP, TOPSIS, and VIKOR. Part II does not repeat this prioritization process; instead, it translates the four selected risks—Delays in Shipment (A1), IT System Failures (A4), Power Outages (A8), and Regulatory Non-compliance (A13)—into concrete mitigation strategies and a phased implementation roadmap. This structure creates a continuous decision process from risk identification and assessment to mitigation,

3. Methodology

3.1 Strategy Selection

For each of the four priority risks, potential mitigation strategies were generated through a structured workshop using the Nominal Group Technique (NGT). Twelve subject-matter experts were drawn from the original 25-expert panel, with representation from Logistics, IT, and Senior Management. The smaller implementation-focused group was used to move from diagnosis toward practical strategy selection.

The strategy-selection stage preserves the results of Part I as its starting point. The decision object, however, is different: Part I asks which risks should be prioritized, whereas Part II asks which mitigation actions should be implemented to address those risks. Keeping these stages separate prevents the implementation assessment from altering the risk-prioritization results.

3.2 Feasibility Assessment

Each strategy was assessed using three feasibility dimensions: implementation cost, implementation complexity, and time to implementation. Cost and complexity were classified as Low, Medium, or High. Time was classified as Short (<3 months), Medium (3–12 months), or Long (>1 year). The mode of expert responses was used as the final classification.

The classifications are intentionally categorical because the study does not establish detailed project-level financial estimates for each intervention. Their purpose is to provide a transparent basis for sequencing actions and distinguishing immediately feasible measures from interventions requiring longer preparation.

3.3 Expected Impact, Phasing, and KPIs

Expected impact was classified as High, Medium, or Low. Strategies were then assigned to Phase 1 (short term), Phase 2 (medium term), or Phase 3 (long term), considering feasibility and dependencies between interventions. A KPI was defined for each action to support implementation monitoring and continuous improvement.

This approach creates a direct chain from risk to action: priority risk → mitigation strategy → feasibility → implementation phase → expected impact → KPI. The structure is intentionally concise so that the conference paper presents the decision logic without reproducing the full thesis-level strategy-selection matrices.

4. Results: Implementable SCRM Framework

Eight mitigation actions were retained across the four priority risks. Table 1 consolidates the implementation findings so that each action can be evaluated in relation to feasibility, timing, expected impact, and measurement.

Risk	Mitigation action	Cost	Complexity	Time	Phase	Expected impact	KPI
A8 – Power Outages	Procure and install a 150 kVA diesel generator for the main warehouse	High	Medium	Short	1	High	Warehouse operational uptime (%)
A8 – Power Outages	Install UPS systems for critical server and IT infrastructure	Medium	Low	Short	1	Medium	IT hardware failures attributable to power events
A13 – Regulatory Non-compliance	Hire a dedicated Regulatory Affairs Officer	Medium	Low	Medium	2	High	Compliance violations; audit-readiness score
A13 – Regulatory Non-compliance	Implement a digital document-management system for audit trails	Low	Medium	Medium	2	Medium	Time required to retrieve audit documents
A1 – Delays in Shipment	Contract two additional backup logistics providers	Medium	Low	Short	1	High	On-Time In-Full (OTIF) delivery rate
A1 – Delays in Shipment	Implement basic GPS tracking for delivery vehicles	Medium	Medium	Medium	2	Medium	Average shipment delay time (hours)
A4 – IT System Failures	Migrate critical inventory data to a cloud-based backup service	Low	High	Long	3	High	IT system downtime (hours/month)
A4 – IT System Failures	Establish a manual paper-based fallback operating procedure	Low	Low	Short	1	Low (fail-safe)	Ability to process orders during system outages

Table 1 shows that high expected impact is not necessarily associated with high cost or high complexity. The proposed Regulatory Affairs Officer, for example, combines medium cost and low complexity with high expected impact. In contrast, cloud-based backup has low stated cost

but high implementation complexity and a long-time horizon. This difference demonstrates why impact alone should not determine implementation sequence.

5. Phased Implementation Roadmap

The implementation sequence is designed around operational urgency and systemic dependencies. Phase 1 contains immediate continuity measures intended to reduce single points of failure. Phase 2 strengthens compliance, visibility, and operational control. Phase 3 addresses longer-term information resilience after key infrastructure prerequisites have been addressed.

Phase	Priority actions	Primary objective
Phase 1 – Short term	A8 generator; A8 UPS; A1 backup logistics providers; A4 manual fallback	Restore continuity and reduce single-point failures
Phase 2 – Medium term	A13 Regulatory Affairs Officer; A13 digital document management; A1 GPS tracking	Strengthen compliance, visibility, and control
Phase 3 – Long term	A4 cloud-based data backup	Increase information resilience after power/connectivity prerequisites are addressed

The roadmap therefore prioritizes continuity before optimization. Actions that can protect essential operations during disruption are introduced first, while more complex digital resilience measures are implemented after the supporting environment is strengthened.

6. Discussion

6.1 From Risk Priority to Action

The main contribution of Part II is the conversion of the four priority risks from Part I into concrete operational interventions. A1 is addressed through redundancy in logistics providers and improved shipment visibility. A8 is addressed through backup generation and UPS protection. A13 is addressed through dedicated regulatory responsibility and controlled audit documentation. A4 is addressed through an immediate manual fail-safe and a longer-term digital backup architecture.

This structure demonstrates that resilience should not be interpreted as a single technology or investment. It is a portfolio of complementary capabilities. A backup logistics provider reduces dependence on one transport channel; a generator reduces dependence on unstable electricity; a regulatory officer strengthens organizational control; and a manual IT procedure provides continuity when digital systems fail.

6.2 Systemic Dependencies

The interventions also reveal dependencies between the priority risks. A8 and A4 are particularly interconnected because power instability can directly affect IT infrastructure. The generator and UPS therefore function as enabling infrastructure rather than isolated interventions. Long-term

cloud backup is more valuable when the organization has sufficient power and connectivity to operate the supporting information environment.

The manual paper-based fallback is deliberately retained even though its expected normal-operating impact is classified as low. Its value appears during disruption: it preserves minimum order-processing capability when the digital system is unavailable. In a volatile operating environment, this low-technology fail-safe can prevent a technical incident from becoming a complete distribution stoppage.

6.3 Monitoring and Continuous Improvement

The KPI layer closes the implementation loop. OTIF delivery measures whether shipment continuity is improving; warehouse uptime measures the effectiveness of power continuity; IT downtime and the ability to process orders during outages measure information resilience; compliance violations and audit-readiness measure regulatory performance; and document-retrieval time measures information-control efficiency.

These indicators should be reviewed periodically rather than collected only after a disruption. Persistent deterioration in a KPI should trigger corrective action, reassessment of resource allocation, and—where appropriate—a new risk assessment. This creates a continuous SCRM cycle in which implementation results can feed back into future prioritization.

7. Managerial Implications

The framework provides management with a practical sequencing logic. Immediate resources should first protect continuity through the generator, UPS, backup logistics providers, and manual IT fallback. Medium-term resources should strengthen regulatory accountability, document control, and shipment visibility. Longer-term investment should complete the information-resilience architecture through cloud-based backup.

The framework also demonstrates why implementation should not be based solely on expected impact. A high-impact intervention that is highly complex and long-term may need to follow lower-complexity enabling actions. The proposed sequence therefore balances urgency, feasibility, and dependency rather than maximizing a single decision dimension.

8. Limitations

The framework is a proposed implementation model rather than an empirical evaluation of realized outcomes. Its classifications depend on expert feasibility judgments, the study uses a single organizational case, and cost, infrastructure, and regulatory conditions may change over time. The proposed KPIs should therefore be collected longitudinally after implementation so that expected impacts can be tested against actual performance.

9. Conclusion

Part II operationalizes the diagnostic findings of Part I into a phased SCRM implementation framework for Medical Family Pharmacy. Four priority risks—A1, A4, A8, and A13—were translated into eight concrete mitigation actions. The roadmap prioritizes immediate continuity measures, followed by compliance and visibility improvements, and finally longer-term information resilience.

The central principle is pragmatic resilience: interventions should be feasible under the organization's operating conditions, sequenced according to dependencies, and linked to measurable KPIs. Part II therefore completes the two-part research logic by moving from risk identification and prioritization in Part I to mitigation, implementation, and monitoring in Part II.

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