

# A community-based approach in response to the COVID-19 humanitarian crisis in Bergamo province

MAIN OBJECTIVE: REDUCE MORTALITY AND MORBIDITY LINKED TO THE COVID-19 OUTBREAK IN BERGAMO PROVINCE - ITALY

## SPECIFIC OBJECTIVES

- Introduce a community based model of care
- Reduce pressure from hospitals
- Engage communities

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# Introduction <sup>1 2 3 4</sup>

The spread of COVID-19 has become a pandemic, that since two months has put a strain on the Italian health, economic, social and family system. Article 32 of the Constitution states that "the Republic protects health as a fundamental right of the individual and an interest of the community,". In the current context, the possible response to this health and humanitarian crisis puts this guarantee at risk. Bergamo is currently the Italian area most affected by COVID-19 infection (it is estimated that well over 60% of the population is contaminated), but also the one with the greatest economic and human resources to try to organize an articulated response.

If the other Regions also face this crisis only from an emergency point of view, without the tools that the Lombard experience can offer, returning to normal, for all of Italy, will be difficult and will have a very high social cost. Forced quarantine will not last forever.

Building a sustainable "Bergamo prototype" in response to the crisis becomes a crucial element for the recovery of the entire country.

COVID-19 is very contagious (10 times more than SARS) and not very lethal (= it makes people die little). The Chinese have estimated a lethality of between 1 and 3%.

If the health system goes into crisis due to an out of control infection (see Bergamo situation), lethality increases because there is no minimum care for the overflowing number of patients into the structures.

Most people have a mild disease (81%), that is, without pneumonia or with mild pneumonia that can be treated at home.

Ambulances and hospital can represent extraordinary vectors for the spread of the infection. Home care can therefore become the central element to reduce the contagion and the overload of health facilities. A community and systematic approach is needed to implement a "home-based care" strategy.

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<sup>1</sup> M Nacoti , A Ciocca , A Giupponi , P Brambillasca , F Lussana , M Pisano, G Goisis , D Bonacina , F Fazzi , Naspro R , L Longhi , M Cereda, C Montaguti. The COVID-19 Pandemic and Humanitarian Crises in Lombardy, Italy: Securing Success By Changing Perspectives on Preparation and Mitigation.

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<sup>2</sup> Walker M, Maremont M. Lessons from Italy's hospital Meltdown. 'Every day you lose, the contagion gets worse. The Wall Street Journal <https://www.wsj.com/articles/every-day-you-lose-the-contagion-gets-worse-lessons-from-italys-hospital-meltdown-11584455470>

<sup>3</sup> Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China. JAMA. 2020; 2019: 25-28

<sup>4</sup> How will country-based mitigation measures influence the course of the COVID-19 epidemic? Lancet Published online March 6, 2020 [https://doi.org/10.1016/S0140-6736\(20\)30567-5](https://doi.org/10.1016/S0140-6736(20)30567-5)

# Summary of the operational proposal

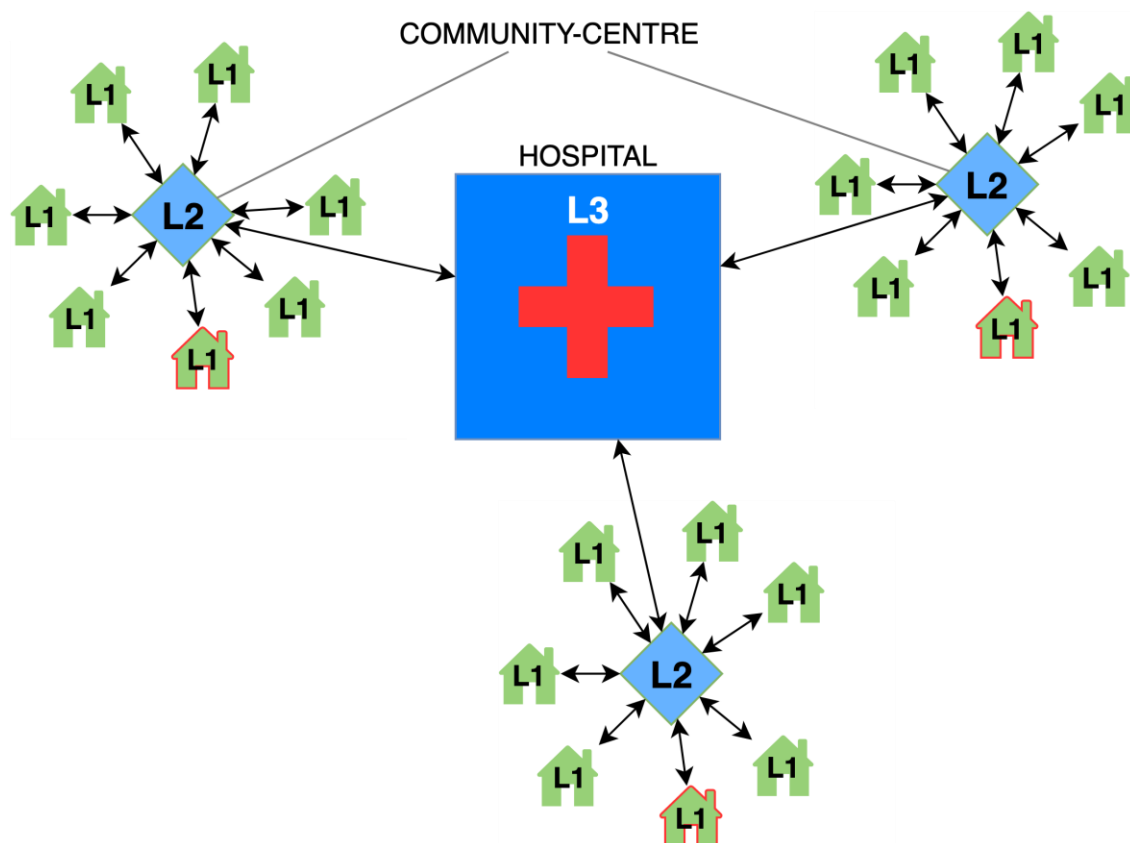
## Preamble

This document describes an integrated project proposal, trying to give a complete answer to the current challenge. In the declination of some details, it is based on the territorial characteristics of the province of Bergamo. We hope that the thought effort can trigger reflections and confrontation, and hopefully influence strategic choices in other places as well. In this sense, the general guidelines and possibly some of the contents, if deemed interesting, must be adapted to the specificity of the context.

## Levels of care

A classification of the disease into three orders of severity, which require different methods of treatment, suggests the adoption of a three-level model of supervision, integrated together:

- **LEVEL 1 - Home Care** for mild cases
- **LEVEL 2 – Care in a dedicated transit clinic (Community Centre)** for moderate cases
- **LEVEL 3 - hospitalization** for severe cases



*Fig.1 Infrastructure architecture*

## The strategic advantages

The decentralization of care allows for:

- support general practitioners
- relieve pressure from hospitals
- counteract contagion, reducing displacements to a minimum
- manage resources efficiently
- involve local communities in the response

## Priorities and features

- protection of personnel with appropriate equipment (PPE) and strict compliance with personal safety protocols (including quarantine)
- intensive use of IPC procedures (infection prevention and control) developed in humanitarian crises and adapted to the specificity of COVID-19
- home visits by multidisciplinary mobile units (healthcare / logistics / health promotion)
- experimentation and use of remote surveillance and monitoring tools
- setting up of a reception facility for moderate patients in the community
- data collection for epidemiological investigation purposes
- psychological support for operators, patients and families

## Rollout

The optimal implementation size of a community model is that of a village / neighborhood (up to 15,000 inhabitants), according to the pre-existing territorial subdivision.

The proposed operating method envisages the initial implementation of a prototype in a community (pilot) used by qualified personnel (expert in the management of epidemics), in collaboration with local health workers, involving assigned, duly trained and trained health workers.

In a second phase, the experience is replicated in other communities, with qualified personnel dedicated to training, coordination and supervision.

## Extensions of the model

This medical and emergency response paradigm lends itself to development along two different directions:

- from the strictly medical plan to a social / health and educational level
- from the emergency plan to a sustainable development horizon

A larger working group, extended to various third sector players, is already hypothesizing actions in this sense, which can be grafted onto the proposed system.

## Case classification

### MILD CASES (MLC)

SpO<sub>2</sub> > 93%

They account for most cases (80%).

81% of them develop mild disease without pneumonia or with mild pneumonia treatable at home with remote assistance LEVEL 1.

## MODERATE CASES (MDC)

$80\% < \text{SpO}_2 < 93\%$ .

They represent a limited number of cases (15%)

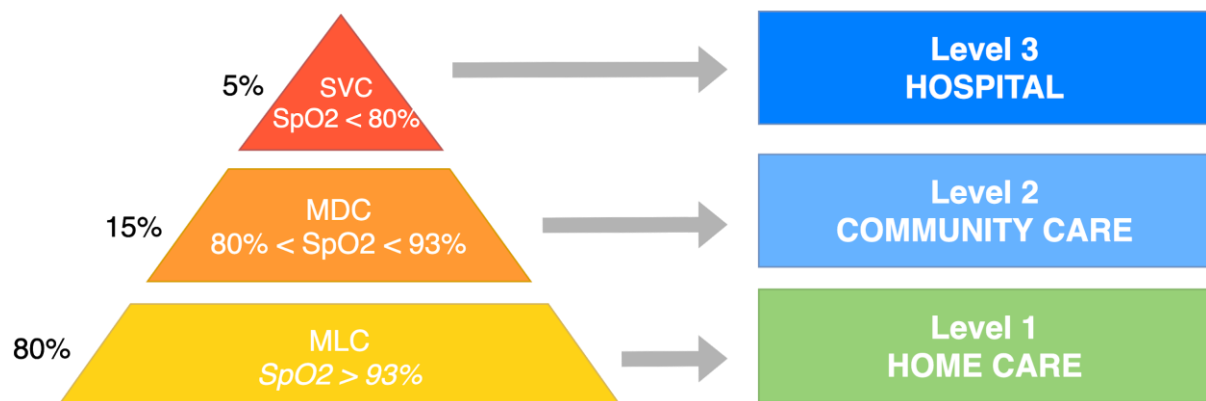
They can be treated at the Community Centre at LEVEL 2.

## SEVERE CASES (SVC)

$\text{SpO}_2 < 80\%$  at LEVEL 1 or non-responder at LEVEL 2

They represent a marginal part of the cases (5%)

They require hospitalization at LEVEL 3.



*Fig.2 Care accesses level based on cases classification*

## Levels of Care

### LEVEL 1: HOME CARE

The patient remains at home, under daily monitoring for temperature,  $\text{SpO}_2$ , HR.

### LEVEL 2: COMMUNITY CENTRE

If  $\text{SpO}_2 < 93\%$  despite AHC, the patient moves to LEVEL 2 by protected transportation (own vehicle or dedicated vehicle and personnel) to a COVID-19 dedicated clinic (red line, adequate PPE, adapted laboratory, epidemiological surveillance system)

### LEVEL 3: HOSPITAL

If  $\text{SpO}_2 < 80\%$  at LEVEL 1 or non-responder at LEVEL 2, the patient moves to LEVEL 3 by protected transportation (own vehicle or dedicated vehicle and personnel) to a COVID-19

prepared hospital (red line, adequate PPE, adapted laboratory, epidemiological surveillance system)

## LEVEL 4: PALLIATIVE CARE

Palliative care or non-responder at LEVEL 3  
(life expectancy in Lombardy = 83 years)

# Levels Management Protocol <sup>5</sup>

## LEVEL 1

Target: MILD CASES (MLC)  
Location: at home  
First visit with PPE

### LEVEL 1A: BASIC HOME CARE (BHC)

If **SpO<sub>2</sub> > 97%**:

- daily self-monitoring parameters (temperature, SpO<sub>2</sub>, HR),
- remote telephone or home counseling,
- antipyretic therapy
- possibly antibiotic,
- possibly psycho-social support (meals, support for fragility in the family).
- epidemiological surveillance.

If **93% < SpO<sub>2</sub> < 97%** move to LEVEL 1B (AHC)

### LEVEL 1B: ADVANCED HOME CARE (AHC)

If **93% < SpO<sub>2</sub> < 97%**:

- Treatment MHM + (ONPA = O<sub>2</sub> by oxygen concentrator (max 5 liters per minute) and humidifier
- antipyretic therapy
- nutrition with high-calorie supplements (at least 600 Kcal and 1 liter fluid per day),
- pronation, anti-thrombosis therapy
- target: SpO<sub>2</sub> > 97%-98%

If **SpO<sub>2</sub> < 93%** despite AHC move to LEVEL 2

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<sup>5</sup> SpO<sub>2</sub>: Peripheral capillary oxygen saturation, BP: Blood pressure, HR: Heart rate, RR: Respiratory rate, CPAP: Continuous positive airway pressure, FiO<sub>2</sub>: Fraction of inspired oxygen, PaCO<sub>2</sub>: Partial pressure of carbon dioxide, DH: Patient(s) discharged from hospital, ONPA: Oxygen/Nutrition/Pronation/Anti-thrombosis-therapy



## LEVEL 1 EXTRA

Treatment for patients discharged from hospital (DH) with  $93\% < \text{SpO}_2 < 97\%$

## LEVEL 2

Target: MODERATE CASES (MDC)

Location: Community centre, on the territory

### LEVEL 2A: BASIC COMMUNITY CARE (BCC)

If  $80\% < \text{SpO}_2 < 93\%$ :

- oxygen with high flow delivery devices
- hydration (intravenous administration)
- nutrition - if necessary nasogastric tube (NGT) to ensure adequate caloric intake
- pronation
- anti-thrombotic therapy
- targeted medical therapy
- blood gas analysis
- laboratory tests
- daily specialist clinical monitoring

If patient non-responder moves to LEVEL 2B.

A patient is defined non-responder if at any time of hospitalization they present:

- insufficient oxygenation ( $\text{spO}_2 < 93\%$ ) despite high O<sub>2</sub> flows
- RR > 30 breaths per minute
- pH < 7.35
- $\text{paCO}_2 > 50$  mmHg
- evident use of accessory muscles
- secondary organ involvement (systolic blood pressure <100 mmHg after volume adjustment; creatinine unchanged from the historical or increase > 0.5 mg / dl; platelets <100,000 mm<sup>3</sup>; PT > 2; blood sugar > 300 g / l; impaired sensory

### LEVEL 2B: ADVANCED COMMUNITY CARE (ACC)

Target: Patients non-responder LEVEL 2A; definition level Severe Case vs Palliative care. (Test clinical response to positive ventilation pressure; prognostic stratification and waiting for hospitalization unless immediate availability of bed)

Non-respiratory therapeutic approach like LEVEL 2A. In addition:

- helmet CPAP test (0, 5, 10 cm. H<sub>2</sub>O e FiO<sub>2</sub> 50%, 70%)

If:

- CPAP test responder = adequate oxygenation ( $\text{SpO}_2 > 93\%$ ) with CPAP support. LEVEL 3A hospital bed required. Waiting for bed availability, we continue to treat with CPAP helmet.
- CPAP test non-responder = insufficient oxygenation despite high FiO<sub>2</sub> and high positive pressure. SDM (shared-decision making) for possible palliative care vs continuation of LEVEL 3C care in the hospital. If decision to continue treatment in

hospital, transfer with high priority, possibly within 6 hours with notification of LEVEL 3C need for treatment.

## LEVEL 2 EXTRA: DH COMMUNITY CARE (DHCC)

BHC treatment DH patients with (SpO<sub>2</sub> >93%/FiO<sub>2</sub> 50%) with helmet or patient with tracheostomy with CPAP 10 since at least 48 hours and 7.35 < pH < 7.45

## LEVEL 3

Target: SEVERE CASES (SVC)

Location: in a hospital facility equipped to this level of care

### LEVEL 3A: BASIC ADVANCED HOSPITAL

Care in isolated COVID-19 wards within the hospital. Evaluation by an internist / pulmonologist with the possible consultation of a resuscitator.

Target patients

- CPAP / NIV test responder = adequate oxygenation (SpO<sub>2</sub> > 93% / FiO<sub>2</sub> 50%), non dyspnoea (PaCO<sub>2</sub> > 30 mmHg, pH>7.30, RR < 25, use of accessory muscles) and/or just 1 organ affected in addition to lungs (BP < 100 after 500 ml filling, creatinine > 1.5 mg/dl, platelets < 100.000, PT > 2, blood sugar > 300)
- CPAP / NIV test non-responder waiting for bed in ICU

Treatment:

- supportive medical therapy (hydration, nutrition, anti-thrombotic prophylaxis)
- antibiotic therapy (antibacterial and antiviral)
- laboratory tests
- radiological checks (chest X-ray / chest CT scan)

If patient becomes non-responder at any time of admission according to respiratory / metabolic criteria:

- CPAP / NIV non-responder = insufficient oxygenation (SpO<sub>2</sub> < 93% / FiO<sub>2</sub> 50%)
- and / or dyspnoea (PaCO<sub>2</sub> < 30 mmHg, RR > 25, use of accessory muscles)
- and / or 2 other organs involved in addition to the lungs (BP < 100 after 500 ml filling, creatinine > 1.5 mg / dl, platelets < 100,000, PT > 2, blood sugar > 300)

Urgent consultation by ICU doctor for risk definition and evaluation if therapeutic desistance (SDM) vs passage to LEVEL 3B with the need for hospitalization in intensive care.

Define withdrawing and withholding criteria (can be modified according to bed occupancy situation).

### LEVEL 3B: CRITICAL ADVANCED HOSPITAL

At least one ICU doctor every 50 patients for supervision

If after 24 hours:

- NIV / CPAP test **non-responder** = insufficient oxygenation (SpO<sub>2</sub> < 93% / FiO<sub>2</sub> 50%)
- and / or dyspnoea (PaCO<sub>2</sub> < 30 mmHg, RR > 25, use of accessory muscles)

- and / or 2 other organs involved in addition to the lungs (BP <100 after 500 ml filling, creatinine > 1.5 mg / dl, platelets < 100,000, PT > 2, blood sugar > 300)

Move to LEVEL 3C.

Define withdrawing and withholding criteria (can be modified according to bed occupancy situation).

## LEVEL 3C: CRITICAL CARE ADVANCED HOSPITAL

Reference is made to the ICU management protocol.

Define withdrawing and withholding criteria (can be modified according to bed occupancy situation).

## LEVEL 3 EXTRA: DH

Patient discharged from ICU to be placed in a dedicated area

Admission criteria: SpO<sub>2</sub> > 93 / FiO<sub>2</sub> 50% with CPAP 10

Discharge criteria:

- LEVEL 3A: SpO<sub>2</sub> > 93% / FiO<sub>2</sub> 50% with helmet or patient with tracheostomy with CPAP 10 sine at least 48 hours and 7.35 < pH < 7. When LEVEL 2A criteria are reached and maintained for 48 hours, move to LEVEL 2A
- LEVEL 2A: patients with clinical criteria LEVEL 2A reached and maintained for 48 consecutive hours.
- LEVEL 1B = 93% < SpO<sub>2</sub> < 97% breathing room air since for 72 consecutive hours.

## LEVEL 4

Target: age > 85 LEVEL 2B o 3A non-responder

### LEVEL 4A: HOME PALLIATIVE CARE

If age > 85 years or > 80 years with comorbidity and SpO<sub>2</sub> < 80% despite LEVEL 1B = activate home palliation.

### LEVEL 4B: COMMUNITY CENTRE PALLIATIVE CARE

- Non-responder LEVEL 2B (criteria ?)

### LEVEL 4C: HOSPITAL PALLIATIVE CARE

- Non-responder LEVEL 3A (criteria ?)
- Non-responder LEVEL 3B (criteria ?)

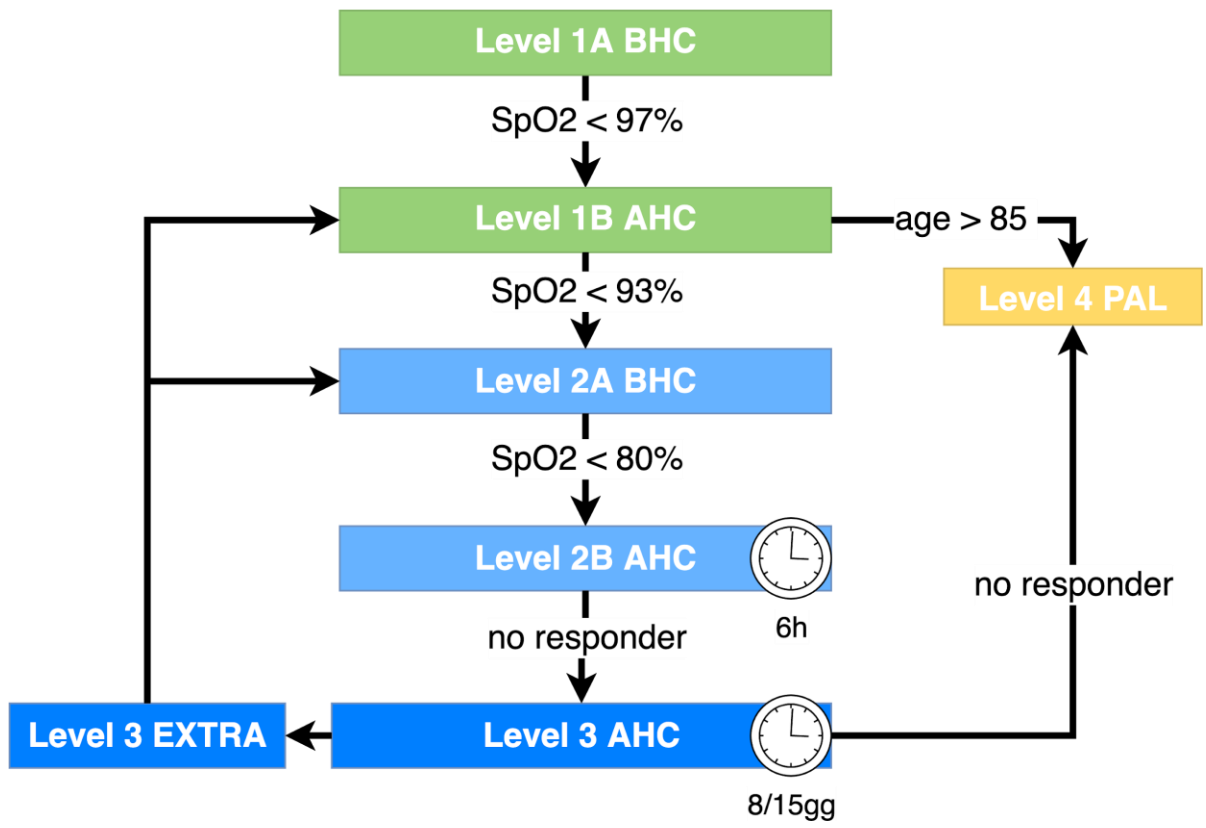


Fig. 3 Care level escalation diagram

# Basic elements for informed emergency and planning choices, in the short and medium term.

COVID-19 is a pandemic that is putting a strain on the health, economic, social and family system.

Responding to an epidemic requires:

- change of the person-centered model of care (heart attack, stroke, etc.) to a community model (everyone is involved);
- understanding that we are not only dealing with a disease but with a social phenomenon; it is not an intensive care problem, but a public health problem;
- requires a look that goes beyond one's own territory, that is simple "pandemic" answers that can be implemented in all territories.

Bergamo is currently the affected Italian area (it is estimated that well over 60% of the population is contaminated), but also the one with the greatest economic and human resources to try an answer.

If all the regions next to Lombardy fall, getting up will be difficult.

Building a sustainable "Bergamo model" in response to the crisis becomes a crucial element for the recovery of all Italian society.

There are three elements to consider before taking action:

- epidemiological
- clinical
- territorial

## Epidemiology

The numerous Chinese reports have already taught us a lot:

COVID-19 is very contagious (10 times more than SARS) and not very lethal (= it makes people die little). The Chinese have estimated 2.3% of confirmed cases (with laboratory examination). If we also consider suspected cases, lethality is 1.4%. It should be noted, however, that these data refer to the statistical average. But be careful it is an average number. Lethality over 80 is 15%, between 70 and 80, 8%. Between 50% and 60% of COVID-19 viral pneumonia patients admitted to ICU die. Normally the general mortality in intensive care is 30%. So when this disease is expressed in a serious form it is lethal. Half of critically ill patients (see below for definition) die. If the health system goes into crisis due to an out of control infection (see Bergamo situation), lethality increases because there is no minimum care for the overflowing number of patients into the structures.

Asymptomatics have the same viral load as symptomatics. The main asymptomatic symptoms are boys and children up to 25 years of age. 1% of people up to 29 years of age get sick with mild symptoms. The asymptomatic period can last several days.

Fearless symptomatic symptoms may have minimal ailments (diarrhea, chest pain, bone pain, prostration).

As for health personnel: 3.8% of operators fall ill, but the percentage can reach 63% in areas with high levels of infection. The lethality among healthcare professionals is estimated to be 0.3%.

The virus is present in the respiratory secretions, in the blood, in the stool, not in the urine. Stay long on the surfaces.

Without a vaccination that won't arrive before 2021, these epidemiological features make this virus less lethal but a devastating social bomb. In addition to improper social behavior, hospitals and ambulances, when not properly managed (stop due to sanitization of the vehicle and personnel's PPE after each transport of suspect patient), have become the main vectors of the infection. The only effective containment elements are quarantine, hand washing, distance, mask to reduce the spread of respiratory particles. With these restrictions, China brought down the cases within a few weeks. There have been no hospitalizations in Wuhan hospital for weeks. Quarantine will reduce contagion, but then the need to restart the economy will require a relaxation of restrictions.

Schools in China are still closed. Quarantine cannot be the only effective action, also because the epidemic peak will restart, albeit with less intensity, with the relaxation of restrictions.

So epidemiology must guide every clinical-political choice.

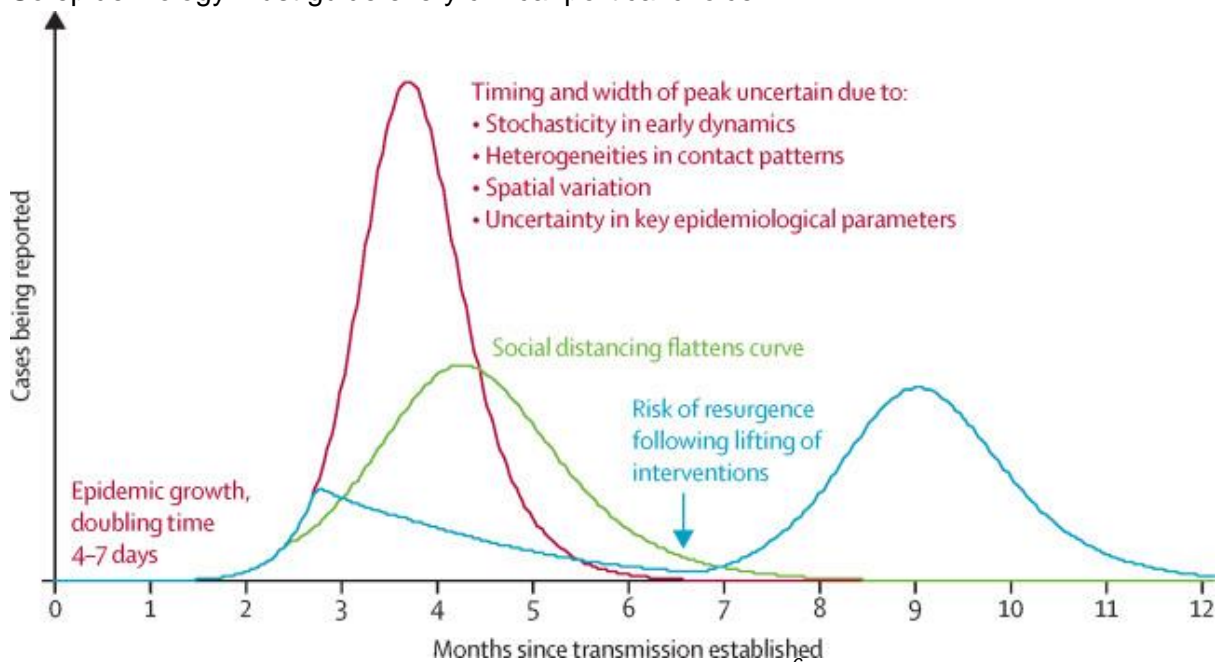


Fig.4 Simulation of COVID-19 transmission. Source: Lancet<sup>6</sup>

## Clinical notes

Again according to Chinese data, the majority of hospitalized patients (87%) are aged between 30 and 79 years. COVID-19 affects the lung in forms with important symptoms (high fever, persistent cough). Obesity, smoking, associated cardiological and severe diseases of another nature are determining factors of aggravation of COVID-19 disease.

Most people have a mild disease (81%), that is, without pneumonia or with mild pneumonia that can be treated at home.

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<sup>6</sup> How will country-based mitigation measures influence the course of the COVID-19 epidemic?

Lancet Published online March 6, 2020 [https://doi.org/10.1016/S0140-6736\(20\)30567-5](https://doi.org/10.1016/S0140-6736(20)30567-5)

14% develop a severe form with dyspnoea, respiratory rate greater than 30 acts / min, saturation <93%, bilateral pneumonia (with radiological evidence) within 48 hours (requires adequate non-intensive care)

5% develop very serious disease with an infection that spreads throughout the body (requires intensive therapy).

The territorial experience of Bergamo teaches us that in patients who develop forms with important symptoms (persistent cough and fever) they start immediately and with them often a certain degree of hypoxia (saturation between 90 and 95%). People do not understand this because they do not have the essential monitoring tool which is the oximeter, they go to bed, eat little, drink little (especially the elderly) and in any case not adequately with respect to needs (imagine a continuous mountain walk without never rest and with little caloric support). A sustained hypoxia with insufficient caloric intake for 7-10 days and immobility, probably turn mild cases into moderate / severe ones especially in the most fragile people.

A home care approach (ONPA = Oxygen, Nutrition with caloric supplements, pronation, antithrombotic prophylaxis) combined with close monitoring of saturation (telematic or with mobile clinics) can allow home treatment and early discharge (which also represent effective measures to contain viral diffusion) and prompt relief of people with need for more advanced care and to be hospitalized.

About 10 days after the onset of important symptoms, the patient (if it is not complicated) seems to begin the healing process. Recovery is very slow. Age and comorbidities are determining factors in the course and recovery.

The relief to territories and hospitals to remedy the emergency need for assistance can be addressed with ad hoc temporary structures, but which must be organized with epidemiological and sustainable thinking.

## Territory

The Bergamo area is pushed to the limit. The peripheral hospitals are struggling with a disease that requires responses of a higher level than that which can be provided in them and are not adequately equipped to deal with the infectious emergency. General practitioners general medicine in great difficulty because they are often exposed due to the lack of PPE, pharmacies without clear supply lines (which drugs, which principals are needed in this situation) and in any case in the almost impossibility of receiving and distributing what is necessary (oxygen, masks ). The major hospitals in Bergamo manage to drain only a very small part of the most serious patients with extreme difficulty. Many elderly people do not go to the hospital and die at home. Many die in suffering, others equip themselves with palliative care offered extemporaneously. Those who have no friends with health knowledge are completely alone. Communities, prisons, third sector subjects do not have the clinical-epidemiological elements to implement non-potentially contagious actions. Generosity and voluntary work not epidemiologically aware, structural elements of the sustainability of the fragility of the Bergamo society, amplify the contagion. Quarantine generates loneliness and enormous psychological problems.

## Conclusions

The challenge is enormous, but absolutely admissible. However, a change in the model of care is needed with choices based on attention to the community and not to the individual patient, and epidemiologically aware. Children and young people can change from asymptomatic greasers to extraordinary social-care workers.

The ATS, in consideration of the great pressure deriving from the number of patients, of the difficulties in which general medicine is found and the difficulty of supplying pharmacies, is in the conditions of struggling to coordinate resources in order to give answers. The Papa Giovanni hospital is now almost exclusively focused on the treatment of Covid patients, exhausted and for these reasons unable to dictate precise epidemiological and long-lasting choices; the policy focused on immediate responses to manage the emergency.

An epidemic is not an earthquake. Generosity, improvisation, personalism increase contagion. Every day lost with short-sighted choices is a gift to the spread of the virus. COVID-19 is not so bad, it must be understood and we already have all the elements.

We need people who have experience in managing an epidemic, who have seen systems destroyed by them and know methodological elements to get back on their feet. Humanitarian agencies are needed: Emergency and Doctors Without Borders are widely present in our territories.

We need a multidisciplinary table coordinated by them, health professionals, mayors, representatives of the third sector.

People have understood and are waiting to see a way out to find hope. It is also ready to financially support the city (targeted fund campaign).

## Notes on management of contagious outbreaks in a humanitarian crisis context.

*It all happened like when you watch a horror movie: you see it coming, yet you get caught unprepared.*

We are dealing with a new disease. We know it is not highly lethal, but it is extremely contagious. There is no specific cure and there is no vaccine. It won't be a quick one.

Experience in the field suggests that simple measures, applied with rigorous strictness, make the difference.

- The first priority is the protection of medical personnel: you can't afford to lose your fighters. No compromise should be made on protocols, equipment must be available.
- Bold measures are needed to slow down the infection. Lockdown is paramount. We need dedicated Covid health structures and operators, separated from Covid-free facilities. Mild-to-moderate cases should be managed at home. Home-care and mobile clinics avoid unnecessary movements and release pressure from hospitals. Measures of infection prevention to be implemented massively, in all locations - and vehicles.
- We cannot afford a shortage of drugs and equipment. Stock up responsibly, demand extraordinary production and rational supply.
- Switch as soon as possible from a defensive approach to a proactive one. We need to know our enemy. Look humbly at the experiences in other regions, especially



China. Schedule quick and dirty surveys, to estimate local prevalence and case fatality. Prevent hotbeds: cases should be actively searched in neglected communities. Try to anticipate next future scenarios.

- People will likely cooperate more if they feel aware and engaged. Disseminate qualified communication, organize fund-raising campaigns, involved existing associated groups in support initiatives at community level.
- It is never too early to provide psychological support to medical staff, patients and their relatives.

*Those who are lucky enough to have been given a head start, should put down the popcorn and start preparing.*

## Psychological support for staff, patients, family members.

The term MHPSS (Mental Health and PsychoSocial Support) is used in the humanitarian field, in the main emergency projects, to describe "any type of local or external support that aims to protect or promote psychosocial well-being and / or to prevent or treat mental health conditions."

Even for a context such as that afflicted by COVID-19, the guidelines of the Inter Agency Standing Committee (IASC) recommend a multi-level and integrated approach with regard to the response to the epidemic.

As in any epidemic, people are likely to feel stressed and worried.

The common responses of those affected (both directly and indirectly) could include:

- concerns about one's health and fear of being infected (also in light of the fact that the transmission modalities are not 100% clear);
- concerns about the consequences (including economic and social) that there will be;
- sense of helplessness and loss of decision-making power;
- psychological consequences of isolation (boredom, frustration, loneliness, anxiety, depression)
- fear of dying or infecting loved ones;

For healthcare professionals there may be additional answers:

- consequences of stigma;
- physical and psychological effort;
- insulation
- constant hyper activation
- greater commitment in the field of work;
- lack of long-term information on the possible consequences of the virus;
- fear of infecting loved ones;

At community level, the following can be found:

- reduction of social interactions;
- anger and sense of helplessness and / or failure.
- reactions and behaviors that may depend more on a misinterpretation of information or on contact with fake news;
- lack of trust in institutions;

On the other hand, different expressions of a certain resilience and cooperation are emerging that can strengthen people's well-being and sense of effectiveness:

- increased sense of selflessness;
- rediscovery of human relationships;

- greater attention to the other.

In concrete terms, to support people and to prevent long-term consequences on the mental health of the subjects, it is possible to act on several levels:

- develop concrete tools (self help kits) that can be adapted to the various targets and distributed (in paper and / or digital form) to healthcare personnel, family members, patients and people in isolation;
- hotlines that people can call for free (check if 24 hours a day is feasible!) In order to speak with psychotherapists expert in supporting the consequences of trauma:
- stress management groups (on platforms that allow you to do them remotely and / or recorded so that they can be used as needed);
- creation of a network where to report the most severe cases;
- develop a network that can collect and disseminate only accurate information regarding the virus and local updates (also in terms of help seeking);
- possibility to organize therapeutic groups on a voluntary basis, with health professionals (doctors, paramedics, hospital staff): a psychologist will guide the group and help in the elaboration of the emotions that the operators are facing in this new context COVID-19

## Logistical considerations

Logistical support must be transversal and communicate with the three levels of care and be at the service of defined medical needs.

The key will be to create a logistic response that is as standard as possible to guarantee the speed and replicability of the processes but which can at the same time expand and shrink according to the needs in the area.

## Transportations

The movements to and from the different levels of care are extremely sensitive not only in terms of patient transport, but also because vehicles can be carriers for the spread of the virus.

- From/to L1
  - Private vehicles? Ambulance?
  - Need for staff?
  - Kit / material on board for transport?
- From/to L2
  - Private vehicles? Ambulance?
  - Need for staff?
  - Kit / material on board for transport?
- From/to L3
  - Ambulance?
  - Kit / material on board for transport?

## IT: data collection and tracking

The collection and organization of data that can provide adequate analysis and decision-making elements is certainly of primary importance.

In this context of emergency, mobile technologies already widespread among the population offer an important opportunity in fact the Ministry for Technological Innovation is activating the scouting of existing applications on the territory for:

- Monitoring patients in Home Care
- Preventive GPS tracking of the infected

The aspect linked to the monitoring of patients in Home Care is a priority in the scope of this project.

The monitoring center provides doctors with some reports and biometric data of patients in Home Care. Through the analysis of these reports, a large number of cases can be monitored massively, managing to predict the onset of critical issues in time and to prepare the appropriate actions.

The tools must have essential interfaces and functionalities to minimize the learning curve when using the tool.

### Useful smart tools

Lo smartphone dei pazienti fornisce alcuni servizi utilizzabili in L1:

- The patient's smartphone provides some services that can be used in L1:
- Phone call
- Video call
- App dedicated to monitoring
- The caregiver measures HR and SpO2 parameters and inserts them in the app
- Geolocation
- Push to Talk

Other instruments such as bracelets and / or Bluetooth pulse oximeters may optionally be optional for manual data entry.

### What data to collect

The parameters useful for monitoring essential to the application:

- Temperature
- SpO2
- Heart rate

### Implementation

An investigation is needed into the possibility of implementing already existing systems rather than requiring the development of an ad hoc prototype.

It is also conceivable that the Ministry will be able to identify a common tool in time.

# Supply

Supply is sensitive, being products in great demand. Need to have a level L2 warehouse that can serve L1 and L2.

Rigid storage management: we cannot afford stock-outs.

Advocacy and donations are important to raise awareness about needs: the channels are open and listening, we must use them.

Paramount is the creation of basic kits to be assigned to different levels of care and for different needs: they standardize and speed up procedures.

- Equipment:
  - Oxygen concentrator (usage location: L1):
    - Supply channel: donations? Wholesalers? Civil protection?
    - Needs assessment: numbers
    - Delivery method to L1: volunteers?
  - Oxygen cylinder (usage location: L2)
    - Supply channel: warehouse L2
    - Needs assessment: numbers
    - Method of delivery to L2
  - Pulse oximeter:
    - Supply channel: donations? Wholesalers? Civil protection?
    - Needs assessment: numbers
    - Delivery method to L1: volunteers?
- Protective devices:
  - Disposable
    - Supply channel: donations? Wholesalers? Civil protection?
    - Needs assessment: numbers
    - Delivery method to L1: volunteers?
  - Washable solutions:
    - Practicable? How?
    - Return to stock of material to be sanitized: procedures
- Kits:
  - L1 base: composition (oximeter, thermometer, ...)
  - L2 base: composition (instrumentation, ...)
  - Other needs in kit to be developed:
    - Protection devices kit
    - Therapeutic kits
    - Hygiene products kit
    - Telemedicine kit
    - Instrument maintenance kit (e.g. batteries for oximeter)
    - Patient kit only
    - "Solidarity" kit (useful non-medical numbers: psychological support, home shopping ...)
- Storage
  - Location: L2
  - Supply and storage procedures (e.g. ensuring buffer stocks at all times to be quantified based on project numbers)

## Equipment maintenance

It is important to ensure a follow-up of the instruments distributed to the different levels of care to ensure efficiency and to be able to intervene promptly, if necessary.

- Oxygen concentrator (usage location: L1):
  - If yes: what maintenance? Frequency? Which and how many spare parts? Plug & play instrumentation or adapters / programming required? Practicable at home level?
- Oxygen cylinder (usage location: L2):
  - Which maintenance? Frequency? Which and how many spare parts?
- Pulse oximeter:
  - Batteries: how many, which and replacement rate
- Reusable protective devices:
  - Sanitation procedures: which ones? where to practice them? necessary products?
- Kit maintenance and replacement: follow-up logs for missing / used / to be replaced material

## Water and sanitation

Water and Sanitation is a transversal discipline between the medical and logistic spheres that deals with sanitation, water networks and waste management.

Key will be training in IPC (Infection Prevention and Control) for the personnel involved in the project.

- Training
- Protection devices
- Sanitation processes:
  - L1: patient sphere (instruments, surfaces, personal objects, toilets ...)
  - L1: Quarantine procedures for families / housing units involved
  - L2: Segregation of areas (planning of high / low risk areas + connected routes)
  - Transport: sanitation (ambulances, private vehicles, material handling vehicles)
  - Warehouse: sanitation (entry and exit of material)

## Human resources

- Number and qualification of the professional figures employed depends on the actions implemented and the scale
- Operators employed at community level (1 and 2), will work in collaboration with AST staff.
- Both professionals made available by the project partners and volunteers are employed

- All operators are trained in IPC standards and protocols (Contagion prevention and control)
- The mobile home-care teams (level 1) are multidisciplinary: they include a healthcare professional, a technician / logistician and an IEC / HP employee (Information, Education and Communication / Health promotion)
- Health profiles: critical / emergency area nurses, infectious disease specialist, anesthesiologists, internists, surgeons, physiotherapists
- Psycho-social area coordination: psychologists, psychiatrist, counselors, social workers
- For treatment activities in direct contact with COVID-19 patients at level 2, staff <30 years and BMI <25 will preferably be employed
- For home care (level 1) or level 2 activities not in direct contact with COVID-19 patients, staff > 30 years and BMI > 25 will be employed
- Actors who may be involved: Bergamo Volunteer Service Center, Doctors Without Borders Group of Bergamo, University of Bergamo (students of medicine, nursing, obstetrics, physiotherapists, educational sciences), ...
- A state of coordination supervises the different communities, sharing the results, centralizing data collection, dictating an address based on epidemiological analysis