

The response of the Italian healthcare facilities to the COVID-19 pandemic: analysis of national and regional legislation

Rossella Marmo¹, Federica Pascale², Enrico Sicignano¹, Pierfrancesco Fiore¹ and Francesco Polverino³

¹ University of Salerno, Giovanni Paolo II, 08544 Fisciano, Italy

² Anglia Ruskin University, Bishop Hall Lane, CM1 1SQ Chelmsford, UK

³ University of Naples, P.le Tecchio, 80125 Naples, Italy

`rmarmo@unisa.it`

Abstract. Since January 2020 Italy has been countering the COVID-19 pandemic with several measures, including strategies to improve the National Health System's preparedness to such a threat. The paper aims to analyse response plans and measures against the COVID-19 pandemic within the Italian healthcare system, at national and regional level. Two objectives have been set: reviewing governmental provisions for territorial and hospital health services rearrangement; reviewing operational responses on the regional scale to address those demands. To collect and review operational responses at the regional level, six Regions have been considered as the field of study, chosen for being a relevant sample of the resident population in North, Middle and South Italy. Comparative analyses have been carried out to outline similarities and differences in managing this difficult healthcare situation. Results show that territorial medicine, particularly epidemiologic service, has been essential in facing the national crisis, but hospitals have been the main actors in addressing COVID-19 needs. Relevant structural, technological and organisational changes were needed to prepare hospitals. The built environment plays a significant role in managing the pandemic response, indeed. Further efforts to develop a novel, resilient and sustainable hospital model are needed. This study contributes to a better understanding of factors influencing current Italian hospitals' strengths and limitations, shedding light on future design models which can increase resilience in emergency conditions.

Keywords: COVID-19, resilience, safety, built environment, healthcare facilities, hospital.

1 Introduction

The world is facing one of the greatest socio-economic crises ever due to the COVID-19 pandemic [1]. Starting from December 2019 a novel virus, named SARS-CoV-2, has caused to date, March 2021, more than 2.7 million deaths around the world,

according to the World Health Organization (WHO) dashboard. The pandemic not only has dramatically changed people's lives but also the Built Environment (BE) requirements. The BE serves as a potential transmission vector for the spread of COVID-19 by inducing close interactions between individuals, by containing fomites and allowing viral exchange and transfer through the air [2]. The pandemic's effects on housing, workplaces and public spaces will last [3]. Ongoing experiences might yield positive impacts for future resilience designs, plans and policies within the BE. Resilience is critically important for filling the void left by risk management, which is limited to probabilistic analysis and events, as it relates to highly uncertain and high impact events such as epidemics [4]. Past epidemics have spurred the development of new solutions for the BE, which not only solve infections but also enhance lifestyles [5]. The COVID-19 pandemic is requiring action to make the BE both resilient and sustainable. The necessity to link disaster risk reduction, climate change and sustainable development goals has been outlined [6, 7, 8, 9]. Capolongo et al. [10] have recently claimed that public health relates to the planet's health and suggested recommendations to make cities and communities resilient to future outbreaks. Also, the pandemic consequences highlighted the need to rethink the indoor environments, as housing, in a more healthy, safe, and sustainable way [11].

During times of disasters, healthcare systems are called upon to ensure essential health services are uninterrupted while protecting healthcare workers, patients and communities at once. The WHO has recently published a suite of health service capacity assessments in order to support rapid and accurate assessments of the current and future capacities of health facilities, so that they are prepared for and responsive to COVID-19. [12]. There are examples of disaster resilience planning activities which have engaged health systems especially in overcoming climate change induced threats (e.g. hurricanes) [13]. Global efforts have been made to improve the functioning of hospitals in emergencies and disasters, developing the Hospital Safety Index [14]; similarly the Project ER One aimed at an all risk ready emergency-care facility [15]. Hospitals face big challenges as they include units with vastly different requirements (e.g. airborne infection isolation rooms and protective environment rooms) [2]. Some authors have argued that a common definition of disaster preparedness in hospital does not exist in the literature [16]. At the same time it is not easy to address how to prepare a hospital for disasters. Capolongo et al. [17] have recently proposed a Decalogue of design strategies for new and existing hospitals aimed at improving hospital resilience.

Italy has been the first western country to be affected by the COVID-19 pandemic and the first who has adopted strict safety measures to stop the transmission chain (the so-called lockdown). According to the WHO dashboard, to March 2021 it counts more than 100.000 deaths, second only to the United Kingdom within the European context. Starting from February 2020, the Italian national health system (SSN) had to quickly respond and adapt to address the surge of care and inpatient demands [18].

Governmental and regional provisions led to a rearrangement of hospital and territorial services. As a consequence, healthcare facilities have undergone extensive changes. Hospital wards and units dedicated to COVID-19 were needed and outpatient services were suspended (Decree Law 9 March 2020, no14), so that the oncological screening activities have decreased by more than 50% compared to 2019 [19].

According to the previous statements and scenario, it can be concluded that the BE plays an important role in the management of the pandemic and that it is important to increase the resilience of spaces and communities to quickly manage emergency conditions. This paper is part of a body of research which argues for a more sustainable and resilient model for hospitals in the post-COVID-19 era. The paper analyses response plans and measures against the COVID-19 pandemic within the Italian context, at the national and regional level. Two objectives have been set: reviewing governmental provisions for territorial and hospital health services rearrangement; reviewing operational responses on the regional scale to address those demands. Section 2 provides for data and methods used for deepening the analysis of the Italian measures to strengthen the health system. Section 3 shows the results achieved from this analysis, while Section 4 discusses them.

2 Materials and methods

This section provides a brief overview of the Italian healthcare system and gives details about accessed databases and adopted processes to analyse healthcare facilities management during the emergency.

The SSN has implemented a decentralised model, especially since the constitutional reform of 2001 by which regions have gained legislative power in a wide range of fields, including healthcare. Health is a constitutional right; the central government defines the essential levels of care and guarantees them to all residents. The healthcare services are categorised in three macro levels: (a) public health, (b) community care, and (c) hospital care (Decree of the President of the Council of Ministers - DPCM - 12th Jan 2017). Regions have the responsibility to deliver health services by means of health districts, hospitals and local health units. They autonomously regulate, organise, and administrate publicly financed healthcare [20]. Also, in addition to public companies, private healthcare facilities, the so-called accredited facilities, can participate in the delivery of essential services. This led to interregional differences in access to care [1, 21]. Bosa et al. [22] have outlined that this decentralised model led to different capacities in addressing the demand and the supply of healthcare services during the COVID-19 pandemic. On one hand it allowed local governments to tailor their responses to the needs of their population, on the other hand it might have impeded fast and integrated responses. Moreover, the COVID-19 pandemic has hit the country hard after years of strict spending reviews and severe cost containment measures which resulted in workforce shortages, insufficient communication and surveillance systems and inadequate healthcare infrastructures [22].

In order to further investigate the Italian response to the COVID-19 pandemic, in terms of national and regional urgent legislative measures, the authors have collected and reviewed regulatory provisions (i.e. Law Decree, Presidential Decree, Ministerial Circulars, Regional Orders), national guidelines (i.e. guides from the Minister of Health and the National Institute of Health), and other grey literature (i.e. reports of the National Centre for Screening Monitoring) from January 2020 to March 2021. National policies have been collected from the website of the Official Gazette of the Italian

Republic. A thematic area, named “Coronavirus”, of the above-mentioned gazette is available online as a dedicated collection of urgent measures to manage the COVID-19 emergency [23]. From January 2020 to March 2021 the government has published 87 documents. The authors gathered these documents in a database and used them as a reference to understand the development of the central response to the COVID-19 pandemic. They also collected and reviewed the provisions of the Minister of Health published within the same time span, for a total of 110 documents. The authors analysed the regional responses, retrieving data from the website of the National Agency for Health Regional Services [24] and from the official website of each region. Documents of particular interest for this paper are the regional plans for the rearrangement of hospital services and territorial services. Those plans have been required since 19th May 2020 by the Decree Law n.34 which argues for enhancing both hospital network and territorial services. The authors selected six regions as a field of study. The six regions were selected for being a relevant sample of resident population in northern, central, and southern Italy, and for having adopted the above-mentioned plans to examine. Comparative analyses have been carried out to outline similarities and differences in managing the healthcare crisis referring to those plans. Table 1 reports population and available plans of the selected regions.

Table 1. Summary of examined plans for the selected regions.

Position	Region name	Population ¹	Hospital plan	Territorial plan
North	Lombardia	10.027,602	DGR ² n. XI-3264	DGR n. XI-3525
North	Veneto	4.879,133	DGR n. 782	DGR n. 782
Central	Umbria	870,165	DGR n.1096	DGR n.1096
Central	Lazio	5.755,700	DCA ³ n. U00096	Note n. 472488
South	Campania	5.712,143	DGR n. 304	DGR n. 542
South	Puglia	3.953,305	DGR n. 1079	-

¹Data are retrieved from the National Institute of Statistics (ISTAT) and refer to the year 2019; ²Regional Council Deliberation; ³Ad acta Commissioner Decree.

3 Results

The results are divided in two sub-sections regarding respectively national policies and regional provisions. The authors selected provisions and circulars related to healthcare facilities management, as those related to other fields of intervention (e.g. general governance, protective equipment, financial interventions etc.) are considered not to fall within the remit of this paper.

3.1 National response

A pandemic’s evolution is characterised by at least four major phases: (a) inter-pandemic, (b) alert, (c) pandemic and (d) transition [25]. To each phase a risk management task can be ascribed (e.g. preparedness, response, and recovery). The pandemic

phase, which the world is currently going through, can be further divided into three sub-phases: acute, post-acute and transition [26]. During the alert phase, the Italian Ministry of Health drafted a national task force and a scientific technical committee to coordinate the emergency interventions. Also, the Italian Government declared a state of emergency on 31st January 2020 as an extraordinary measure to ensure public health against the forthcoming pandemic. The state of emergency has two important implications for the governance of the crisis. First, the government can bypass the Parliament in the definition of legislative interventions, approving the so-called ‘Decrees of the President of the Council of Ministers’ (DPCM). Second, the state of emergency introduced the possibility of derogation of existing procurement rules, facilitating the acquisition of Personal Protective Equipment, tests and ventilators [22]. On 20th February 2020 the first Italian COVID-19 positive patient was reported, thus the acute phase began, and it lasted until 20th March. The acute phase was characterised by rapid growth of positive cases and insufficient contact tracing and surveillance measures [26]. The first significant national provision on healthcare facilities management is the Decree Law n.14 of 9th March 2020. It oversaw the recruitment of healthcare personnel and the introduction of the special units of continued assistance (USCA), to be placed at least 1 every 50,000 inhabitants. USCA are in charge of managing COVID-19 patients in home-isolation. The Decree Law n.14 has also required the division of the triage area from the admission room in emergency departments, placing attention on hospital infrastructures for the first time. Finally, outpatient activities have been suspended as well as all the other activities considered as deferrable. Shortly thereafter, the Minister of Health provided guidelines about how to define deferrable and urgent activities. The post-acute phase lasted from 21st March until 4th May 2020, during the national lockdown [26]. The surveillance system registered a flattening and then a decrease of reported COVID-19 cases, followed by a gradual reactivation of social and health services, as non-residential care homes. The epidemic transition started on 5th May 2020 and it is still ongoing at the time of writing. The most significant national provision about healthcare facilities management is the Decree Law n. 34 of 19th May 2020. Article 1 calls for enhancement and organisational plans for the territorial healthcare services. It establishes that regions must adopt specific measures for contact tracing; they should start surveillance at residential care homes, while improving home care. Also, they can lease hotel facilities to manage and treat asymptomatic patients. Article 2 requires regions to adopt rearrangement plans for hospital networks. The main goal is to increase the number of beds in intensive and semi-intensive care units (ICU). To do so regions can also build temporary additional infrastructures. Also, dedicated pathways within healthcare facilities and additional dedicated means of transportation must be ensured for COVID-19 patients. The Minister of Health has published guidelines to support the adoption of such a plan as well as a checklist to assess the preparedness of Regional Health Systems to face the pandemic during the winter. Since November 2020 emergency interventions have depended on the risk assessed in each region, so that limitations and allowed activities can considerably vary across the country. Figure 1 depicts a flowchart of most important governmental provisions and epidemiological data from January 2020 to March 2021.

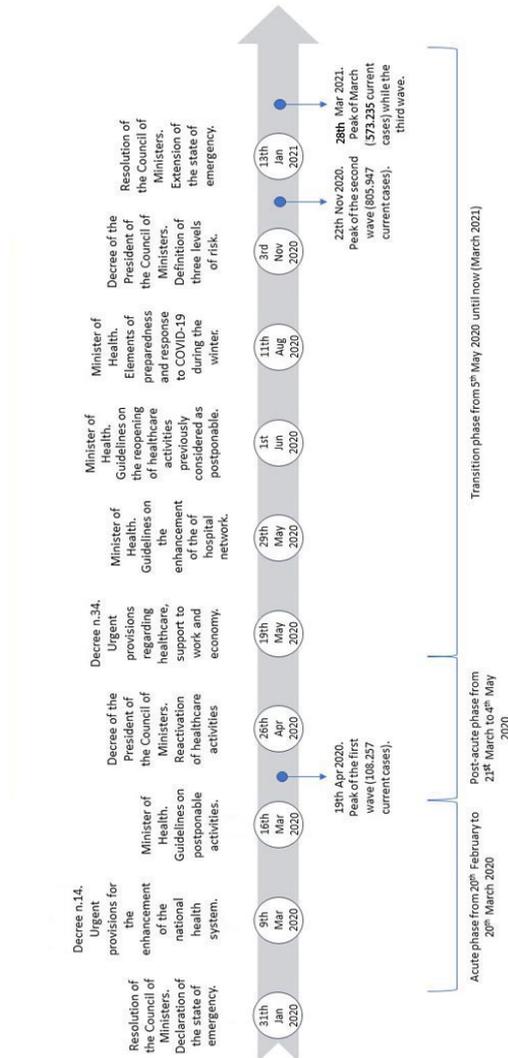


Fig. 1. Flowchart of the main national provisions regarding healthcare facilities management from January 2020 to March 2021. Epidemiological data are retrieved from the website of the Italian Minister of Health.

3.2 Regional responses

Within the broader national policy, each region developed one or more response plans to enhance both hospital and territorial services. As reported in Table 1, the authors have selected six regions as a field of study to deepen the operational response in the context of healthcare facilities management. Veneto and Umbria have adopted integrated plans, while the remaining regions adopted separated provisions.

Regarding the enhancement of the hospital network, the regions have followed ministerial guidelines and provided for common responses, such as: identifying COVID-19 dedicated infrastructures; increasing the ICU bed numbers; reviewing the emergency and urgent care network (i.e. restructuring the emergency department and providing for additional means of transportation); increasing the workforce. The northern regions had started the rearrangement of their healthcare networks even before national regulation. During the continued pandemic they also provided for detailed documentation on how to renovate emergency departments and the ICU. The Lazio region has been providing, since January 2020, a wide set of guidelines and circulars on both patient and facilities management. Some regions (i.e. Puglia, Umbria, Lazio, Lombardia) immediately involved private facilities to address the surge of demand. Table 2 reports a comparison of measures to enhance the hospital network according to the analysed plans. In the table, Y stands for 'adopted'.

Table 2. Comparison of hospital-related measures adopted by the selected regions.

Measures	Puglia	Campania	Lazio	Umbria	Veneto	Lombardia
COVID-19 dedicated hospitals	Y	Y	Y	Y	Y	Y
Increase of ICU beds	Y	Y	Y	Y	Y	Y
Renovation of Emergency Departments	Y	-	Y	Y	Y	-
Additional means of transportation	Y	-	Y	Y	Y	Y
Additional long-term care beds	Y	-	-	Y	-	Y
Temporary field hospitals	-	Y	-	Y	Y	Y
Engagement of private hospitals	Y	-	Y	-	-	Y
Engagement of private facilities (other than hospitals)	Y	a	a	Y	-	a

^a hotels and care homes have been involved by means of further provisions to assist and manage asymptomatic and discharged COVID-19 patients.

Territorial services management can greatly differ from one region to another as these services belong to Local Health Units. Moreover, they have secondary impacts on healthcare facilities as they generally focus on organisational measures more than infrastructural ones. However, from the analysed plans (Table 1) it is possible to outline some common measures and policies, such as: the establishment of contact tracing and surveillance systems; the introduction of the Special Units of Continued Assistance (USCA); the enhancement of integrated home assistance; coordination and information management (e.g. activating territorial operating centers); increasing workforce for primary care; additional measures (e.g. the control of private facilities offering long-term

care services). Territorial medicine, particularly epidemiologic services which belong to departments of prevention, has been reinforced all over the country.

4 Discussion

Past pandemic leveraged changes into the BE, on both building and urban scale. The BE has an important role to play in supporting public health and reducing the risk of infections, indeed [5]. Solutions and strategies to move towards more sustainable and resilience buildings and cities are needed. In particular, there is a drive for improving multidisciplinary programmes to develop a new design for the hospital of the near future [17]. Within this background, this paper provides for the analysis of central and regional government provisions to rearrange healthcare facilities in Italy due to the ongoing pandemic. COVID-19 requires healthcare systems to have all essential preparedness measures in place to deal with the pandemic, while continuing to provide essential services. From the results exposed above it is possible to deduce that:

- in Italy, hospital care and territorial services have been reorganised by adopting specific regional plans.
- the changes on hospital infrastructure have been extensive. For example, to increase the ICU bed numbers, regions have restructured existing assets, built temporary field hospitals, restored unused portions of their facilities.
- the necessity to separate COVID-19 patients to reduce the risk of nosocomial transmission led to COVID-19 dedicated hubs or at least dedicated units. Either way, renovation interventions were required to control and prevent infections. Both technological features, spatial layout and organisational requirements have been reviewed in the face of the pandemic.

5 Conclusion

There is the need to enhance the preparedness of the national health system to cope with epidemics which have a predictable recurrence of 10 years. In this sense, a tool to assess healthcare infrastructures can help hospital managers make their asset more resilient and sustainable. This paper reports the preliminary results of a research aimed at proposing a novel model for the hospital of the future. The research has originality values as it tries to address extremely timely needs, and it has relevant practical implications regarding the need of multidisciplinary actions to define novel models for post-COVID-19 hospitals. The research will benefit (i) healthcare systems, providing advices for additional infrastructural capacities; (ii) healthcare workers, shaping safer work environments; (iii) patient's lives, modelling more resilient infrastructures to future epidemics which will enable the continuity of essential services. The research is currently limited to the Italian context. Future developments of this research will regard the acquisition of further data to determine how we will use and manage hospitals in the future. The main goal is to understand if architectural and technological changes will be needed to cope with future functional requirements of hospitals. To do so, real experiences will be gathered by means of field surveys and semi-structured interviews with

healthcare professionals, hospital managers, and hospital facility managers involved in the pandemic management. Reflecting upon the Italian experience and analysing corresponding international approaches and policies will help identify the layout and engineering components of a prepared hospital in the case of epidemic. An evaluation framework can then be developed based on these components.

References

1. Sanfelici M.: The Italian Response to the COVID-19 Crisis: Lessons Learned and Future Direction in Social Development. *The International Journal of Community and Social Development* 2(2) 191–210 (2020). DOI: 10.1177/2516602620936037.
2. Dietz L., Horve P. F., Coil D. A., Frezt M., Eisen J. A., Van Den Wymelenberg K.: Novel Coronavirus (COVID-19) Pandemic: Built Environment Considerations To Reduce Transmission. *mSystems* 5:e00245-20 (2020). <https://doi.org/10.1128/mSystems.00245-20>.
3. Bereitschaf B., Scheller D.: How Might the COVID-19 Pandemic Affect 21st Century Urban Design, Planning, and Development? *Urban Science* 4, 0056 (2020). doi:10.3390/urban-sci4040056.
4. Keenan J. M.: COVID, resilience, and the built environment. *Environment Systems and Decisions* 40, 216–221 (2020). <https://doi.org/10.1007/s10669-020-09773-0>.
5. Pinheiro M, Luís N.: COVID-19 Could Leverage a Sustainable Built Environment. *Sustainability* 12, 5863 (2020). doi:10.3390/su12145863.
6. Kelman I.: Linking disaster risk reduction, climate change, and the sustainable development goals. *Disaster Prevention and Management*, 26(3) 254-258 (2017). doi: 10.1108/DPM-02-2017-0043.
7. Aitsi-Selmi A., Murray V.: Protecting the health and well-being of populations from disasters: health and health care in The Sendai Framework for Disaster Risk Reduction 2015-2030. *Prehosp Disaster Med* 31(1) 74-78 (2016). doi:10.1017/S1049023X15005531.
8. Djalante R., Shaw R., DeWit A.: Building resilience against biological hazards and pandemics: COVID-19 and its implications for the Sendai Framework. *Progress in Disaster Science* 6, 100080 (2020). <http://dx.doi.org/10.1016/j.pdisas.2020.100080>.
9. DeWit A., Shaw R., Djalante R.: An integrated approach to sustainable development, National Resilience, and COVID-19 responses: The case of Japan. *International Journal of Disaster Risk Reduction* 51, 101808 (2020). <https://doi.org/10.1016/j.ijdr.2020.101808>.
10. Capolongo S., Rebecchi A., Buffoli M., Appolloni L., Signorelli C., Fara G.M., D'Alessandro D.: COVID-19 and Cities: from Urban Health strategies to the pandemic challenge. A Decalogue of Public Health opportunities. *Acta Biomed.* 91(2):13-22 (2020). doi:10.23750/abm.v91i2.9615.
11. D'Alessandro D., Gola M., Appolloni L., Dettori M., Fara G.M., Rebecchi A., Settimo G., Capolongo S.: COVID-19 and Living space challenge. Well-being and Public Health recommendations for a healthy, safe, and sustainable housing. *Acta Biomed.* 91(9-S):61-75 (2020). doi:10.23750/abm.v91i9-S.10115.
12. World Health Organization, Suite of health service capacity assessments in the context of the COVID-19 pandemic, interim guidance, 2 November 2020, <https://apps.who.int/iris/handle/10665/336278>, last accessed 2020/03/20.
13. Flynn S. E.: Higher Ground: The Sophisticated Healthcare Response of the SouthEast Texas Regional Advisory Council to Hurricane Harvey. Northeastern University Global Resilience Institute, Boston, MA (2018).

14. World Health Organization & Pan American Health Organization: Hospital safety index: guide for evaluators. 2nd ed. WHO, Switzerland (2015). <https://apps.who.int/iris/handle/10665/258966>.
15. Smith M., Feied C., Pietrzak M.P., Pickard J., Hawkins R. and Vincent D: Project ER One Technical Reports, Phase I & II. ER One Institute, Washington, DC (2003).
16. Verheul M., Dückers M.: Defining and Operationalizing Disaster Preparedness in Hospitals: A Systematic Literature Review. *Prehosp. Disaster. Med.* 35(1) 61-68 (2020). <https://doi.org/10.1017/S1049023X19005181>.
17. Capolongo S., Gola M., Brambilla A., Morganti A., Mosca E.I., Barach P.: COVID-19 and Healthcare Facilities: a Decalogue of Design Strategies for Resilient Hospitals. *Acta Bio Med.* 91 (9-S) 50-60 (2020). DOI:<https://doi.org/10.23750/abm.v91i9-S.10117>.
18. Armocida B., Formenti B., Ussai S., Palestra F., Missoni E.: The Italian health system and the COVID-19 challenge. *Lancet Public Health.* 5(5):e253 (2020). doi: 10.1016/S2468-2667(20)30074-8.
19. Report on screening activities, <https://www.osservatorionazionale screening.it/content/rapporto-ripartenza-screening-maggio-2020>, last accessed 2021/03/20.
20. Torbica A., Fattore G.: The “Essential Levels of Care” in Italy: when being explicit serves the devolution of powers. *Eur J Health Econ* 6, 46–52 (2005). <https://doi.org/10.1007/s10198-005-0318-x>.
21. Ferré F, de Belvis AG, Valerio L, Longhi S, Lazzari A, Fattore G, Ricciardi W, Maresso A.: Italy: Health System Review. *Health Systems in Transition*, 16(4):1–168 (2014).
22. Bosa I., Castelli A., Castelli M., Ciani O., Compagni A., Galizzi M.M., Garofano M., Ghislandi S., Giannoni M., Marini G., Vainieri M.: Response to COVID-19: was Italy (un)prepared? *Health Econ Policy Law.* 5:1-13 (2021). doi: 10.1017/S1744133121000141.
23. Official Gazette of the Italian Republic, <https://www.gazzettaufficiale.it/dettaglioArea/12>, last accessed 2021/03/25.
24. National Agency for Health Regional Services, <https://www.agenas.gov.it/covid19/web/index.php?r=site%2Findex>, last accessed 2021/03/25.
25. World Health Organization: Pandemic Influenza Risk Management. A WHO guide to inform & harmonize national & international pandemic preparedness and response. WHO, Geneva, Switzerland (2017). http://www.who.int/influenza/preparedness/pandemic/influenza_risk_management/en/.
26. Ministero della Salute - Istituto Superiore di Sanità: Prevention and response to COVID-19: evolution of strategy and planning in the transition phase for the autumn-winter season. Ministero della Salute, Istituto Superiore di Sanità, Rome, Italy (2020).