Promoting the Development of a Pandemic Risk Prevention and Monitoring System in Health Organizations for Post Covid-19 Restart[1]

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ABSTRACT

Global emergencies require coordinated and global responses: the COVID-19 world pandemic has made explicit the strong link of the current situation with the culture of risk. In particular, the spread of this disruptive virus and the possibility that the epidemic may will reach such a great extent in terms of increating demands and pressed capacity of patients in hospitals that it will no longer be manageable with current health facilities: therefore, this paper aims at investigating the potential of the synergic use of Risk Prevention and Monitoring System (RPMS) practices in the health sector, with the aim of improving the ability to predict and manage the risk of a pandemic, with a comprehensive Risk Management approach, in order to contain the adverse effects on the territory and therefore on the whole society.

A literature review in the field of pandemic risk management was performed, with particular attention to the impact of the strategies and preventive models adopted in the health sector. In more details, organizational and managerial aspects, resources made available, advantages, enabling and hindering factors, and context of application were analysed, in order to grasp indications to promote the development of an integrated RPMS approach.

The application of RPMS practices stands as the barrier of considerable social importance for the improvement of the quality and effectiveness of preventive health measures and involves the establishment of collaborative relationships among all the organizations involved, as well as the spread of a risk culture, with the final intent to become more resilient towards pandemic risk as COVID-19.

Keywords: Risk Management, Pandemic risk, Risk Prevention and Monitoring System, Healthcare, Covid-19

INTRODUCTION

We have been living with the COronaVIrus Disease (COVID-19) for over a year: in December 2019, the phenomenon of collective pneumonia appeared in the South China seafood market in Wuhan, China [1], [2]. On 7 January 2020 a new virus was detected [3]: from that date on, the number of patients with pneumonia virus has skyrocketed and has spread throughout the nation, and unintentionally exported internationally. Globally, there are 115.094.614 cases of

[1] How to cite this paper: Spezie, M. and Bragantini, D. (2021). Promoting the Development of a Pandemic Risk Prevention and Monitoring System in Health Organizations for Post Covid-19 Restart; *PM World Journal*, Vol. X, Issue IV, April.

Coronavirus confirmed in the world since the beginning of the pandemic, while 2.560.995 are the dead (875.805 in Europe alone) [4].

In the face of the negative events and the difficulties of the last year related to the spread of the novel coronavirus, the Covid-19 pandemic is now still pushing healthcare systems around the world to the limit and, despite the heroic effort of healthcare professionals, hard work has often been not enough: Emergency Departments filled to the brim, hospitals struggling to treat everyone due to the very high number of people that the virus sends to the intensive care units (ICU), and exhausted staff who are often forced to work without adequate protective gear [5].

Additionally, in December 2020, the UK faced a rapid increase in COVID-19 cases, associated with the emergence of a new SARS-CoV-2 variant; at the same time, South Africa reported another SARS-CoV-2 variant, also potentially worrying, while in January 2021 Brazil reported the presence of an additional local variant. In recent weeks, despite an initial decline in the overall incidence of SARS-CoV-2, the epidemiological situation is still a cause for serious concern across the European Union (EU): since 21 January 2021, member countries have observed a substantial increase in the number and rate of SARS-CoV-2 cases of the variant first reported in the UK. Due to the greater transmissibility of the virus, the risk is currently assessable as high/very high for the overall population and very high for vulnerable individuals [4]. It is the UK variant which appears to be more transmissible than previously circulating strains and which causes more severe infections: several countries where it has become dominant have seen rapid increases in hospitalizations, overloaded health systems and excess mortality. Consequently, in the European Union, based on the current epidemiological situation with the greater circulation of more transmissible variants, immediate, strong and decisive public health interventions are essential to control transmission and safeguard health capacity, thus also minimizing opportunities that new variants emerge [6].

Despite the ability to respond to the crisis itself was a merit to be underlined, the lack of prevention of the event was crucial: this virus has such subverted the priorities of action for the systems-country to total level, particularly in Italy, where the absence of a management plan of the pandemic, or at least a deficiency of prevention of the same, has made control and modus operandi less effective and secure, both in terms of behaviour (progressive saturation of intensive terapie) and information management [7]. The main Project Management standards define a “risk” as “an event that, if it occurs, can have impacts on the objectives of the project, impacts that can be both negative and positive” [8], [9]. The risk represents the measurable part of the uncertainty itself, and it is expressed in the combination of two fundamental variables [10], [11]: the *frequency* of occurrence (understood as the probability of the risky event occurring), and the *severity* of the possible consequences (the magnitude of the damage that the risk can bring). The type of health risk referred to pandemics is identified as "pandemic risk" or "catastrophe", and it’s officially defined as "the potential loss of human life, injury or destroyed or damaged property that could occur in a system, society or community in a given period of time, probabilistically determined according to danger, exposure, vulnerability and capacity "[12]. A salient characteristic of this risk is that it combines a low probability of occurring with high, potentially catastrophic, global impact, so it represents an extreme event, potentially in able to impact on an entire territory (in terms of health companies, citizens, local authorities) and on its resources

(especially human and natural, but also economic). Difficult to predict due to the lack of sufficient historical data to support a quantitative analysis, pandemic risks in the health sector can however be mitigated if preceded, during the ordinary period, by a phase of preparation and careful planning of the response of health care in emergency: in fact, evaluation errors very often derive from an incorrect application of the basic techniques of Risk Management and risk prevention in a proactive way [13].

Risk Management (RM) is defined as the process intended to safeguard the activities of an organization from losses that could affect it in the exercise of its activities, by identifying risks, measuring their probability and the possible impact on events, eliminating or reducing their effect with the minimum investment of resources [14], [15]. To be effective, a Risk Management process should be integrated with the other activities of the organization, customized on the organization and its objectives, dynamic to respond easily to changes in the context and be inclusive, that is, involving stakeholders, in order to have a broader awareness and vision of human behavior and cultural factors that influence every level of the organization. In particular, Risk Management has as an important component Risk Prevention, which materializes in a RPMS (Risk Prevention and Monitoring System), a managerial approach of identification and analysis of new risks and reanalysis of existing ones, monitoring of residual risks and reviewing the execution of risk responses during the evaluation of their effectiveness [16], [17]. This Risk Management approach should be integrated with the stakeholder analysis as suggested in the "Stakeholder Shape" (StSh) by PMP Bragantini [18], in order to build a systemic and holistic framework that, through three new fundamental attributes (*agreement, relationship* and *risk leverage* of each stakeholder) will lead to a new bidirectional communication, in reference to the impact that each stakeholder could have for each specific and single risk [19].

The two basic joint analysis of the StSh methodology are outlined in Figure 1. [18]

PROCESS	TO DO	NEW ACTIVITIES
INITIATING	Identify Stakeholders	Also look for the values of agreement and relationship (absolute values from 0 to 100)
PLANNING	Identify Risks	Introduce for each stakeholder the influence it has on that risk of passing from possible to happening (value in percentage)

Figure 1. Interaction of risks and stakeholders in the Stakeholder Shape methodology

However, only a little attention has been paid so far to the potentialities that the combination of RPMS practices and preventive models adopted specifically in the health sector can provide [20]: therefore, through a systematic literature review, this paper aims to supply a comprehensive view of the state of the art about the integrated approach of RPMS in healthcare, with the imperative to optimise both the prediction and management of a pandemic, in order to become more resilient

towards pandemic risk as COVID-19 and to contain the adverse effects on the territory and therefore on the whole society.

The paper is organised as follows: Section1 with an introduction, Section 2 illustrates the objectives and the adopted methodology, Section 3 reports the results of the analysis and, finally, Sections 5 and 6 set out the discussion of results and conclusion, respectively.

OBJECTIVES AND METHODOLOGY

As mentioned in the previous section, this paper aims at seeking efficient ways of reorganizing the health sector in the case of maxi emergencies, developing a multilateral solution as a RPMS approach in order to contain the adverse effects of pandemic risks on a entire territory, under the protection of a regional or national government.

Two research objectives (ROs) have been defined from that general aim and they are:

RO1: the identification of what has happened in the past regarding global pandemic, in reference to a possible adoption of a preventive approach to support Risk Management in cases of maxi emergencies such as Coronavirus disease;

RO2: Following the possibility of adopting a RPMS approach, to identify the improvement in the health sector (in terms of performance and organisation) that could be obtained, in order to reduce the probability of pandemic risks coming.

To achieve the previously defined research objectives, the following steps were taken and the following methodological tools were used:

1) In order to identify similar cases of risk management in emergencies, a literature review has been carried out: all the articles' main information collected (such as database/search engines, journal or date of publication) have been schematized and summarized (Fig.2);

2) As a consequence of conducting a systematic literature review, research outcomes have been assessed and aggregated, in order to provide a balanced and objective summary of research evidence in support of a RPMS approach [21]. Attemps have been made to extrapolate objective and real data regarding the advantages, the opportunities and the limits to apply that approach in a stricty and planned way, starting from the health sector with the support and collaboration of different organizations: the intention is to enhance RPMS approach as a starting point for further research activities to be grasped.

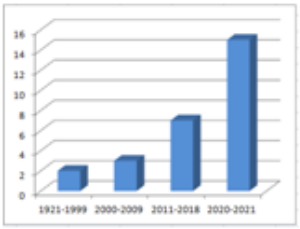
Date of publication	Author's country	Searching field	Main journals	Database/ search engines
	China, US, UK, Italy	Topic, article title, abstract, keywords, all text	Journal of Risk and Financial Management, The Lancet, Planet Lean, The Journal of Systems and Software, Virology, Journal of Risk Research, Journal of Healthcare Risk Management	Pubmed, Research Gate, Semantic Scholar, Google Scholar

Figure 2. Searching strategy and criteria adopted in the literature review

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RESULTS

The word *"pandemic"* comes from the Greek *pan* meaning "all" and *demos* "the people": WHO's standard definition of pandemic influenza refers to a situation in which a new and highly pathogenic viral subtype, one to which no one (or few) in the human population has immunological resistance and which is easily transmissible between humans, and rapidly spreads worldwide [22] [23].

The pandemic related crises have been associated with enormous negative impacts on health, economy, society and security of national and global communities. In order to answer the first RO, through the literature analysis, a lot of information was collected. Looking at the time distribution of the papers (from 1921 to 2021) in first column of Figure 1, it is possible to note a low publication rate for the first and second period (20th century), while in 2020-21 the number of articles greatly increased. In particular, the most fruitful countries for the analysed topic are China, the US, UK and Italy. Papers were published mainly in Pubmed, ReseachGate and semantic Scholars.The scientific journals that dedicate great space to the research subject and which, therefore, should be taken into consideration, are the Journal of Risk and Financial Management, the Journal of Healthcare Risk Management, the Journal of Risk Research.

There have been many significant disease outbreaks and pandemics recorded in history, including Spanish Flu in 1918-1919, which killed more than 20 million people in the world and has been cited as the most devastating epidemic in recorded world history [23], SARS (Severe Acute Respiratory Syndrome), Ebola virus disease epidemic, Zika and H1N1 (2009), which was the first pandemic influenza of the 21st century and caused more than 18,000 deaths [24]. Studying past pandemic viruses is key to a better future risk management: side-by-side analyses of viruses from both 1918 and 2009 has provided invaluable information towards influenza viruses in general and current risk assessments and pandemic risk preparedness efforts [25]. For instance, AIDS was first recognized by the Centers for Disease Control and Prevention (CDC) in 1981. It took more than twenty years between the first documented cases in the late 1950s and diagnosis (1981): this long delay contributed to the disease spreading to more than 34 million infected people by 2010 and it was partly due to the interval of up to ten years between infection

and symptoms; this hampered detection, as did the fact that this is a slow-onset pandemic. But poor public health capacities were also a key factor in the delay in detection and diagnosis: the public health systems failed to deliver the core service (control of infectious disease) that populations rightly expect to receive from them. Good international coordination and strong public health agencies made control of SARS possible in 2003: mass vaccination and surveillance were among the elements behind these successful campaigns, where contagion risk was reduced to zero (it initially occurred because of failures of disclosing information, but after 8,000 people were affected and 10 percent killed, the chain of transmission was broken and contagion stopped). In the health care sector, medications and equipment to treat existing illness are far better developed, better financed, and more profitable than preventive measures (such as vaccines, public health systems, veterinary services, and risk awareness efforts). These may include simple measures, such as closing the mouth when sneezing or coughing and washing hands [26]. In fact, resilience is not an outcome, but rather a process by which organisations continuously work to anticipate, and respond, to external threats on a continuous basis [27]. The H1N1 swine flu virus in the UK represented a fundamental failure of preparedness by the national government: most stern criticism relates to National Health Service (NHS) staff not being adequately tested or properly resourced with Personal Protective Equipment (PPE), and the poor provision of ventilators (along with trained staff able to operate them) for severely ill patients. The anticipatory element of resilience is based upon 'foresight': Meyer's examination of San Francisco hospitals found out that foresight derives from organisations adopting entrepreneurial and outward looking strategies [28] [29]. The initial moment of the response to H5N1 avian flu was quickly followed, starting in 2008, by sharply diminished funding for human public health systems, waning political support, pandemic fatigue in the media, and pandemic amnesia in governments and organizations. The international community therefore adopted a strategy to promote One Health approaches: pandemic preparedness, which was the other strand of the H5N1 avian flu response, became the "Towards a Safer World" (TASW) initiative, which promotes whole-of-society preparedness for complex disasters (including pandemics) and integration of whole-of-society preparedness within disaster risk management.

In particular, clinical risk management had a great boost since the publication, in 1999, of the report "To err is human" [30], developing as a real discipline in the field of quality and safety of care, and becoming more and more important in highly reliable health organizations. In major pandemic events, such as in the case of COVID-19, health professionals involved in the management of the health emergency had to confront not only with strictly clinical aspects of the medical profession, but also related to health care organizations, to research and experimentation and to the safety of care, with repercussions on the entire community [31].

In order to answer the RO2, some cases of performance improvements obtained using RM tools and approaches have been analysed.

March 18th, 2020 marks the fifth anniversary of implementation of the 2015–2030 Sendai Framework for Disaster Risk Reduction (SFDRR), which aims to enhance national and community capacity to cope with disaster risks. It emphasizes a comprehensive approach, to address multiple hazards (technological, biological and environmental) that impact at different scales, frequency, and intensity [32]. Existing mechanisms and strategies for disaster resilience,

such as those detailed in the SFDRR, offer concrete means to respond effectively to epidemics and even global pandemics such as the outbreak of COVID-19, focusing in particular on public health sectors in the European Union, concerning knowledge and science provision in order to understand disaster and health-related emergency risks, as a final attempt to manage both disaster risks and potential health-emergencies, particularly for humanitarian coordination aspects, and the strengthening of community level preparedness and response [33].

But how current strategies for disaster resilience can contribute to responses to COVID-19? Specifically, the problem that the health care industry faced in the spring of 2020 with Coronavirus disease was an acute shortage of critical resources, such as intensive care unit (ICU) beds, ventilators, and personal protective equipment (PPE). This led a number of organizations to postulate that the standard of care during a crisis should be different than the standard of care during normal times. This so-called "crisis standard of care" was an attempt to allocate scarce resources in a fair and equitable manner and it contemplated the occurrence of a system of prevention and rationing of resources, because healthcare providers couldn't physically provide all necessary care to all of the patients who needed that care considering the level of infection. As part of its "surge" capacity plan, the hospitals converted ordinary medical/surgical rooms into ICU rooms, "borrowed" ventilators from the surgical department, and then cut back on elective surgical procedures. In a nutshell, the standard encompassed the key principles of *Fairness* (criteria for the allocation of care and resources that are objective and evenly applied), *Duty to Care* (to provide some level of palliative care for those persons who are excluded from full life-saving care) and *Proportionality* (calls for restricting care no more than what it is absolutely required by the situation and continually rebalancing restrictions against the evolving supply/demand situation) [31].

Prevention and control of covid 19 epidemic is nowadays a major challenge at a global level: in particular, how to predict the risk grade of the epidemic is an urgent problem for the prevention and control departments of all countries. According to the current situation of COVID-19, there are two research characteristics and trends: one is to pay attention to the research on the implementation of epidemic prevention and control grade (in a management perspective), while the second, from a technical perspective, it's focused on epidemic risk assessment. However, the investigation and analysis show that there is a big deviation between theoretical and technical methods and practical prevention: in fact, the essence of risk prediction and prevention, together with control strategy of Coronavirus disease, show how to deal with the uncertainty of susceptible population [34].

The management of risks requires decisions which influence the performances of the healthcare system [35]. The key problem of the prevention and control of the COVID-19 epidemic is the reliability of the prediction results of population flow. In fact, the research (through data statistics of the flow and aggregation of people) shows that the method and results are only a preliminary study, and many problems need to be further discussed [36]; however, it is a meaning and quite urgent topic to study the prevention and control of covid-19 epidemic from the perspective of healthcare systems, which have as a starting point the population flow prediction's perspective [34].

For this reason, the idea could be to study, and later, to implement an approach of epidemic risk prediction and prevention, making the method and the related technology feasible by taking the short-term prediction of epidemic prevention and control in a certain region. For example, to prevent people population flow and aggregation when an epidemic occurs, as an effective measure to reduce the risk of widespread COVID-19 and, as a consequence, hospitals' pressure, should be minimizing movements and concentration of people in specific areas or in certain times of the day (a sort of curfew), reducing or at least, reorganizing public transportation and minimizing contacts with returnees from infected cities: the basis of epidemic prevention and control should be identified in the monitoring of personnel flow and aggregation. In addition, it can effectively help the epidemic prevention and control departments to formulate management strategies and prevention measures, in order to reduce the losses caused by the pandemic [34].

Regarding health and science aspects, it is imperative to strengthen information sharing and other coordinating mechanisms for health-related humanitarian issues. This includes sharing examples and experiences of preventive and treatment systems, new vaccine and preventive medicine information, means to protect the community from spreading through breaking the line of infection, and also basic awareness on sanitation. First, good hygiene and a robust immune system are key to coping with any virus, and COVID-19 is no exception. Learning from prior experiences makes a difference: in fact, some countries and regions such as Singapore, Vietnam, Taiwan learned from the bitter experience of SARS of 2003. The recent past incentivised them to act promptly and no doubt inclined their citizens to cooperate, which paid off in reducing COVID-19's spread.

Stronger knowledge and science provision in understanding disaster and health-related emergency risks Disaster Risk assessment is a standard approach in DRR (Disaster Risk Reduction), since core methodologies for disaster risk assessment include hazard and vulnerability assessment. In addition, the health sciences should be more involved in the community of disaster risk management, to advance our understanding of outbreaks and pandemics, the health impacts of all hazards, and improve data collection. Science is recognised especially in modelling disease spread, data on affected people, and the rush for vaccines [33]. The immediate challenge now is that of vaccinations against Covid-19, with the green light for the vaccines: the goal is to vaccinate all Italians by autumn or at least, the end of 2021. Variants against which current licensed vaccines might have a reduced efficacy, as observed for some vaccines with the variant first identified in South Africa, will probably continue to emerge in the future. This should be mitigated by designing next-generation vaccines with mutated spike sequences and using alternative viral antigens. Consideration should also be given to their use either as booster doses for those vaccines which have already been developed and are being administered, or, if needed, for the primary series [6].

The data analysis shows the forecast of a significant increase in COVID-19 related cases and deaths in the EU: although vaccination, the launch of which has started by targeting priority groups based on the risk of developing serious diseases (elderly and residents in long-term care facilities, as well as health care and other frontline workers), will mitigate the effect of replacement with more transmissible variants, and seasonality could potentially reduce transmission during the summer months, premature easing of measures could presumably lead to rapid increases in

incidence rates, severe cases and mortality [4], [6]. In fact, although Europe has –more or less- found a common cohesion for the purchase of the anti-Covid vaccine, the same did not happened in the management of the pandemic, also due to the fact that healthcare is in the hands of the Member States: WHO has changed several times strategic model due to the initial lack of scientific knowledge that would allow clear positions to be taken: the future basis for discussion could therefore be to restart from Europe, to have unique response models. The stakes are high: if the short-term challenge is to offer the widest vaccination coverage, in the medium-long term it is to ensure that the pandemic becomes an opportunity not only for a restart, but for a rebirth of the whole healthcare system.

In such a view, the Risk Prevention and Management System (RPMS) approach is highly dependent on the logic used to evaluate risks interactions, and it requires an overall view of the entire working environment: precisely, the indications of strategies for risk management need to be executed through a set of corrective actions, properly defined and implemented: primarily, enumerate the actions performed to reduce the risk level, and who receives this communications; to each risk level, strategies should be associated. There are also other aspects that influence the decisions: one of them is the real-time aspect. Risks and emergencies need to be immediately identified and managed [35]. However, the RPMS can exploit the adaptivity pattern (based on feedback loops) which consists of the following steps: monitoring the meaningful parameters, analyzing them, deciding whether a risk occurred or not and which strategies to adopt, and applying the necessary modifications. The RPMS applied in healthcare systems can be seen as a mixed solution and a self-healing system in that it includes elements able to detect risky events (for example, through the Stakeholder Shape (StSh) methodology mentioned before, identifying the impact that each stakeholder could have for a specific risk) and to put in place preventive actions (if the risk is below a given threshold) and corrective actions, when the risk is beyond such threshold. Monitoring should be the basic function of the RPMS, performed through a set of data about the exceeding of a parameter value or risky events regarding people, tools, and the environment having an associated probability of causing a risky situation. Figure 3. below shows a summary diagram of the main features of the RPMS approach.

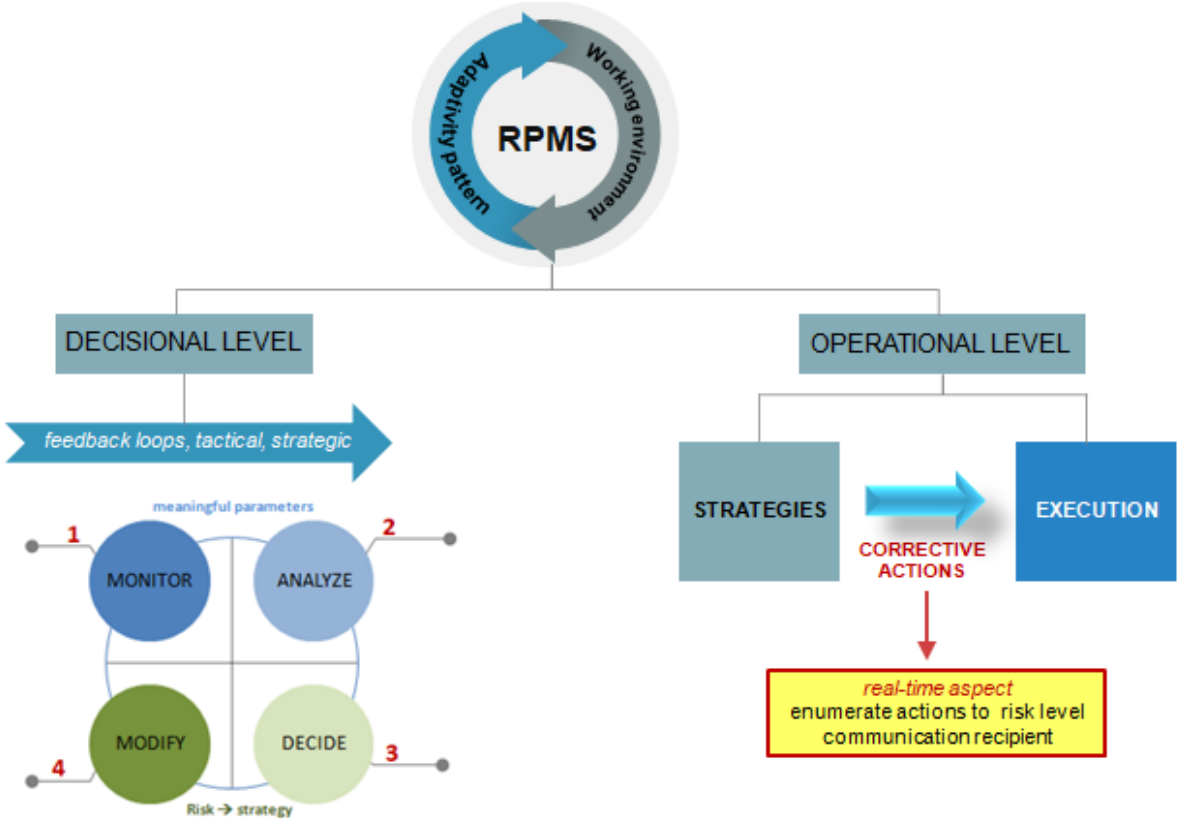

Figure 3. The logic of the RPMS approach

In summary, the crisis standard of care is population-centered, not patient-centered, and it involves the allocation of limited resources, first based on likelihood of benefit or to avoid premature death, and then to promote the greatest duration of benefit after recovery. Triage teams should include members with experience and perspective that are relevant in a public health emergency, and triage officers should similarly have appropriate expertise or training, while the informations need to be current on practically a minute-by-minute basis and all facets of the operations should be documented in real-time: this includes status determinations, location decisions, and resource availability [37].

Not less important, it should be necessary an attempt to avert existing disaster risk from governance structure to manage disaster risk and potential health-emergencies: assuming that multi-stakeholder engagements have been established, especially in disaster vulnerable countries, (with the expression “Stakeholder Engagement we mean the process, the sequence of activities implemented by an organization to involve interested parties in a positive way in the decision-making processes of the same, with a well-defined purpose and to achieve a common result [38]), the same engagements can be utilised for addressing pandemic risks, doing this

activities together as suggested in StSh. An additional point is that health is a critical infrastructure: the resilience of critical infrastructure is well identified in DRR literature. Resilience is fostered not just by sciencebased decisions and coordination, but also via redundancy to ensure buffer capacity when a particular system collapses [33]. The adaptation of a similar model in healthcare was hoped for during the opening day of the 15th edition of the Risk Management Forum, which compares the main players in the health system, to rethink it in the short and long term, taking advantage of European funds that the Italian Government is introducing into the national healthcare system, to conform to a flexible model that provides for the new generations a team work with responsibility for prescription and consumption and in connection with the hospital. Regarding the Covid pandemic in Italy, with reference to the health sector, a well-defined management model will need to be rethought and re-proposed, such as the one adopted in the fight against AIDS, with the aim of recreating a planned national network of infectious diseases. In this regard, the President of the Istituto Superiore di Sanità Silvio Brusaferro states that, following the Covid/post Covid phase, the key words for the organization and the future of Italian healthcare will be the following [39]:

- *Preparation* (speed of action, flexibility, production and logistics);
- *Prevention and Public Health* (essential for the health of the community, for the growth of the country, coordination between regions and local health authorities);
- *Centrality of human resources* (in terms of participation and training);
- *Fragility/Elderly people* (models to rethink, integration of health partners);
- *Digitalisation* (information systems, interoperability platforms, regulations and pricing for services, regional and national coordination).

The basic principle for strategies regarding epidemic risk prevention and control is the following: if the same grade of countermeasures can be used before the occurrence of an epidemic, the maximum damage can be reduced if the grade of prevention and control strategy is higher than the epidemic (even if it will cause a large prevention and control input cost); otherwise, it will cause losses that could have been avoided [34]. In RPMS must be considered an operational level (the working environment) and a decisional (tactical and strategic) level (the RPMS itself). At the operational level, the environment topology, the persons working therein, the work tools and machinery are modelled; the sensors and the devices (intensive care, temperature/oxygen etc. sensors) which are in the environment to monitor patient's status, generate data for RPMS notifications, and communicate information about risk to persons protection elements (security garments and tools) that allow risk to be faced: to summarize, the RPMS evaluation function considers observed risks and gives a risk level about modelling and prototyping for risk prevention, to evaluate the most appropriate strategies for risk prevention [35]. Figure 4. and 5. outline a synthetic and summary pattern on all the main operations of the RPMS methodology applied in the health sector.

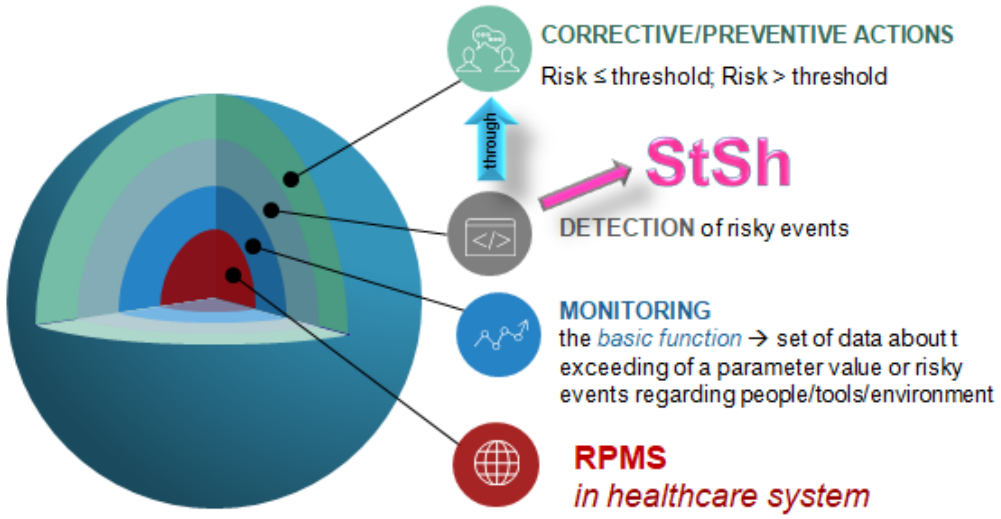

Figure 4. The structure of RPMS methodology

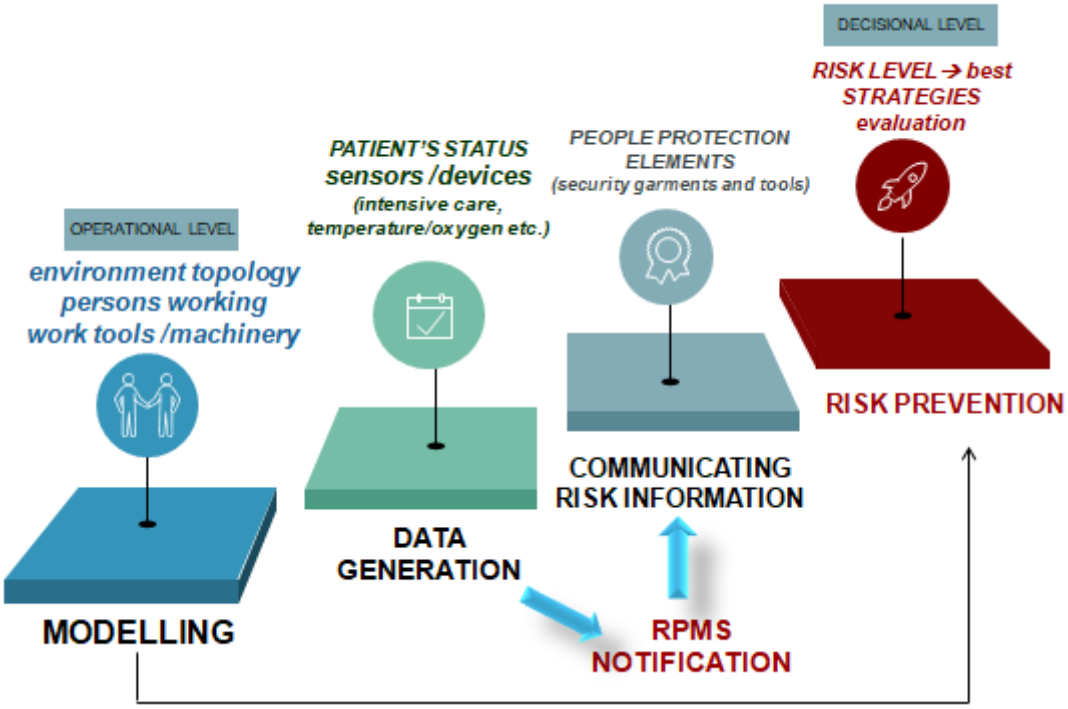

Figure 5. The main steps for a RPMS approach in the healthcare system

DISCUSSION AND CONCLUSION

As emphasised in the literature, the studies of past pandemics have illuminated areas where our knowledge of influenza virus management was incomplete, and have identified new tools and approaches to meet the needs of healthcare systems all over the world: these results contribute to answer the second RQ, demonstrating that a strategic RPMS model can be important where innovation, diversity, flexibility and the ability to work across boundaries may encourage new and adaptive approaches in the face of adversity [29]. Global security is threated from pandemics, in terms of lives and economic stability: even if efficiency improvements are nowadays being tested, it would be necessary for developing countries in the world to acquire a robust pandemic prevention capability, since pandemic risk reduction results from pandemic prevention and mitigation [22], [26]. It is perhaps no coincidence that countries such as South Korea, which learned concrete lessons from its severe experience of SARS in 2002–2003, have been better at both anticipating and containing COVID-19: their sensitivity to ensure 'anomalies' do not become 'vulnerabilities' (Roux-Dufort 2009) was well placed, an example in the practice of 'foresight' leading to effective responsiveness [29].Prevention will also render ex post measures such as vaccines and antivirals medications less necessary. To this extent, public health systems in each country need to be capable of detecting contagion early, diagnosing it accurately, implementing effective disease control measures, and fully collaborating with the relevant international authorities at each stage. But such systems will only succeed in preventing pandemics if they are financed and managed as essential permanent infrastructures, rather than temporarily funded only in emergencies: surely, effective management of pandemic risk will require setting international goals for risk reduction, assessing performance of country human public health systems relative to established performance standards, and financing strengthening of the parts of the systems that are not operating to international standards. Such plans for responses and risk communications may be usefully coordinated among countries (e.g., within a region) and globally: this should involve periodic contingency planning and simulation exercises, covering all relevant hazards and engaging all key sectors in an attempt to manage and reduce disease transmission [40].

In conclusion, now more than ever it is necessary to promote a positive culture of health risk, understood as a propensity to "preparedness" and prevention of the crisis: the harsh reality today, in a world of growing complexity, technological advancement and interconnections, indicates that planning and preparedness will always trump technological reaction and adaptation. In such a context, it is desirable that healthcare preparedness, including for potential pandemics, will require coordination and management of complex relationships across different sectors and between international, national, and local actors, in order to build organizations that, through a systematic and proactive approach, will know how to implement effective RPMS actions and models to manage the unexpected [29].

With this in mind, applying the StSh tool, the priority and modality of action towards stakeholder change with respect to the results of Risk Management, giving to the RPMS framework an holistic focus. In this contest the application of the RPMS can represent the "springboard" for the creation of a "common value" oriented to the collective good which, it is hoped, can help organizations at

a global level not so much to share the same vision, as to convey the same message together [41]. To paraphrase the Chinese proverb, without rice, even the cleverest cannot cook.

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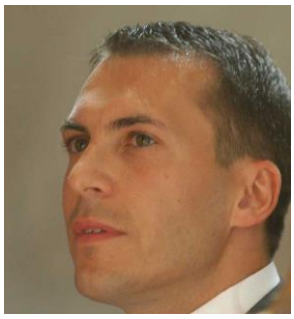

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