

The paradigm of networked crisis management: A strategic re-alignment of the public health service for civil security scenarios

Frank Naujoks¹ 

¹Gesundheitsamt Frankfurt am Main, Frankfurt am Main, Germany

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Correspondence to:

Frank Naujoks
email: frank.naujoks@stadt-frankfurt.de

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Abstract

Crisis management in the Public Health Service (PHS) require a paradigm shift, transitioning from a reactive medical provider to a central strategic pillar of national security. Addressing 21st-century hybrid threats — such as cyber-attacks, disinformation and sabotage – the “Frankfurt Model” offers a blueprint for systemic resilience. The framework moves beyond linear logistics toward a networked, “whole-of-society” approach. Key components include scenario-agnostic business continuity planning, information sovereignty via offline redundancy and a four-level escalation framework. We conclude with five strategic imperatives: legislating multi-agency crisis frameworks, embedding redundancy into critical infrastructure, formalizing a permanent civil-military health command, developing secure interoperable communication platform and initiating national societal resilience programs. Ultimately, we argue that health and security are interdependent, requiring PHS to assume a proactive, formative role in maintaining societal stability during protracted crises.

Take-home message for students Modern crisis management must look beyond clinical silos toward systemic resilience and inter-agency cooperation. This requires proactive, scenario-agnostic planning, digital sovereignty and the realisation that public health is an indispensable for national survival.

Introduction

The geopolitical upheavals of the 21st century, characterised by the proliferation of hybrid threats and the escalating complexity of global interdependencies, compel a fundamental reassessment of state security architectures. Civil defence and population protection, in particular, face challenges that extend far beyond traditional disaster scenarios. In this context, the public health sector is transitioning from a purely reactive body to a central pillar of strategic thinking on the preservation of national resilience. This necessitates a paradigm shift: away from isolated, siloed crisis plans and towards an integrated, whole-of-society and proactive approach to crisis management.

The contours of this new paradigm drawing upon the strategic developments within the Gesundheitsamt Frankfurt am Main, located centrally in the metropolitan Rhein-Main-Region, as a compelling case study. A model is being developed here that is founded on the principles of systemic resilience, operational endurance and profound civil-military and cross-departmental integration. It will be argued that, in the face of modern, complex crises, the functionality of the healthcare system is inextricably linked to the stability of all other critical infrastructures, and that the Public Health Service (PHS) must assume a central coordinating and formative role within this new framework.

The anatomy of modern crises: From linear logistics to systemic collapse

The traditional conception of a crisis, often viewed as a linear event focused on a primary phase of initial response, is ceding to a more complex understanding of cascading and protracted emergencies. A critical

analysis must distinguish between two fundamentally different phases of logistical and care provision, the management of which demands distinct capabilities.

The initial response phase can be conceptualised as a relatively orderly, hub-and-spoke system. In such a model, central nodes function as distribution points for emergency services, equipment and the first wave of casualties, geared towards immediate threat mitigation and the maintenance of a basic operational capacity. This model is characteristic of well-defined incidents with a limited geographical and temporal scope.

In stark juxtaposition stands the sustained societal impact phase, which marks the diffusion of the crisis into the wider civil society. The clear vectors of the initial response dissolve into a multi-directional, chaotic network that permeates the entire social and infrastructural fabric of a nation. The challenges are no longer primarily logistical but systemic in nature: the care for a high number of civilian casualties, the management of refugee flows and displaced families, the consequences of critical infrastructure failure and the long-term psychological trauma. In this phase, the healthcare system becomes the critical fulcrum, the overloading of which can precipitate a systemic societal collapse. This complexity is potentiated by the modern threat spectrum, which spans across a continuum from a state of peace, through crisis, to open conflict. The most critical phase is that of "crisis," which is defined by a range of hybrid tactics designed to destabilise a society long before a shot is fired (Prasad et al. 2025; Miller and Miller 2015). These tactics include:

- **Disinformation and psychological operations:** The targeted dissemination of false narratives, designed to erode trust in state institutions, emergency services and allied forces, can

foment social unrest and paralyse the authorities' ability to act.

- **Cyber-attacks:** Targeted digital assaults on the IT infrastructure of hospitals, command-and-control centres, energy grids, or communication networks pose an existential threat by directly disabling the nerve centres of crisis management and medical care.
- **Espionage and sabotage:** The clandestine reconnaissance and physical disruption of critical infrastructure—from water supplies and transport routes to pharmaceutical production facilities—are aimed at eroding the logistical and material foundations of civil defence.

In the event of further escalation towards a war-fighting scenario, this spectrum expands to include direct attacks on defence-critical infrastructure, the deployment of special forces, deliberately induced large-scale accidents or environmental disasters and ultimately the use of weapons of mass destruction. The realisation that even nations not situated on a direct geographical front line are existentially vulnerable through these networked threats, that must serve as the starting point for any modern security strategy.

The imperative of systemic resilience: Conceptual analogies and strategic imperatives

The response to these complex threats cannot lie in a mere quantitative increase of existing capacities. It demands a qualitative leap towards a system that is conceived, from bottom up, to be resilient and capable of sustained operations. A valuable conceptual model that entails logistical autonomous, often mobile, military units designed to ensure the operational freedom and endurance of formations by providing essential functional elements included

medical services. The strategic relevance of this model for the civilian sector lies in its recognition of medical care not as an external service, but as an integral and indispensable component of the entire system's resilience. The system is only as robust as its ability to provide medical care for and protect its personnel.

From this analogy, three core imperatives can be derived for the Public Health Service (PHS) as a key actor in civil health protection (Tinnemann et al. 2024):

1. **Intrinsic resilience:** The PHS must develop the capacity to absorb external shocks to the health system and adapt dynamically to volatile situations whilst maintaining its critical core functions. This implies organisational redundancy, decentralised command structures and independence from vulnerable, centralised infrastructures.
2. **Sustained operational capability:** Crises are not sprints; they are marathons. Planning must be predicated on the assumption of weeks or even months of sustained pressure. This requires strategic personnel and resource management that incorporates factors such as staff rotation, psychological support (Psychosocial Emergency Care), equipment stockpiling and autonomous energy supplies.
3. **Anticipatory planning:** A reactive posture is fatal in the face of modern crises. Modern crisis management requires detailed, scenario-agnostic and regularly exercised plans that define clear responsibilities, reporting chains, communications protocols and decision-making processes.

The systemic interdependence of the healthcare system can be visualised as a complex clockwork of interlocking cogs. While the health system may be a central driving gear, its function is entirely dependent on the seamless interaction

of all other gears: energy, water, logistics, communications, security and public administration. The failure of a single one of these elements can bring the entire system to a halt.

Operationalising the strategy: The Frankfurt model of integrated crisis management

The practical implementation of these abstract requirements can be examined in detail through the example of the City of Frankfurt am Main. The crisis strategy there is based on a multi-layered approach, extending from internal organisational reform to city-wide network integration (Tinnemann et al. 2024; Tinnemann 2025). The foundation is the Public Health Authority Business Continuity preparation, a strategic document that deliberately adopts a scenario-agnostic prioritisation. The focus is not on preparing for a specific event, but on building robust and flexible capabilities. The measures implemented include:

- **Organisational flexibility:** The establishment of remote working protocols and the comprehensive provision of secure mobile communication technology reduce the dependency on central office buildings and enable the continuation of work even when physical access is impossible.
- **Holistic preparedness:** The guidance encompasses not only official stockpiling and procurement but also strategic recommendations for the private preparedness of employees. This is done in recognition of the fact that the personal resilience of emergency personnel is a prerequisite for their professional availability.
- **Information sovereignty:** The maintenance of essential emergency documents in physical form ("red folders")

and the deployment of autonomous offline laptops with redundant databases ensure decision-making and operational capability even during a complete blackout of IT and communication infrastructures.

This approach, however, only develops its full efficacy when embedded within a city-wide structure. Under the guiding principle of "Joint Planning – Joint Action," a comprehensive Critical Infrastructure Network has been established. Here, crisis management is understood not as the task of individual authorities, but as a permanent, cooperative, whole-of-city undertaking that incorporates all operators of critical infrastructure, security agencies and relevant administrative departments. This network operates within a clearly defined and legally grounded Escalation Framework, which ensures a response proportionate to the situation (Heßberger 2024; Hafering 2024):

- **Level 1 (normal operations):** Permanent exchange and preventative planning within the CNI Network.
- **Level 2 (special organisational structure):** In the event of an emerging situation, a flexible, incident-specific coordination and command structure is activated from within the network.
- **Level 3 (major incidents command):** Activation of an administrative crisis staff for pre-emptive disaster prevention in the event of a threatened escalation.
- **Level 4 (major emergency declaration):** Following an official declaration, the Emergency Management Staff (operational) and the Administrative Staff (administrative) are convened as the supreme command bodies of the city.

Proactive coordination and needs analysis as strategic instruments

A decisive instrument for fostering this networked culture and for proactively identifying challenges is the establishment of strategic dialogue platforms, as institutionalised by the Frankfurt Symposium "be prepared". This format systematically brings together high-ranking experts from all relevant civilian and military sectors, including the police, the armed forces (Bundeswehr), medical associations, hospitals, various levels of the health administration and the city's fire and rescue service.

The analyses and workshops conducted within this framework have identified a series of critical needs and challenges that are shaping future planning (Tinnemann et al. 2025):

- **Management of patient flows:** The necessity of a seamless chain of care for a large number of casualties, including the establishment of a crisis-proof digital patient record and an intelligent, supra-regional system for distributing patients to prevent local services from being overwhelmed.
- **The human resource bottleneck:** The resilience, endurance and protection of medical personnel represent the system's Achilles' heel. The challenge of dual-assigned personnel (individuals with obligations to different civil protection organisations in a crisis) must be resolved through clear rules of precedence.
- **Physical and material security:** Ensuring the material supply of hospitals and their physical protection against attack or sabotage must become an integral component of major incident planning for healthcare facilities.
- **Information management:** Overcoming the tension between the immense information requirements of all stakeholders and necessary military or state security classifications demands the creation of secure, interoperable communication platforms.
- **Societal engagement:** Crisis planning must systematically integrate the primary care and outpatient sector, whilst the general population must be prepared through targeted public information and education to become a resilient and self-sufficient partner in crisis management.

Conclusion

The strategic re-alignment of health protection culminates in the vision of a comprehensive ecosystem of health security. Within this, the healthcare system is a fabric of core processes (pre-hospital, hospital-based and primary care, as well as the public health functions of the PHS) and support processes (logistics, laboratories, pharmaceuticals, waste disposal). The central coordination of this complex system falls to a crisis coordination entity, ideally the public health authority.

The ultimate conclusion, however, is the recognition of this system's dependencies on a multitude of external actors. A functioning healthcare system in a crisis is inconceivable without a stable blood transfusion service, a secure energy and water supply, protection by the police and security forces and functioning transport and logistics networks.

The Frankfurt model sketched here is therefore more than a local crisis plan. It is the starting to develop a blueprint for an indispensable paradigm shift in the national security posture. It transcends traditional, silo-based thinking and establishes a culture of networked, shared responsibility. Confronting the existential challenges of

the 21st century is a whole-of-society endeavour, in which the Public Health Authorities are called upon to play a central, proactive and strategically coordinating role. Security and health are two sides of the same coin — a realisation that must become the foundation of all future planning.

Five strategic imperatives for national resilience

Based on the foregoing analysis, the following five strategic imperatives are proposed as essential for preparing a nation's public health system for future crises:

1. **Mandate integrated crisis management frameworks:** National, state and local governments must legislate and enforce the creation of permanent, multi-agency crisis management structures that legally bind all operators of critical infrastructure, security agencies and public services into a unified planning and response framework, moving beyond voluntary cooperation.
2. **Embed resilience and redundancy as core design principles:** All critical infrastructure, particularly within the health, energy and digital sectors, must be designed and regulated not just for efficiency in peacetime, but for resilience and redundancy in crisis. This includes mandating standards for offline operational capability, physical security and supply chain diversification.
3. **Formalise a permanent civil-military health security command:** A standing joint command structure, comprising senior leadership from the Public Health Service, the Ministry of Defence and emergency services, must be established and resourced to facilitate continuous joint planning, training, intelligence sharing and resource coordination for national health security.
4. **Develop a national secure and interoperable communication platform:** A single, secure and resilient communication platform must be commissioned and deployed to enable real-time information sharing and the maintenance of a common operational picture amongst all authenticated stakeholders in a national crisis, from local hospitals to national government.
5. **Launch a national programme for societal resilience:** A comprehensive, long-term national programme must be initiated to enhance societal resilience through public education on personal preparedness, strategic training for essential personnel to mitigate burnout and skill shortages and support for community-level resilience initiatives.

Author contribution

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