Comparative Analysis of Emergency Medical Systems: Triage Models and Response Times in Europe

1. Introduction and Strategic Framework

The modernization of Integrated Emergency Medical Systems (IEMS) in Europe transcends the mere operationalization of ambulances; it represents the evolution towards complex public health architectures where triage acts as the fundamental " gatekeeping " mechanism. The harmonization of protocols among Member States is the cornerstone of systemic resilience, ensuring that crisis response is predictable and efficient. From a systems architect's perspective, efficiency in triage and metric accuracy in response times are not only operational objectives but critical indicators of sustainability. In a scenario of limited resource management, the optimization of clinical outcomes depends on the precision with which the system differentiates vital emergencies from non-urgent situations, ensuring equity in what we define as the "Geography of Emergency Response". The diversity of approaches among the twelve countries analyzed reveals how different organizational structures seek to guarantee the social contract of safety and citizen trust.

2. Screening methodologies: The debate between clinical assessment and algorithmic rigor.

The call reception phase is the moment of greatest vulnerability and strategic importance in the chain of survival. European systems fundamentally diverge between immediate clinical judgment and reliance on algorithmic protocols. In the French model, real-time medical regulation by SAMU (Mobile Emergency Care Service) doctors allows for a highly sensitive and personalized assessment. In contrast, countries like Poland and Lithuania use command support systems (such as the Polish SWD PRM or the MPDS ProQA) that impose algorithmic rigor to minimize subjectivity.

The table below categorizes countries based on the technical data provided, highlighting the transition from models based on professional intuition to protocol-based systems:

Screening Model	Reference Countries	System Characteristics
Clinic	Portugal, France	Centralized decision-making based on the judgment of healthcare professionals (Doctors/Nurses) with a focus on clinical sensitivity.
Algorithmic / Protocolled by Professionals	Estonia, Lithuania, Latvia, Poland	Use of decision-making algorithms (e.g. , Scandinavian Index in Estonia; SWD PRM in Poland) and structured medical questionnaires.
Hybrid / Protocolled	Netherlands, Luxembourg, Bulgaria	A combination of national medical logic with predefined color-coded or alphanumeric urgency categories.

Impact Analysis: The choice of rigid algorithms (as in Lithuania or Poland) increases procedural safety and uniformity, while the clinical assessment model (Portugal) offers greater flexibility in managing advanced versus basic resources. This distinction is vital to avoid over-engaging Advanced Life Support teams in cases that could be resolved by Basic or Immediate Life Support.

3. Hierarchy of Priorities and Temporal Response Patterns

Response segmentation is based on urgency taxonomies that vary between color codes (Bulgaria, Luxembourg) and alphanumeric codes (Estonia, Netherlands). These patterns define resource mobilization and arrival targets.

Response Patterns: Portugal vs. Estonia

- **Portugal (Levels P1 to P5):**
    - **P1 – Emergency:** Imminent life-threatening risk; immediate response with BLS and ALS/ALS.
    - **P2 – Very Urgent:** High clinical risk; target arrival within **18 minutes** .
    - **P3 – Urgent:** Risk of worsening; arrive within **60 minutes** (BLS).

- **P4 – Low Urgency:** Low risk; arrival within **120 minutes** .
- **P5 – Not Urgent: Immediate transfer** to the SNS 24 helpline.

- **Estonia (Scandinavian Index adapted):**
  - **Priority D (Delta):** Immediate life-threatening risk. **Dispatch within 1 minute** | **Travel within 1 minute** .
  - **Priority C (Charlie):** Potentially fatal. **Dispatch in 4 min** | **Travel in 3 min** .
  - **Priority B (Bravo):** Diagnosis required. **Dispatch within 1 hour** | **Travel time 5 minutes** .
  - **Priority A (Alpha):** Stable. **Dispatch within 2 hours** | **Travel within 10 minutes** .

Strategic Insight: In the Netherlands, the 15-minute target (A0/A1) is rigorously defined as a **capacity planning standard** , not as a purely medical quality metric. In Poland, the rigor is extreme for Code 1: the system requires 30 seconds for dispatch and another 30 seconds for the team to exit, totaling 60 seconds for the start of the emergency march. In Bulgaria, the use of codes **A1 (Red)** , **B2 (Yellow)** , and **C3 (Green)** allows for rapid visual and operational triage, essential for managing flows in high-pressure systems.

4. Resource Management and Integration of Relief Resources

Multisectoral integration is the driving force behind effective pre-hospital care. The role of firefighters as first responders is a common denominator in Portugal (providing >80% of services), France, and the Netherlands.

In the Netherlands, dispatching firefighters with AEDs in cases of cardiopulmonary arrest is a strategic measure to fill the critical window of the first few minutes while the ambulance (standard 15 minutes) is en route. In France, the use of **Firefighter Nurses (FNS)** under established care protocols allows for a "gradual response." This model exemplifies efficiency, providing advanced care before a doctor arrives, optimizing the resources of the Emergency Medical Service (EMS). In Estonia, the system is predominantly nurse-led, reserving specialized medical support for extremely complex situations.

5. Transparency and Management of Citizen Expectations

Call management doesn't end with dispatch; communication with the applicant is a component of clinical safety. In Portugal, transparency is reinforced by informing the citizen about the priority and estimated time, including a crucial " safety net": the instruction for the citizen **to immediately report any changes in signs or symptoms** while waiting.

In Estonia, for Priority D, the assistant remains online providing continuous telephone instructions, which reduces anxiety and initiates care before the physical arrival of emergency services. This transparency in prioritization (including the **White category** in Luxembourg or **P5** in Portugal) is essential to avoid overloading emergency lines with cases that should be referred to primary care or telephone advice.

6. Comparative Synthesis for Benchmarking Public Policies

For policymakers, European benchmarking points to models that balance geographical dispersion with speed of intervention. Poland stands out for its legislative integration between the Ministries of Health and the Interior, creating a unified command system (SWD PRM).

Benchmarking Best Practices Framework

Analysis Dimension	**Reference Country**	**Key Metric / Practice**	**Strategic Lesson**
Rural Areas and Equity	Latvia	Differentiated targets: 12m (urban), 15m (municipal), 25m (rural).	Adjusting targets to population density for realistic indicators.
Multisectoral Integration	Poland / France	Legislative integration and use of protocol-based nurses (ISP).	Reducing institutional silos and implementing a gradual response.
Dispatch Efficiency	Poland	30s for dispatch + 30s for departure (Code 1).	Maximizing the team's operational readiness.
Transparency and Security	Portugal	Time information + Symptom monitoring.	Managing expectations and mitigating clinical risk.

7. Conclusion

The success of a modern emergency medical system is not measured solely by the kinetic speed of the ambulance, but by the intelligence of the initial triage. As a Senior Specialist, I reiterate that triage is the brain of the system: its ability to adapt limited resources to real clinical needs is what determines survival.

The most resilient systems in Europe—such as the Polish, Latvian, and Dutch—demonstrate that clarity in timelines and the integration of non-medical resources (such as firefighters and specialized nurses) are indispensable. The future of pre-hospital care requires continuous European cooperation, using vehicles such as the **CTIF and FEU,** for technical harmonization, ensuring that excellence in rescue is a universal standard and not dependent on the geography where the incident occurs. Comparative Analysis of Emergency Medical Systems: Triage Models and Response Times in Europe

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