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# Earlier detection of public health risks – Health policy lessons for better compliance with the International Health Regulations (IHR 2005): Insights from low-, mid- and high-income countries



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## ABSTRACT

The International Health Regulations (IHR 2005) require all Member States to build and maintain the capacities to prevent, detect and respond to public health emergencies. Early detection of public health risks is one of the core functions. In order to improve surveillance and detection, a better understanding of the health system conditions and their influencing factors are needed. The Israeli Ministry of Health/IHR National Focal Point held a workshop to elucidate health system conditions and their influencing factors that enable earlier detection. The workshop methodology employed a stepwise, small working group analysis approach to elucidate the conditions and their influencing factors affecting each stage of recognition, assessment, and reporting of infectious disease outbreaks, at the local, regional and national levels. In order to detect public health risks earlier, the detection process needs to be moved closer to the local communities and start with building capacity within communities. Building capacity and engaging with local and diverse communities requires significant changes in the governance approach and include information sharing, multi-sectoral communication and coordination across various levels before, during and after public health emergencies. Across the regions, low-, mid- and high-income countries seem to struggle more with governance and information sharing rather than with technical capacities and capabilities.

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## 1. Introduction

Combating public health risks has been a primary goal of health-care systems worldwide for the better part of two centuries, as they pose significant threats to health security [1,2]. Despite extensive measures that were developed and implemented to reduce outbreaks of pandemics and epidemics, global surveillance and monitoring systems have witnessed a rise in the number of such events [1,3,4]. In recent years, the international community, led by the World Health Organization (WHO), has been called upon to manage numerous infectious disease outbreaks: the 2002 Severe Acute Respiratory Syndrome (SARS) outbreak, the 2009 H1N1 pandemic, the 2014 Ebola outbreak and the most recent 2016 Zika

outbreak [1,3]. Due to the substantial impacts on social, economic, and even political systems, outbreaks of infectious diseases pose a great concern to national governments, as well as the international community [5].

The recent trend toward globalization has offered substantial benefits, but carries significant health risks. [4,6] International travel, tourism, extensive international trade, and open borders offer to improve the quality of life and standard of living of people all around the globe. However, these same factors facilitate rapid spread of communicable diseases and hinder their containment [7–9]. In tandem, the capacity to electronically share information, data, guidelines and protocols, facilitates an enhanced ability to detect and identify the development of a high-risk event, and may thus contribute to earlier detection [6,10].

To enhance global health security, the World Health Assembly adopted the newly revised International Health Regulations (IHR) in 2005. The IHR aims to protect the world population by encouraging all countries to create and maintain core capacities of detection,

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assessment, reporting, and management of public health risks, as well as timely sharing of information concerning events that may impact the public health in many countries. [7,8] Policymakers and healthcare leaders are urged to ensure appropriate allocation of resources to enable the management of public health risks by building capacities to detect events that may constitute a threat to public health, determine if these may impact the international community and enact an appropriate response to contain the event [2,4,7]. Yet, recent publications have indicated that less than one third of the global community fully complies with the IHR, emphasizing the crucial need to design mechanisms that can be appropriately and practically implemented by all nations [4]. Health policy makers, navigating complex systems and pressed to make difficult decision within scarce resources setting, need to prioritize resource allocation, implement decision-making mechanisms, and instate governance in building and sustaining preparedness and response measures [11]. There is a need to advance evidence-based insights, a, rational framework and a methodology that can facilitate the process.

Early detection of public health hazards constitutes a first and fundamental component of efficient outbreak management. [2,12] Early detection of infectious diseases is vital to management of public health risks and may be the main determinant in selecting the appropriate response; i.e. containment, vaccination, distribution of medications, or any other action targeted at identifying the risk population and treating them properly. Such actions are crucial during well-known diseases and even more so during emerging diseases, when there may be a need to develop new medications or effective treatment protocols [13,14].

Earlier detection may enable early containment of the disease, preventing its spread to additional communities, nationally or internationally. [13] Failure of early detection may cause rapid distribution, making containment of the disease much more complex, or practically impossible [14].

Early detection of disease outbreaks is dependent on the awareness of primary medical teams, epidemiological networks, risk communication policies and public health governance, supported by information technologies (IT) systems for surveillance, communication and appropriate infrastructure [12,15].

Furthermore, many attempts have been made to expand capacities for earlier detection through the use of mass communication mechanisms. For example, social media are increasingly investigated as a surveillance tool to accumulate and disseminate data concerning disease risks. The substantial data that is transmitted through the varied social media channels, most especially queries raised by lay persons, serves as a complementary measure to traditional information exchange that facilitates an earlier disease detection. However, communication is not only a technical infrastructure/platform problem: sharing information among entities requires establishing collaborations between local, national and international bodies as well as familiarity and trust among the different sectors such as animal, human and environmental health sectors, among others [1].

Together, these mechanisms have not generally offered sufficiently early detection. [16] To the contrary, a lesson learned repeatedly in the epidemics of the late 20<sup>th</sup> and early 21<sup>st</sup> century has been the need to improve the detection of the early phases of emerging or re-emerging infectious diseases [1].

Progress towards this goal can be made through a more in-depth understanding of the underlying conditions upon which a healthcare system is based, factors that may affect those conditions, and effective interventions to facilitate earlier detection.

To promote the capacity for detecting events that may constitute a threat to public health, a workshop was conducted in Israel, aimed at achieving the following objectives: 1) identify drivers of early detection; 2) reveal conditions of earlier detection and their

influencing factors, and 3) recommend interventions that can lead to earlier detection of infectious disease outbreaks.

The objective of this paper is to share the insights learned in the workshop concerning earlier detection and facilitate understanding of measures that may support diverse communities in combating public health risks across the three income regions, and reflect on health policy lessons that may be drawn from these insights.

## 2. Methods

On September 2017, the Ministry of Health (MoH) in collaboration with an international risk communication expert conducted a two-day workshop on Earlier Detection of Infectious Disease Outbreaks. The workshop was the third in a series of workshops aimed at creating an effective response to public health risks at national health policy level. The current workshop represented an example from a high-income country, while earlier workshops were held in a low-income (Southern and East Africa) and mid-income region (Southeast Europe).

The workshop focused on the first capacity required by the IHR from each nation, i.e. early detection of risks to the public health. Earlier workshops were held in a low-income region (Southern and East Africa) with 19 participants from the region; and in a mid-income region (Southern Europe) with 33 participants. [17] All three workshops followed the same methodology and were designed to generate insights into systematic conditions and their influencing factors on earlier detection, and their translation into strategic planning of interventions that could be systematically implemented as part of the IHR framework.

At the Israeli workshop, eighteen multi-sector professionals from diverse Israeli entities participated in the workshop: the primary healthcare system (Health Maintenance Organizations), the hospitals, the Ministry of Agriculture, and the military Medical Corps and the Ministry of Health (MoH). MoH representatives hailed from the following divisions: Epidemiology, Emergency Preparedness, District and Regional Health Offices, Hospitalization Management, Risk Communication, National Reference Laboratories, Israeli Centre for Disease Control, Environmental Health (sea-ports), Airport liaison, and Legal Office.

The workshop employed a new methodology, phrased “the incubator methodology” that facilitates the structured and systematic gathering and analysis of health system information through an interactive and collaborative process with a group of stakeholders (“champions”). Basic concepts are deconstructed to their most fundamental elements. These elements are later reconstructed to suggest effective and innovative interventions. [10] Throughout the workshop the participants worked intermittently in small-groups and in plenary sessions, conducting open and interactive discussions. Matrices were used to systematically deconstruct and expand current understanding and concepts of early detection to encourage innovative thinking and re-build interventions to improve them, based on the dynamics and insights of the content experts.

The workshop employed a five-step analysis approach to elucidate the necessary conditions and factors that influence (facilitate or block) each stage of earlier detection of public health risks. The stages include: 1) local recognition of an event; 2) local reporting; 3) local assessment; 4) reporting to higher levels, from local, regional and up to national governance bodies; and 5) higher level assessment. At each stage, participants rotated through three vantage-points: human health, animal health and data requirements, all leading to the higher level recognition of “an event”, i.e. an outbreak.

Each breakout group assigned: a facilitator, responsible for time management, content and group dynamics, and ensuring that each

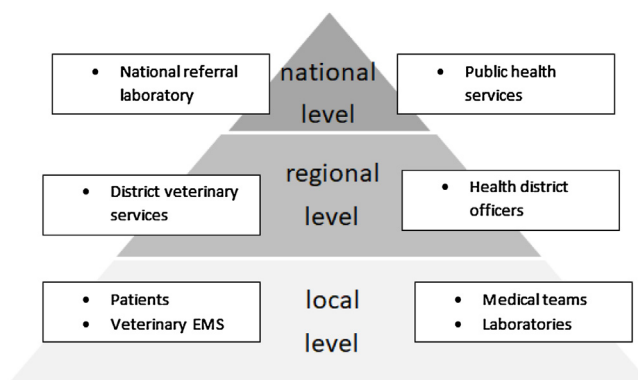


Fig. 1. Stakeholders in the detection process.

voice be heard; a flip-chart responsible for documenting the main points raised during the discussion; and a presenter, responsible for presenting the outputs produced by the group to the plenary. The group composition changed at each phase, so that all participants had the opportunity to experience and voice the various viewpoints. At the end of each stage, the outputs constructed by each of the breakout groups were presented to the plenary, discussed and put to a vote to assess their relative importance. Thus it was possible to generate a prioritized map of conditions and their most important influencing factors for each component of the earlier detection. It is believed that this output will reflect the collective expertise and insights of the participants.

The outputs of the workshop were systematically analysed in a qualitative methodology and collated to extract practical measures.

### 3. Results

#### 3.1. Stakeholders

Stakeholders, identified by their contribution to early disease detection, were classified according to their level of operation in the local, regional or national realm. All three groups – the human, animal and data group shared the perception that the medical teams as well as the laboratories formulate the main foundation for earlier detection. The main stakeholders that were identified by the different groups, in the three levels of operation are presented in Fig. 1.

Participants stressed the importance of conditions for earlier detection on a **local level** in the early stages of recognition – whereas district and national levels play a less important role in the initial stages, becoming more involved at later stages of reporting and assessment.

#### 3.2. Conditions

The human health perspective highlighted the priorities of knowledge, policies and local capacities and the animal health group prioritised technical competence, governance and local capacities. The data perspective stressed the importance of local capacities, reporting and local beliefs as well as district level assessment. The main insights concerning the conditions for earlier detection are presented in Table 1.

#### 3.3. Influencing factors

Groups then worked on identifying and prioritising factors that could influence the main preconditions.

All three groups highlighted aspects and outputs of governance, such as education, training and personal reliability as

top facilitating factor that can speed up earlier detection, followed by cooperation, incentives (compensation) and available data infrastructure. Key factors blocking early detection were lack of awareness and knowledge, political indifference and religious or cultural objections. Low budget and incoherent data formats were also ranked among the blocking factors. The main facilitating and blocking factors for earlier detection are presented in Table 2.

#### 3.4. Interventions

Finally, groups were asked to develop interventions to improve information sharing, communication and coordination using the results from the influencing factors. A recurring insight was the need to create a platform for sharing information and data, most vitally among responders and authorities from the local level. On the national level, the most important measure that was raised focused on the need to establish laws and regulation, as well as the creation of a network for joint operations. The main recommended interventions are presented in Table 3.

### 4. Discussion

Earlier detection of public health risks is a vital component of risk management, and has thus been recognized by both the IHR and the Sendai Framework as a crucial capacity that must be developed by all nations. [7,8,14] The global as well as national challenge is how this capacity can be effectively achieved, considering the cultural, social, political, structural, economic and financial characteristics and constraints of each society [5,18].

The importance of establishing mechanisms that will enhance information sharing and continuous communication has formerly been highlighted. [1,12] To date, great emphasis has been put on creating national capacities, based on partnerships between nations and international entities [19]. In contrast, the present study stresses the need to concentrate efforts on establishing local partnerships and shifting the focus from national and district activities to local levels. This shift requires communities that relate and report to health authorities; it also involves the transformation – in adequate formats – from professional reporting and assessment to enabling and empowering lay people to report [20].

Information gathering is a continuous process and the foundation for the ongoing surveillance that ultimately enables better preparedness. Although epidemic and pandemic preparedness is at the top of international health risk preparedness agenda, continuous, integrated preparedness has been seen as a field that requires more strengthening and capacity building. [16] This may stem from efforts that have to date focused primarily on national and international efforts, such as the Global Health Security Initiatives, rather than on community/localized levels of cooperation [19].

Though the importance of local awareness and competencies for gathering information need to be highlighted, appropriate evaluation of the information provided by the local level must be instated. A well-considered balance between high sensitivity and high specificity needs to be ensured to balance benefit and harm, as well as sufficient capacities for a high-quality work-up of signs and signals considered vital. Appropriate technical assistance such as statistical/epidemiological and medical/veterinary expertise must be accessible, either at the local level or regional level, in order to support the local evaluation processes. The disruptive effects of “false positive” signals on societal function and cohesion and the provision and practical application of appropriate communication strategies need to be considered in parallel to the evaluation process.

Education and awareness-raising in communities is one of the elements that enable earlier detection so that people can report

**Table 1**  
Ranked main conditions for earlier detection.

Perspective	Ranked main conditions
Human health	1. Competence/knowledge: Awareness, knowledge of signs and symptoms 2. Governance/policies: Sentinels, designation and responsibilities 3. Capacity (technological/human resource): training and exercises
Animal health	1. Competence/knowledge: Knowledge of the vets 2. Governance/policies: mandatory animal sampling, financial compensation 3. Capacity (technological/human resource): Number of samples and labs
Data	1. Capacity (technological/human resource): Budget 2. Attitude and beliefs: Transparency, cooperation 3. Capacity (technological/human resource): technological abilities

**Table 2**  
Ranked main influencing and blocking factors for earlier detection.

Perspective	Facilitating factors	Blocking factors
Human health	1. Personal reliability 2. Organised database/technology 3. Willingness to report	1. Lack of awareness/ knowledge 2. Low budget 3. Political interests
Animal health	1. Education 2. Compensation 3. Politics	1. Politics 2. Budget 3. Cultures
Data	1. Training 2. Cooperation 3. Data sharing	1. Religious/cultural objections 2. Incoherent data formats 3. No data sharing

**Table 3**  
Ranked main interventions to speed up the detection process.

Perspective	Category	Intervention
Human health	Information	Design regulations and create a national joint community
Animal health	Communication	Create a platform for shared information at local level
Data	Communication	Create a platform for data sharing

events in almost real-time. Health authorities, however, also need to broaden their information sources and include more informal reports and/in innovative formats (internet, social media, etc.). [6,10] It would be hoped that community engagement of various health providers, between themselves as well as between them and the public, will enhance awareness-building and provide a platform for continuous communication. Aligned with these previous findings, the stakeholders in the present study identified a common pattern of these conditions: all three groups highlighted education and training, alongside the key role that information systems play. They articulated the need for more data-coding uniformity and an underlying governing policy that facilitates information gathering and integration into ongoing and continuous assessment.

The key needs identified by this workshop were the desire for multidisciplinary avenues for information and collaboration: interdepartmental meetings, shared platforms and joint forums, with each organization contributing its unique inputs and all sharing a greater common picture. This finding supports previous insights that were voiced by the WHO, advocating the “One Health” approach rather than limited cooperation between the human and animal sectors that may result in a lack of formalized information exchange. [21,22,11] The aim should be to reach beyond interpersonal or ad-hoc basis, and progress to an institutionalized, concurrent sharing of information and data [23]. Interestingly, this workshop acted as a first forum of this type, offering convivial interactions between professionals from disparate fields, sharing information, understanding each other’s challenges and realising that the whole is greater than the sum of its parts.

In a follow up meeting the workshop results informed a draft strategy to implement actions for earlier detection and better preparedness.

#### 4.1. Comparison with the two previous workshops

The results from the Israeli workshop representing a high-income country mirror the results achieved in the workshops within a low-income and a mid-income region. The previous two workshops, too, emphasized that governance with its major areas (such as culture of information sharing, responsibility to report, etc.) is a key factor that drives change. [10,17] Facilitating factors for earlier detection are risk communication activities such as information sharing, communication and collaboration activities. Blocking factors were lack of communication, coordination and leadership. Interestingly, inadequate technical capacity, commonly assumed to be a leading factor impeding early outbreak detection, especially in low- and mid-income settings, was not found to be a leading factor [8,11,18].

#### 4.2. Common recommendation

The key recommendation from all workshops was to embrace and integrate the diversity of the inter-governmental and cross-sectoral collaboration in order to better work as a unity. This requires a governance and cultural change in coordination, communication and information sharing that facilitates collaboration between multi-sectoral sectors and diverse stakeholders in order to support earlier detection and improve continuous integrated preparedness. Building and strengthening community-level, local networks, both formal and informal, that operate on a continuous and sustainable level are key indicators for earlier detection.

## 5. Perspective

### 5.1. Reflection on the health policy relevance

In low- and mid-income regions health policy interventions often focus on building technical capacities. However, our results indicate that technical capacities come in second, behind governance, the culture of sharing information, communication across multiple sectors and coordinate across all administrative levels throughout the lifecycle of an event (before, during, after). This finding may substantially impact on the global, national, regional and local efforts that need to be implemented to enhance public health preparedness since establishing and sustaining effective networking can be created and maintained in all societies, regardless of availability or scarcity of resources.

## 6. Conclusions

Based on a series of workshops that was conducted to identify insights concerning earlier detection of public health risks, four main recommendations were formulated concerning public health risk management, as follows:

- 1 Locality:** It might be useful to establish a community level “focal” point so that the awareness can be embedded in community settings, and not just in the national level.
- 2 Routine:** Collaboration mechanisms need to be established and sustained on a routine basis, to facilitate a continuous flow of information, as well as personal and institutionalized contact. Elements that function effectively in normal times will be more functional and efficient during emergencies.
- 3 Governance:** The local networks require a framework that will allow and facilitate information-sharing and communication between themselves and with higher levels on a routine basis. More efforts should be instated to discriminate between vital signs and signals that should be rapidly reported versus low-risk suspicions that may be examined and reviewed before their relay to a higher level of authority.
- 4 Networks:** Sophisticated technological platforms would seem to be of secondary importance. Rather, efforts should be invested in strengthening intra- and inter-networking on the local level, to enhance information sharing and continued flow of communication, based on available platforms that already exist. Such mechanisms should be identified and leveraged for the purpose of enhancing preparedness to prevent, detecting and managing public health risks.

These results and recommendations are the output of a new methodology, which could be applied in various settings and assist health policy makers in objectively analyzing health systems. This in turn may inform scarce resource allocation. IHR has introduced a detailed set of minimum requirements for member state capacities. Our work takes these capacities a step further, indicating how these capacities may be further honed and integrated to improve early disease detection. The present methodology offers a HOW-TO-tool to facilitate the development and implementation of such interventions so as to enhance the capacity-building.

Based on the results of the workshop, recommended interventions to enhance emergency management capacities were identified, ranked and will be presented to the MoH senior management to be utilized as a foundation for strengthening the national policy and capacity to prepare for and manage public health risks.

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