COVID-19

Triage procedures in Lombardy Region, Italy

How did emergency services adapt to respond to the COVID-19 outbreak?

What lessons were learnt from introducing new call procedureing protocols?

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118
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Emergenza
112

COVID-19 TRIAGE PROCEDURE IN LOMBARDY REGION, ITALY

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EXECUTIVE SUMMARY

The COVID-19 outbreak heavily impacted the Lombardy region in Italy, creating unprecedented challenges for emergency response organisations. Emergency call centres faced high volumes of calls, putting pressure on call handlers and ambulance services in particular. In order to continue to provide the best service possible for citizens, the emergency response organisations needed to adapt their response procedures.

The aim of this document is to explore in detail the actions taken by AREU – Agenzia Regionale Emergenza Urgenza – in Lombardy Region, Italy, to fight the COVID-19 outbreak that heavily hit the region. Out of the 60 million people living in Italy, 10 million live in Lombardy.

The document explains how the triage procedures of AREU changed during this period, what other measures were taken, and which areas were most impacted by these actions. The aim of the measures was to keep a robust and acceptable level of emergency service, despite the unprecedented crisis.

Through analysing how highly impacted countries and regions responded to the crisis and the lessons learnt, we can share best practices and better understand how to prepare for future challenges.

The Italian COVID-19 outbreak was initially located in two hotbeds, both located in the Lombardy region. The Lombardy emergency response organisations were therefore under immense pressure and needed to adapt to the situation.

This document outlines the situation in the Lombardy region and the measures taken to respond to the COVID-19 outbreak, particularly the introduction of new procedureing procedures for emergency call handlers.

1 | 112 IN ITALY AND THE ROLE OF AREU

First, it is important to have a clear picture on the Emergency Management infrastructure in Italy.

Italy is divided into 20 regions. The responsibility of emergency interventions is divided by category:

- **Police and Fire Brigades** depend directly on the Ministry of Interior on a national level, except for the Regions with Special Autonomies (Trentino Alto Adige, Valle D'Aosta), which have their own authority on their Fire Brigades.
- **Carabinieri** depend directly on the Ministry of Defence on a national level and provide law enforcement services, like the National Police.
- **Ambulance Services**, as part of the healthcare system, are managed on a regional level. Each region has funds and the authority to organise their whole healthcare system (including medical emergency), following the directives of the Ministry of Health.
- **112 PSAPs** also have a regional management. They are considered level 1 Public Safety Answering Points (PSAPs), with duties of receiving all emergency calls, geolocating them and forwarding them to the most appropriate second level PSAP for the rescue (second levels are the services listed above).

This configuration of services creates two effects:

1) Healthcare organisation varies from region to region, according to local requirements, needs, budget availability and organisation methods.
2) 112 PSAP creation follows a local planning, which has led to a situation where some regions are equipped with 112 PSAPs and some are still in the phase of migration. For the latter, the old emergency numbers are still active (112 = Carabinieri, 113 = Police, 115 = Fire Brigades, 118 = Ambulance Service).

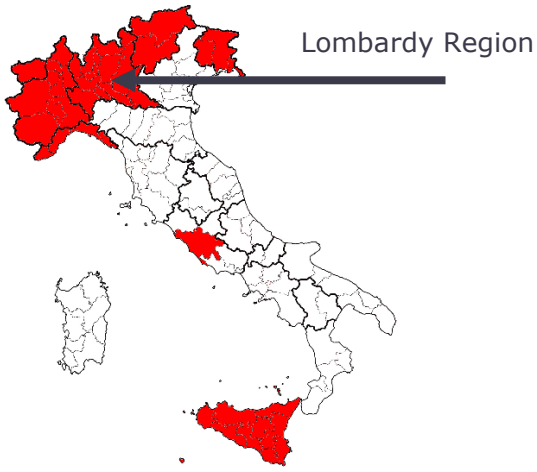


Figure 1: Areas covered by 112 PSAPs, May 2020

1.1 | THE ROLE OF AREU

AREU – Agenzia Regionale Emergenza Urgenza or "Regional Agency for Emergencies" – was created in 2007 as a Regional Agency for Lombardy Region with the main task of overseeing Emergency Medical Services, before the introduction of 112 PSAPs. Since then, the Agency has been managing all regional ambulance PSAPs, rescue coordination, blood transfusion and organ transportation activities.

In 2009, the duties of AREU were extended. AREU was given the responsibility to manage the first 112 PSAP in Italy, as the beginning of the migration process that is still ongoing. The first 112 PSAP was created in Varese in 2010.

The Agency is in an unusual situation: it has authority on two regional services, which are different but very much connected with each other. AREU manages both the 112 PSAPs as the first level citizen contact point and the ambulance PSAPs, as the second level dispatching centres for medical rescue. This allows a very deep relationship between the structures and organised planning for critical health-related emergencies.

1.2 | COVID-19 EMERGENCY IN ITALY & LOMBARDY

AREU manages emergencies in the most populated region in Italy: out of the 60 million Italians, about 10 million live in Lombardy. Lombardy is therefore home to a sixth of the total population and a population larger than the average European country. The Italian COVID-19 outbreak was initially located in two hotbeds, both located in Lombardy. The situation raised to critical levels quite soon, due to the population density of the region, especially in the case of the second hotbed. As of now, Lombardy has most cases in the whole country (37,5%).

Considering numbers above, Lombardy's emergency response organisation was under much more pressure than any other in Italy. The crisis was felt by AREU since the beginning of the outbreak, receiving an enormous amount of calls, reaching 5 times the usual daily emergency call rate (tables and statistics in the chapter 3 of this document). AREU did expect an outbreak of this proportion, but not on such short notice and with this rapidity.

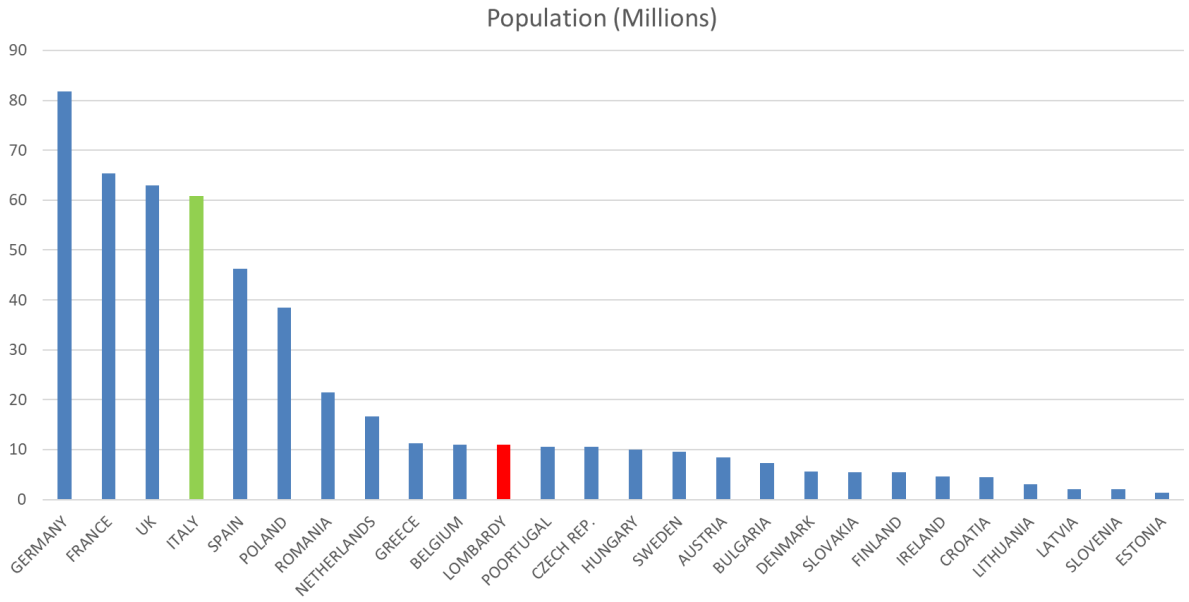


Figure 2: Population comparison between Lombardy and European Countries

Figure 3: COVID-19 case distribution in Italy, May 13th, 2020

Legend:

- **Totale positivi =** Total currently infected
- **Guariti =** Recovered citizens
- **Deceduti =** Deceased citizens
- **Casi totali =** Total cases since the beginning of the outbreak

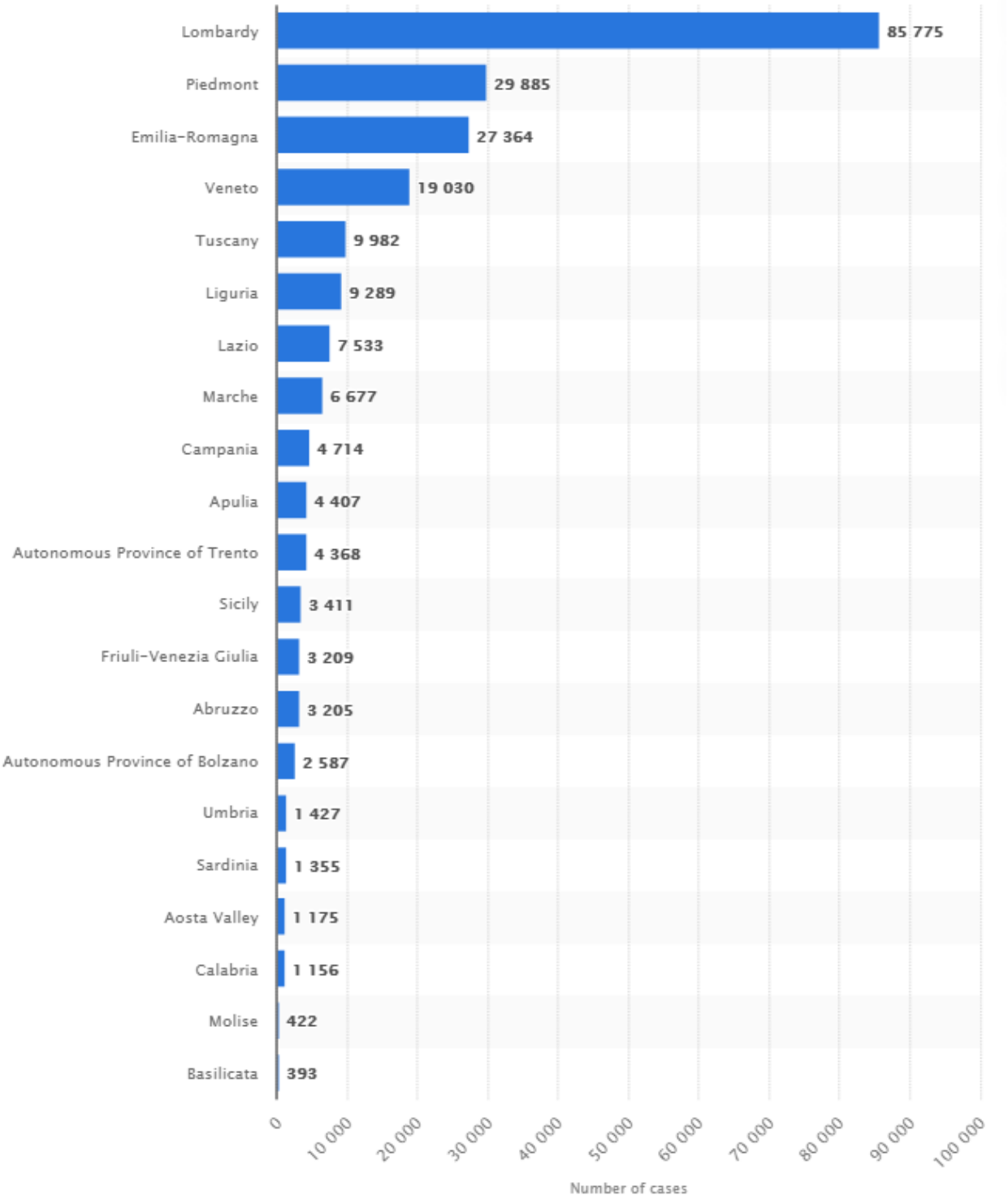
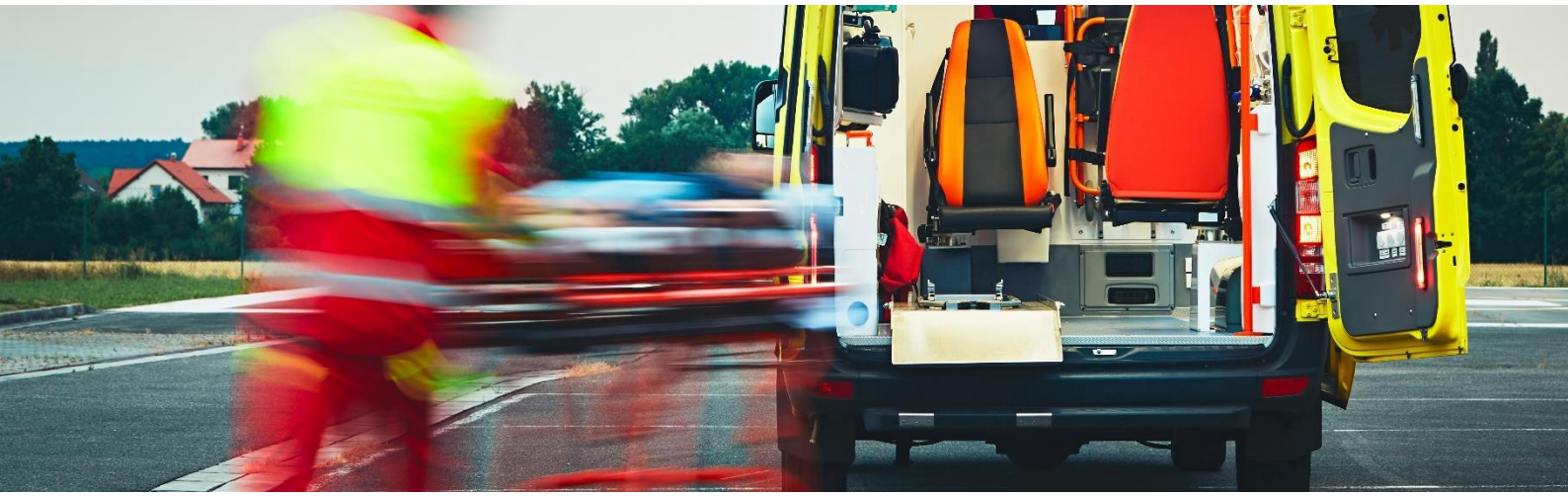


Figure 4: COVID-19 case distribution in Italy, May 20th, 2020 (one week later the previous picture)



2 | ACTIONS TAKEN BY AREU FOR COVID-19 RESPONSE

As mentioned above, AREU was overwhelmed by emergency calls, but this did not just have an impact on the 112 PSAP as the first level call handler. Due to the high amount of calls, ambulance PSAPs were also suffering from an extreme amount of work. This was especially so in the first phase, when the situation was still unclear and the methods of classification of COVID-19 were not yet standardised.

The difficulties that ambulance PSAPs were experiencing in responding to every call had consequences on the 112 call takers who, according to procedures, must wait online until a dispatcher is able to pick up the emergency, before leaving the conversation. All these factors were an avalanche on the quality of service perceived by the citizens: the 112 PSAP went from an average of 5 seconds call waiting, to more than 10 minutes.

2.1 | THE GENESIS OF THE NEW TRIAGE PROCEDURE

In just a matter of one day, AREU had to brainstorm a solution to face this unprecedented situation and a crisis that was growing faster than it could handle. From this situation, AREU developed the idea of introducing a special triage procedure in 112 PSAPs, to start evaluating COVID-19 cases.

Until then, 112 call takers had performed some initial call analysis operations (Where are you located precisely? What is the nature of your call?) to be able to distribute the call to the most appropriate PSAP, letting the professionals at the second level investigate the precise nature of the emergency and dispatch the appropriate resources.

The first version of the procedure (we are at version 12 at the time of creating this document) was intended to avoid all calls that were not related to a real emergency. It was adopted alongside the creation of a toll-free information service, set up in two PSAPs within the time frame of two days, using personnel already employed in the regional service call centres. This procedure was intended to separate citizens with real medical problems from those who needed assistance or information about COVID-19.

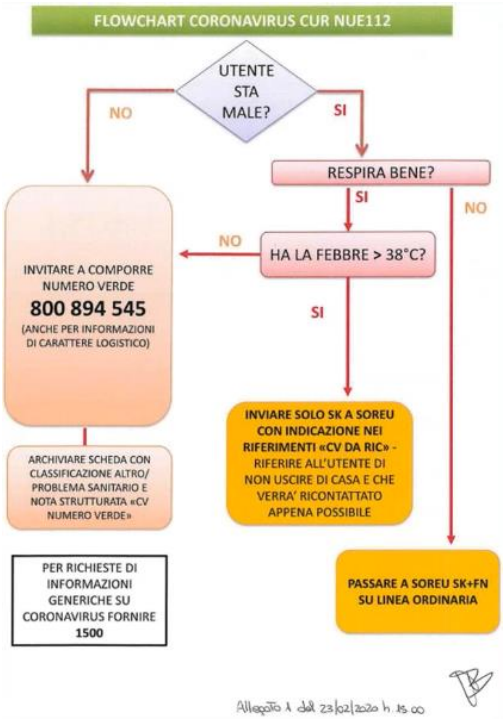


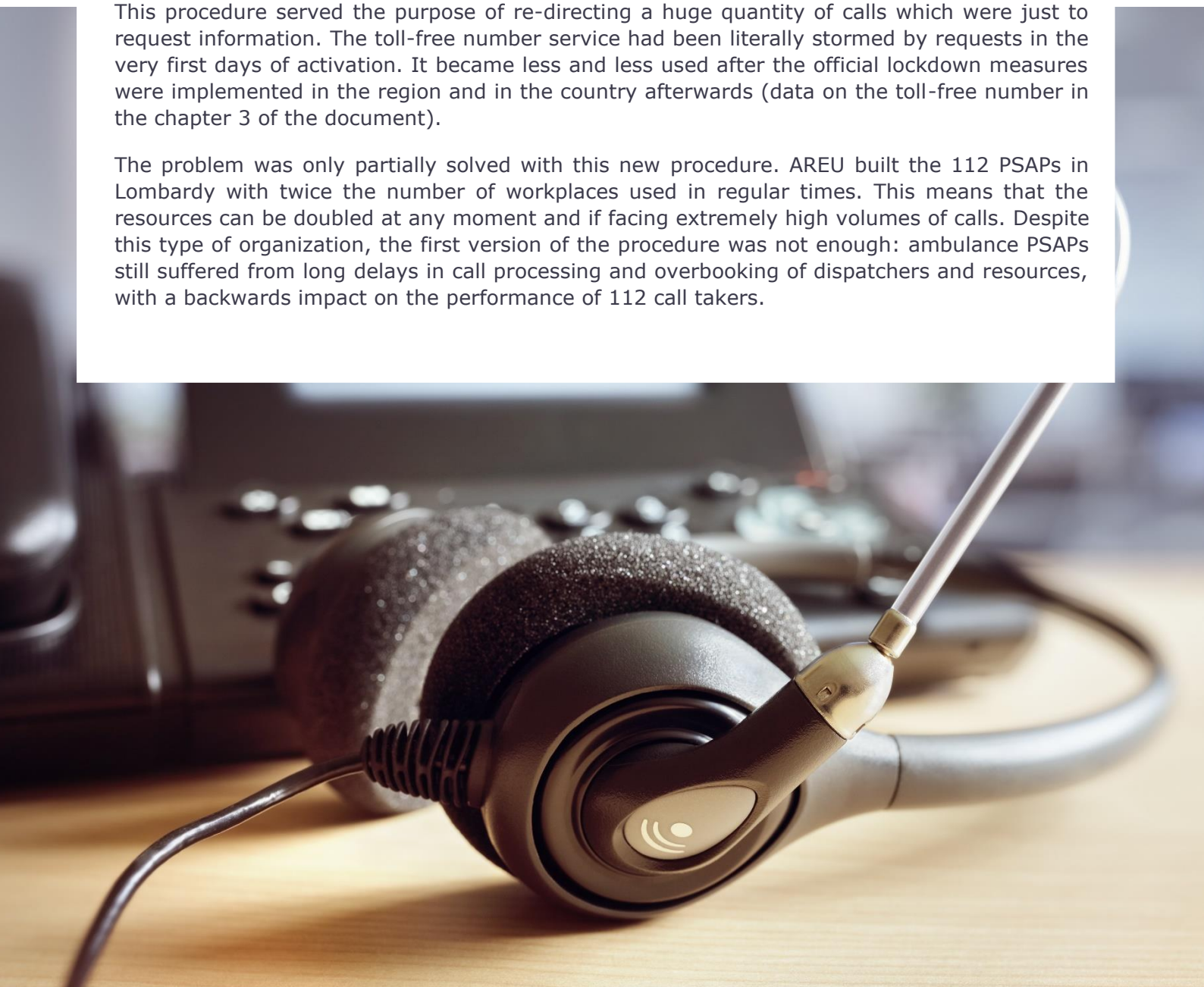
Figure 5: First version of the 112 PSAP triage procedure, February 23, 2020

Procedure workflow:

- Citizen is sick? (yes/no)
    - If no, citizen is encouraged to call the toll-free number for information.
    - If yes, can he breathe? (yes/no);
        - If no, then immediately forward the call and incident form to the ambulance PSAP.
        - If yes, does he have fever higher than 38°? (yes/no)
            - If no, citizen is encouraged to call the toll-free number for information.
            - If yes, forward only the incident form to the ambulance PSAP with "suspected case of COVID-19". The ambulance will call the citizen back. The citizen is asked to stay home.

This procedure served the purpose of re-directing a huge quantity of calls which were just to request information. The toll-free number service had been literally stormed by requests in the very first days of activation. It became less and less used after the official lockdown measures were implemented in the region and in the country afterwards (data on the toll-free number in the chapter 3 of the document).

The problem was only partially solved with this new procedure. AREU built the 112 PSAPs in Lombardy with twice the number of workplaces used in regular times. This means that the resources can be doubled at any moment and if facing extremely high volumes of calls. Despite this type of organization, the first version of the procedure was not enough: ambulance PSAPs still suffered from long delays in call processing and overbooking of dispatchers and resources, with a backwards impact on the performance of 112 call takers.



2.2 | THE PEAK PERIOD

The first procedure was useful to avoid non-emergency calls, but more adaptation was needed when the COVID-19 outbreak was at its peak. The second hotbed in Lombardy exploded and it was in a more populated area, heavily increasing the number of calls regarding breathing-related issues (some data analysis is found in the chapter 3). As mentioned above, 112 centres suffered, but were prepared to take the hit of increasing calls. However, ambulance services were collapsing.

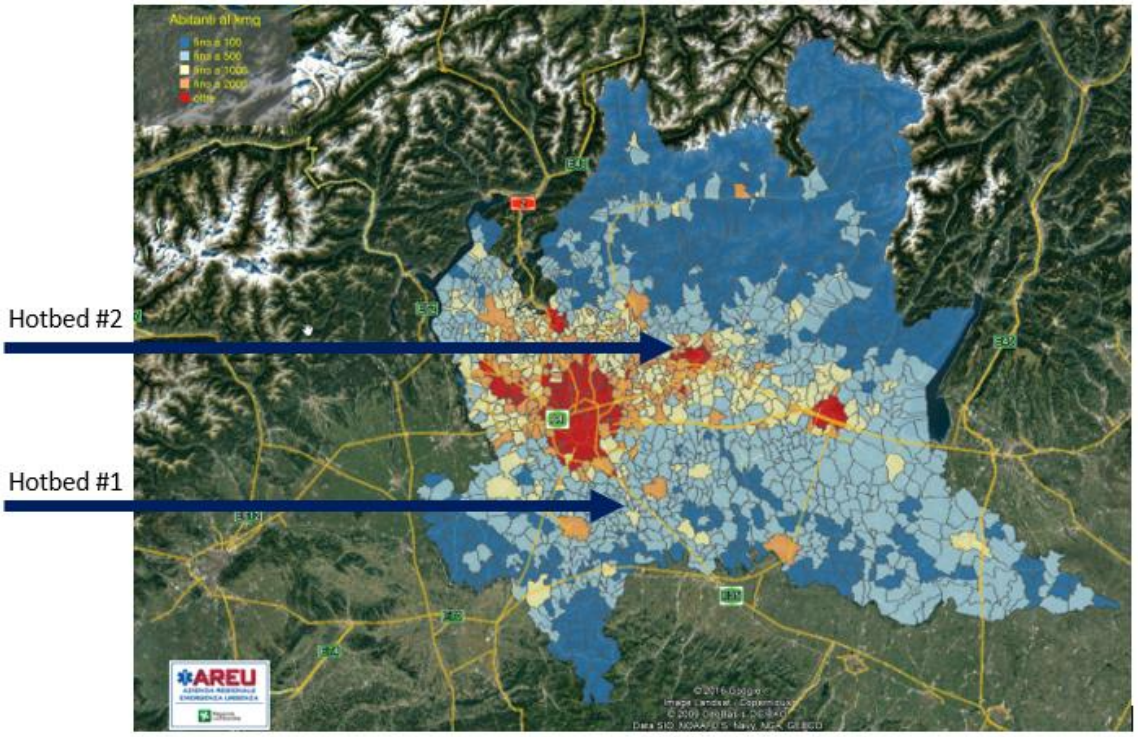


Figure 6: Population density in Lombardy and hotbed areas comparison

AREU evolved the process again: this time, thanks also to the support of their technology providers and the web-based nature of the CAD used by ambulance dispatchers. AREU decided to create temporary Support PSAPs to distribute cases with different priorities and to move an optimized triage procedure at call taking level. The supporting PSAPs were run by volunteer physicians and medics who received one-day training sessions on how to use the CAD, using the e-learning method for the first time to avoid unnecessary physical contact.

Figure 7: Temporary ambulance PSAP launch day

AREU also made use of a very important element introduced just a few months before the COVID-19 outbreak and initially planned for other purposes. Between the 112 PSAP and the ambulance PSAP, a special "hotline" was established for the most critical cases detected by the 112 PSAP call taking interview. This hotline was given higher priority than any other medical emergency call when received on the ambulance PSAP side. The same hotline became a dedicated line for COVID-19 critical requests and other high severity medical cases to get the fastest response from dispatchers.

With this evolution of the model, which greatly impacted the way the medical emergency service was working, the procedure at the 112 PSAP was also modified. The procedure went through multiple evolutions to arrive at version 10 (March 23, 2020).

The procedure allowed the 112 call taker, who once only determined the nature of the emergency at a high level, to go into a deeper analysis of the situation. This involved asking medical-related questions, which were tested and defined to be highly precise, to determine the existence of a COVID-19 case or to define less severe situations.

The red lines in the procedure lead to forwarding the call and incident form to the ambulance PSAP on the hotline mentioned above. These calls are related to time-dependent pathologies such as traumas, strokes or cardiac arrests (right side of the diagram) or to a COVID-19 critical situation (left side of the diagram).

In the middle, the cases marked in yellow - less severe - were forwarded to regular PSAPs during night shifts (right yellow branch). Forwarding calls and incident forms was done during the night, as the general load of activities is lower during the night than during the day. Therefore, during the daytime, the decision was made to forward just the incident form to the Support PSAPs. The

Support PSAPs then call the citizen back (within a longer time period than more severe cases) to follow up on the non-severe case. The lowest severity cases (green branch) were also managed through call-back from the Support PSAPs, but within 24 hours.

This produced an important result: ambulance PSAPs were relieved of the high pressure of interventions and responses. They were able to dedicate themselves to the most critical cases inside the dispatching centre and the number of dispatches was reduced by 15%. The situation at the 112 PSAP improved greatly: the previous extreme waiting time of more than 10 minutes went back to an acceptable 12 seconds waiting time (compared to the nominal 5 seconds waiting time before COVID-19).

EENA published a video where Dr. Alberto Zoli, General Manager of AREU explains the steps taken by AREU to face the COVID outbreak, including the adoption of this version of the procedure. The interview can be found *here*.[1]

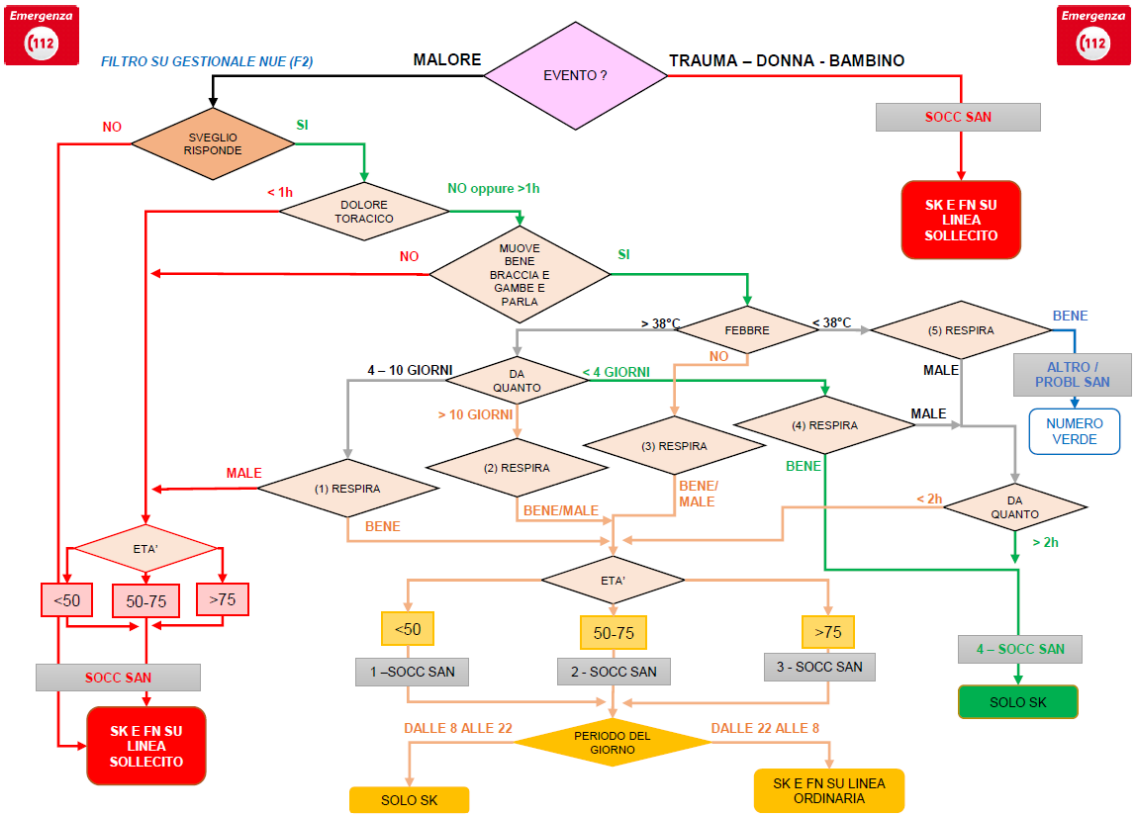


Figure 8: 112 COVID-19 procedure, version 10, March 23, 2020

[1] eena112 "COVID-19 – EENA interview with Dr. Alberto Zoli, AREU Lombardia" 27 March 2020 *https://www.youtube.com/watch?v=ww6QS0InQpw&feature=youtu.be*

2.3 | THE LONG DECREASE

A crisis like this is continuously evolving: lockdown measures affected the case ratio and in the long term produced a stabilisation of cases. This also impacted AREU, which saw a decrease in emergency calls one month after the application of version 10 of the procedure. AREU decided to temporarily switch off the Support PSAPs and implement a new process which reflected this change, giving back the management of all emergency calls to the regular ambulance PSAP.

The main differences in version 12.B are represented by the yellow block, which is merged with a unique destination, different from the red blocks, whose calls are forwarded on the previously mentioned hotline. The last version is also defined by a more structured triage, regarding the situation of fever and breathing problems of the caller.

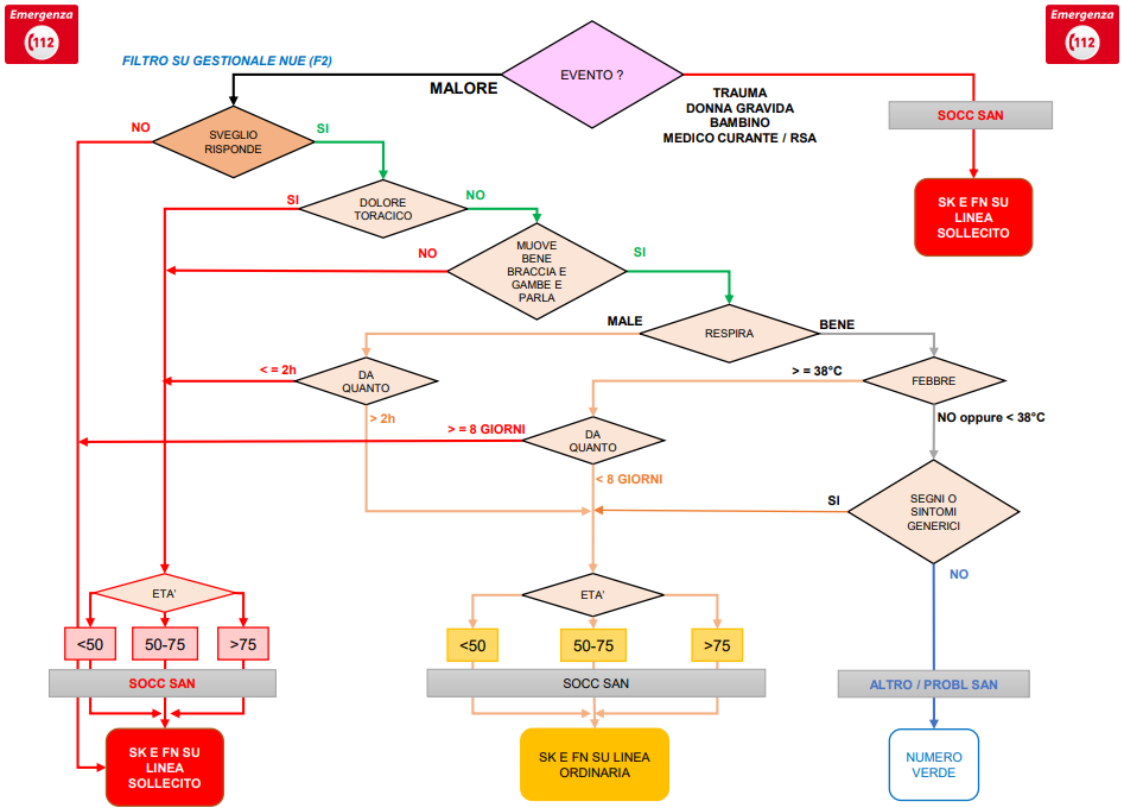


Figure 9: COVID-19 112 PSAP procedure, version 12.B, April 23, 2020

2.4 |APPLYING THE PROCEDURE: RESULTS AND CONSIDERATIONS

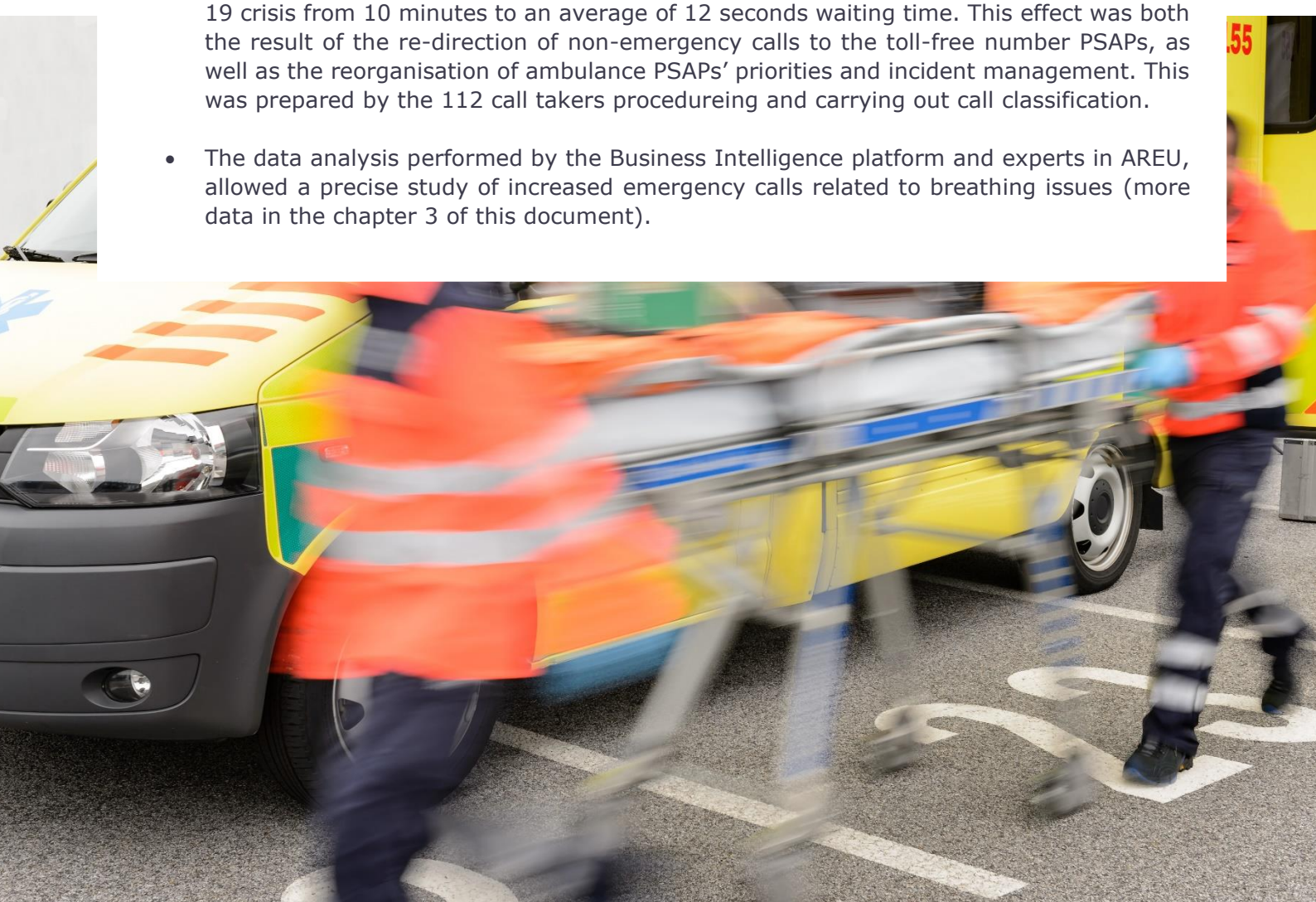
AREU's triage procedure is a perfect example of cooperation in emergency situations. Although it may seem to be just a simple procedure for incident qualification, the procedure is the summary of a professional and rapid response to a crisis with a very limited warning time and little time for intervention. This list summarises the most important results achieved by the introduction of the procedure:

- The procedure evolved 12 times in the time span of two months (February 21-April 23) and the CAD software implemented every change immediately, with the definition of the new second level PSAPs introduced during the process.

- Under the procedure application, AREU established two toll-free PSAPs for information and two support PSAPs within four days, to manage mid-low severity incidents in place of the regular ambulance PSAPs.

- The application of procedures modified the response time of 112 PSAPs during the COVID-19 crisis from 10 minutes to an average of 12 seconds waiting time. This effect was both the result of the re-direction of non-emergency calls to the toll-free number PSAPs, as well as the reorganisation of ambulance PSAPs' priorities and incident management. This was prepared by the 112 call takers procedureing and carrying out call classification.

- The data analysis performed by the Business Intelligence platform and experts in AREU, allowed a precise study of increased emergency calls related to breathing issues (more data in the chapter 3 of this document).



1 | REPORTS FROM THE COVID OUTBREAK

Data presented in this chapter wants to be a summary of the situation that AREU managed during the COVID-19 outbreak in Lombardy. They have been created by the business intelligence tools used by AREU, daily, from the BI experts inside the Agency.

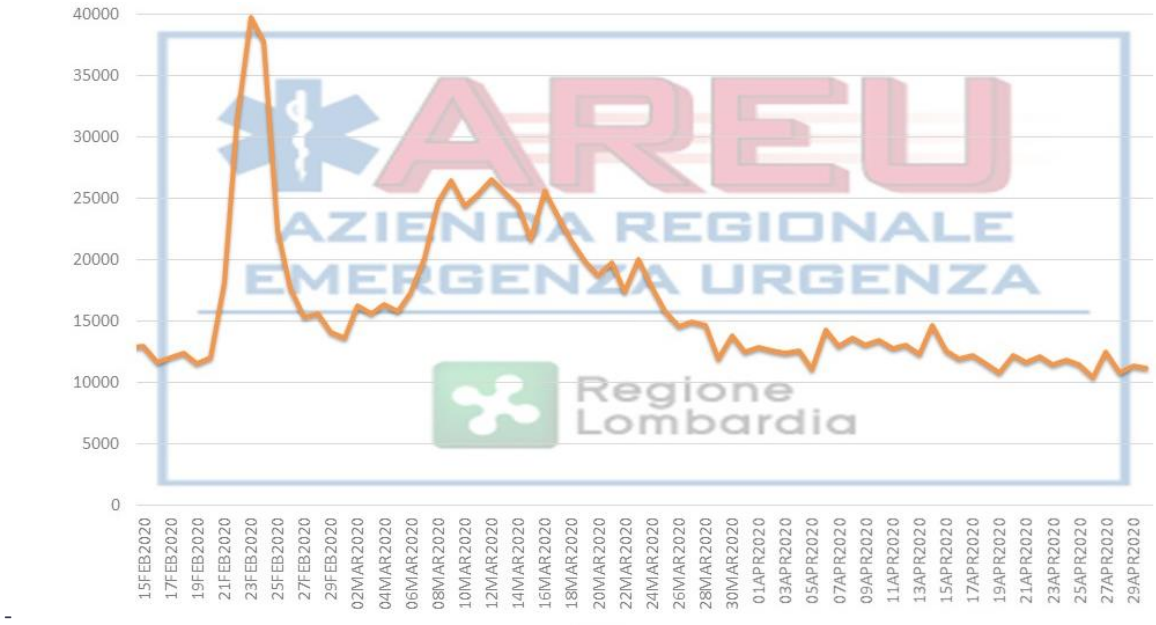


Figure 10: Number of calls received by AREU 112 PSAPs

21 February was the first day of the official COVID-19 outbreak in Italy. Calls went from an average of 13,000 calls per day pre-COVID, to a peak of 40,000 calls during the first outbreak.

The second outbreak was also challenging for AREU: another peak of 25,000 calls was reached. It was not as high as the first, but was maintained for a longer period, as the second hotbed was in a more densely populated area.

Figure 11: calls to toll-free number for COVID-19 information

The toll-free information service was created by AREU on 23 February, just two days after the first Italian outbreak. It reached a peak of 400,000 calls in one single day (out of a population of 10 million citizens in Lombardy). The numbers decreased as the days passed, until the official country lockdown, as the need for information on COVID-19 decreased.

The following graphics were collected by the BI experts in AREU, analysing cases managed by the ambulance PSAPs. They show the incidence of breathing and infectious cases (COVID-19 or COVID-suspected cases) and their behaviour during the two months of virus outbreak in different zones of the region, each served by an ambulance PSAP. The following data shows the distribution in these zones and represents the behaviour of breathing-related cases (blue), other emergencies (red) and the total number of cases (green).

The second hotbed (Figure 13) had a high impact on responses, rising to 7 times the numbers of breathing-related problems in the period of the virus outbreak.

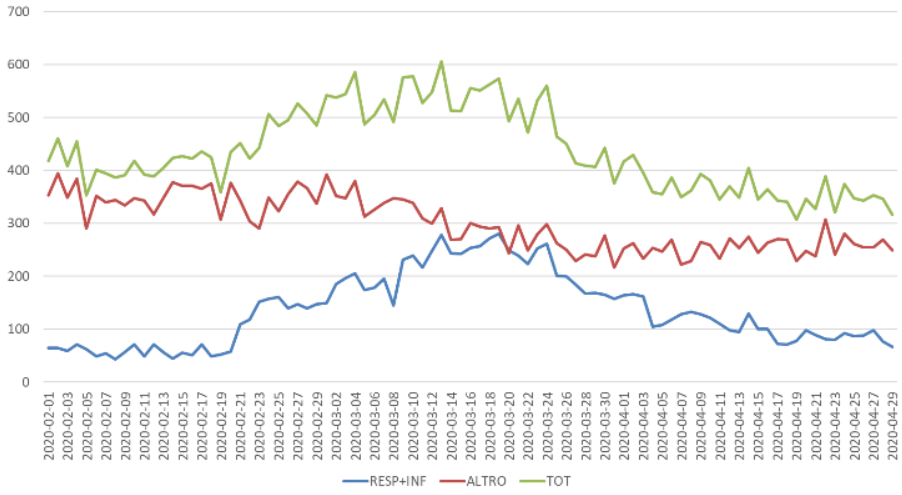


Figure 11: South zone (hit by the first hotbed of virus)

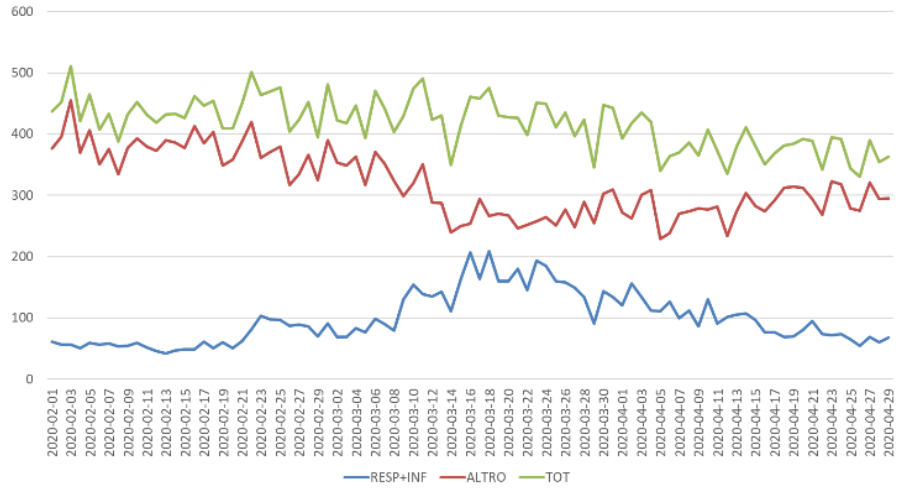


Figure 12: Northwestern zone

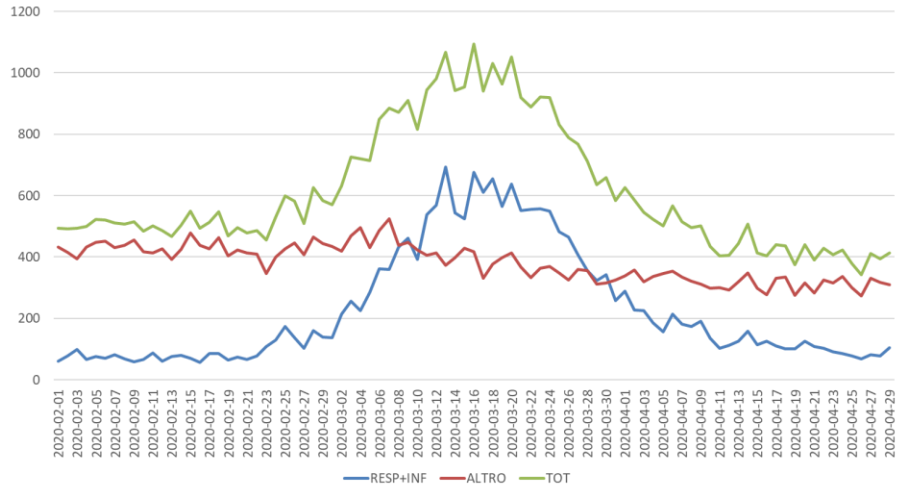


Figure 13: Northeastern zone (hit by the second hotbed of virus)

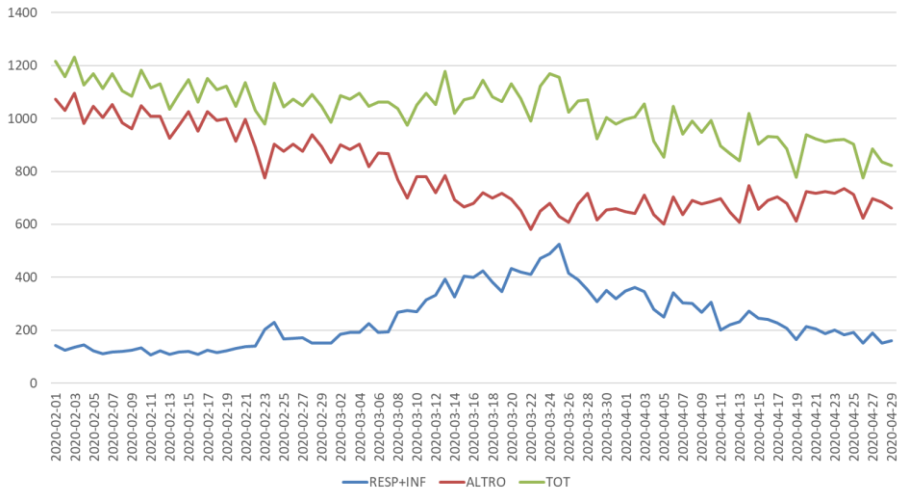


Figure 14: Metropolitan city of Milan