Migration to 112 – European Emergency Number in the Lombardy region, Italy

Italy is migrating its emergency model from the traditional multi-number system to the European 112 model.

How is its largest and most populated region facing this change?

eena

EUROPEAN EMERGENCY NUMBER ASSOCIATION

AREU

Sistema Socio Sanitario

Regione Lombardia

MIGRATION TO 112 – EUROPEAN EMERGENCY NUMBER IN THE LOMBARDY REGION, ITALY

Version: 2.0

Publication date: 07/06/2022

Status of the document: APPROVED

Authors that contributed to this document:

This document was written by members of EENA.

Authors:

Luca Bergonzi – Beta 80, Italy
Andrea Pagliosa – AREU, Italy

Contributors:

Cristina Lumbreras, Gary Machado & Marta Azevedo Silva - European Emergency Number Association (EENA)

EENA

European Emergency Number Association

EENA 112

Avenue de la Toison d'Or 79, Brussels, Belgium
T: +32/2.534.97.89
E-mail: info@eena.org

EXECUTIVE SUMMARY

112 has been the official European Emergency Number for many years, and there are several models for implementing this service at national level. Italy is undergoing a transformation, and Lombardy has been leading this change.

The aim of this document is to explore in detail the actions taken by the **Lombardy** Region, in Italy, through its Regional public agency, – Agenzia Regionale Emergenza Urgenza (AREU), to implement the transformation from the traditional multi-number emergency services to the European Emergency number 112, following the European Council Decision 91/396/EEC.[1]

The document explains who AREU is, their duties and how they organised the process for the setup of 112. We will also see the status of AREU's operations and why the existing model is considered better than the previous one.

Finally, we will give an overview of how the system reacted to the COVID outbreak – Lombardy was the first region after China to deal with the pandemic in 2020, providing data and statistics for the overall performance of the 112 system since its beginning in 2010.

AREU manages three 112 call taking PSAPs and four Ambulance dispatching PSAPs. This has been a crucial element in defining the success of the implementation of 112.

This document outlines the situation in the Lombardy region and the rationale for implementing the service, as well as an overlook at the performances and results of the service.

[1] For more details about the Council Decision on matters regarding 112, please check *here.*

1 | EMERGENCY SERVICES ORGANISATION IN ITALY

Italy is a 60-million citizens country with a robust regional government model. Several topics are defined on a regional level, including education and healthcare (all levels, from hospitals to family doctors, to ER and ambulance PSAPs).

With its 10 million population, Lombardy is the biggest and most populated region in Italy. Its capital, Milan, is the second biggest city in Italy (after the capital, Rome), counting more than 3.5 million people in its metropolitan borders.

The government of Lombardy, in many aspects, is comparable to several European middle-sized countries, so despite being a region, it has all the qualities to be regarded as a positive example of 112 service setup through cooperation between emergency services.

We will describe AREU in the next chapter: here, we will just say that they are responsible for Medical Emergency and 112 PSAPs in the Lombardy region. Therefore, they have the responsibility for emergencies of a territory comparable to a mid-size country.

Figure 1: Italy and its 20 regions. Lombardy by itself includes 1/6th of the entire population.

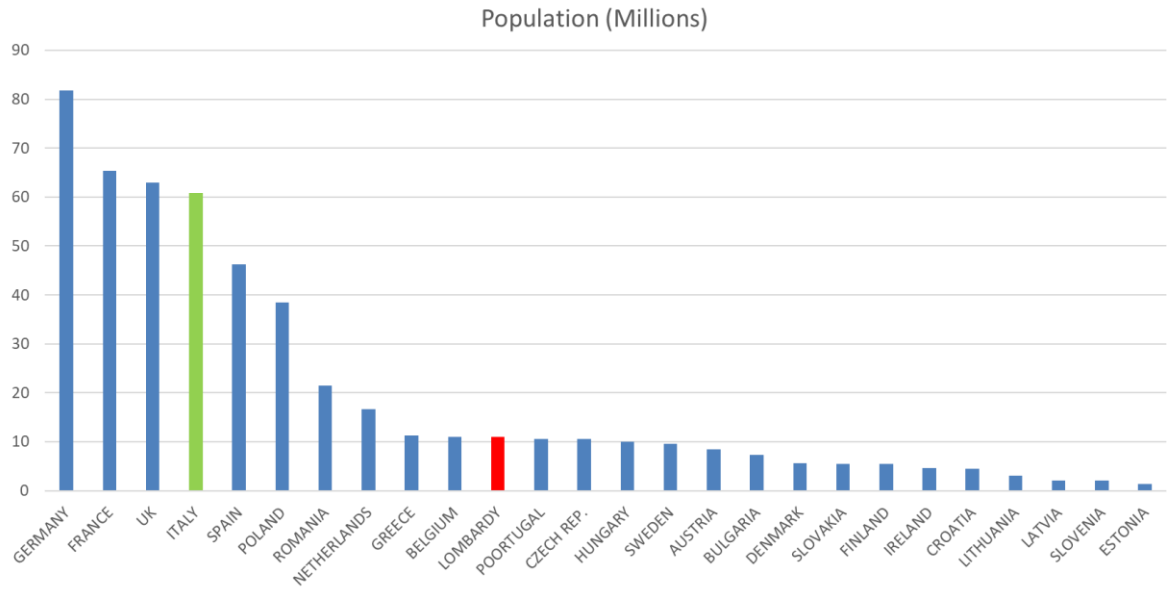


Figure 2: European population comparison. Italy is the 4th most populated Country in the Eurozone (including the UK) and Lombardy is larger than several European Countries.

In Italy, there are four main emergency numbers:

112 – Used historically by the Carabinieri since 1981. The Carabinieri is the national military police of Italy, policing both military and civilian populations. In addition, there are hundreds of PSAPs on the territory, managing the traditional Carabinieri emergency number. Under the Ministry of Defence, Carabinieri is a national agency managed at a national level.

113 – Used by the National Police since 1968. The "Questura", equivalent of a provincial Police headquarters, manages the service. There are currently 103 Questuras (PSAPs) managing the Police emergency number. Police is a national agency under the Ministry of Interior, managed at a national level.

115 – Used by the Firefighters since 1987. The Firefighters' Provincial headquarters manage the service. There are currently 100 provincial HQs (PSAPs) managing the Fire emergency number. Firefighters are a national force under the Ministry of Interior, managed at a national level (except for four tax-independent regions).

118 – Used by the Emergency Medical Service since 1992. Each province manages the service (110 provinces), with a few exceptions, such as Lombardy and five other regions where the service is managed on a regional level. Emergency Medical Services are a local responsibility, receiving directives from the Ministry of Health.

This heterogeneous conformation of responbilities raised some problems when deciding to implement a single Emergency Number, namely 112:

- The coordination of forces, some of which have local power to decide their processes, and others are managed at a national level.
- The coordination of ministries when managing the new emergency number, mainly because the Carabinieri already used 112.

2 | WHAT IS AREU

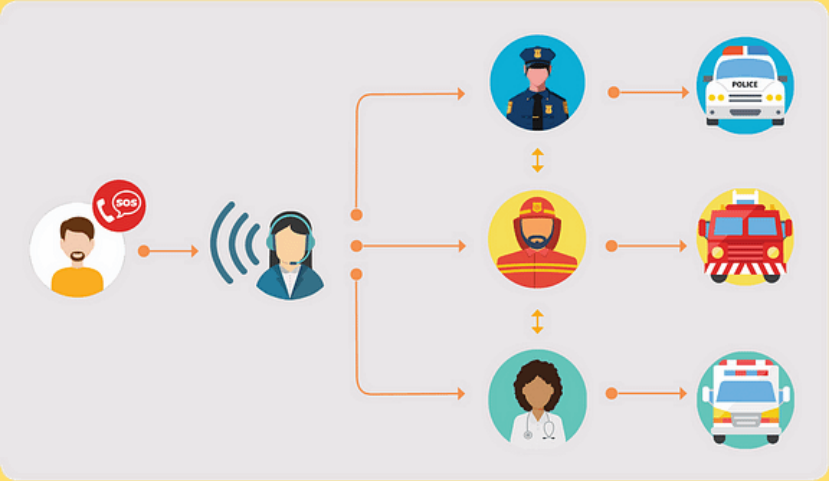
AREU - Azienda Regionale Emergenza Urgenza (or: Regional Agency for Emergency and Urgency) was instituted on April 2nd, 2008, with the Deliberation no. 6994, issued by Lombardy Region. In this Deliberation, AREU was instituted as the Regional Healthcare Agency, aimed at the governance and operational management of all the extra-hospital Emergency Medical activities in the Region, to develop the integration of the intra and extra hospital healthcare emergency, to coordinate the organs and tissues transportation service and to coordinate the regional blood transfusion and haematic-components activities. AREU used to manage 12 Regional Ambulance PSAPs, before the consolidation plan in 2015, moving from 12 to 4 ambulance PSAPs.

In 2010, AREU was also appointed (by a joint decision of the regional government, the Ministry of Interior, Ministry of EconomicDevelopment and Ministry of Health) with the responsibility of setting up **the first Italian 112 PSAP**, based in the city of Varese, to begin the migration towards the new model of 112. Since then, AREU deployed two more PSAPs in the Region and coordinated the deployment of 112 PSAPs in all other regions that, so far, have embraced this model. The model selected for the implementation corresponds to Model no.3 proposed by EENA in the list of possible 112 models.

Focus on: 112 PSAP model 3

Model 3

In Model 3, the classification, geolocation, and data gathering are done by the first (stage 1) call taker. The call taker then makes a parallel dispatch to the relevant services, which send resources to the scene. We see this model in place, for example, in Romania.



The application of Model no.3 includes some very crucial decisions:

1) The original emergency numbers described in the following chapter still exist after the migration to 112. However, they are all routed to the same calltaking PSAP: no matter what emergency number the citizen dials, they will always talk to the same 112 PSAP call takers.

2) For every real emergency, a dispatch agency is selected as responsible as per the procedures defined at the MOI level. If the incident involves more agencies, one is anyway selected as the responsible one, and the others are alerted to the same case.
3) Every real emergency call is forwarded to the responsible dispatch agency to put the citizen in touch with the dispatcher and to collect more relevant information, according to the type of agency (especially ambulance services, which need to collect health-related data).
4) Alongside the call, the software used by 112 PSAPs forwards the data collected by the call taker in the incident form. This is received by every involved dispatcher and prevents them from going through a citizen's interview from scratch. The incident has been already geolocated and identified at a high level by the call taker. The result is that the dispatcher can concentrate on questions related to his type of specialisation.

3 | THE PROCESS IMPLEMENTED BY 112 PSAPS

The process implemented in all 112 PSAPs in Lombardy (and in the rest of Italy) is regulated by a Standard Operations Procedures (SOP) document, created jointly by:

- Ministry of Interior – Department of Public Safety
- Ministry of Interior – Department of Public Rescue and Fire Brigades
- Ministry of Defense – Arma dei Carabinieri

Which deals with:

- Procedures for the 112 PSAP call takers
- Mapping of all dispatching PSAPs involved in the rescues, with territorial jurisdictions and timetables of availability
- Methods of call transfer and data transfer between the 112 PSAPs and the dispatching PSAPs
    - Including the XML data format that every software vendor involved with emergency services PSAPs or 112 PSAPs must implement to enable the data transfer
- Handling of calls in a foreign language
- Handling of technical issues (redundancies, disaster recoveries, etc.)
- Responsibilities for the maintenance of the 112 system

In particular, it is worth noticing how the SOP document describes the call takers as employees "*Appointed of Public Trust"*, whose duties and rights are described in Art. 1 of Law no. 146, of June 12, 1990: the call takers, being Public Trust employees, have a role that is created for the benefit and the interests of the community. This role bypasses the nature of their employment for regulation matters, and the rules for *Public Trust Agents* are applied to their contracts.

In addition, it is important to note that the SOP document specifies that 112 PSAPs manage incoming emergency calls, filter false calls and forward real emergency calls and related data to the correct dispatching PSAP. The 112 PSAP, therefore, has no formal management function over the emergency operations (e.g. dispatching).

The SOP document is available upon request to AREU, and currently, it is only in Italian. The following chapters give a brief overview of the topics covered in the document.

3.1 | Call handling

Call handling is the procedure concerning the reception of the call and the first treatment of the caller's needs by determining the nature of his call. For this part of the procedure, the SOP document states as follows:

- Callers may call emergency numbers from a landline or mobile networks
- Callers may dial 112 or any former emergency numbers (113, 115, 118), and their call will always land on the most appropriate 112 PSAP, redirected by network routing mechanisms.
- The 112 call taker picks up the call and, if required, sets up a conference bridge with an interpreter.
- The 112 call taker locates the caller through a query to the MoI data centre (CED interforze), connected to telco operators' location databases (addresses for landline numbers; cell triangulation from mobile numbers)[2].
- The 112 call taker identifies the **Nature** of the call (public safety, medical rescue, technical rescue) and the **Reason** for the call, selecting one of the choices indicated in the SOP document and implemented in the 112 PSAP CAD software. There is no further qualification or detail about the emergency call by 112 call takers. Managing the emergency details, to decide the dispatch operations is left to the dispatching PSAP.
- The 112 PSAP call taker forwards the call **and** the incident information to the most appropriate dispatching PSAP, mapped by the SOP document and into the 112 PSAP CAD software. This is done as follows:
    - The 112 PSAP call taker contacts the dispatch PSAP by phone, alerting the dispatcher that an emergency call is on hold.
    - If the dispatcher is ready to continue the emergency triage, the 112 PSAP call taker transfers the call, forwards the data, and releases the call.
- Recording of the calls received by 112 call takers is done at the 112 PSAP premises for the whole duration of the communication with the citizen.

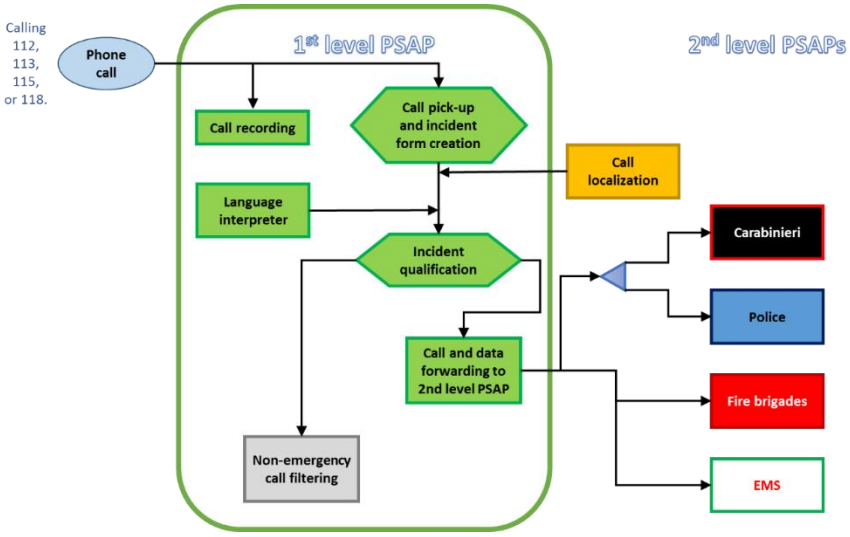


Figure 3: 112 call handling process, as described in the SOP document

The SOP document also describes cases to be managed, including, but not limited to:

- Handling of mute calls.
- Handling of calls dropped during the conversation.
- Handling of calls that require the intervention of more agencies.
- Handling of situations of call overflow.

[2] 112 PSAPs can locate calls also by other means explained in Chapter 3.2

3.2 | Call geolocation

The traditional caller location is done using the service provided by the MoI through its data centre, connected to the telecommunication providers. By law, telecommunication providers are obliged to provide the location of their subscribers to the MoI. Landline subscribers are located using the Provider's database, and mobile subscribers by cell triangulation.

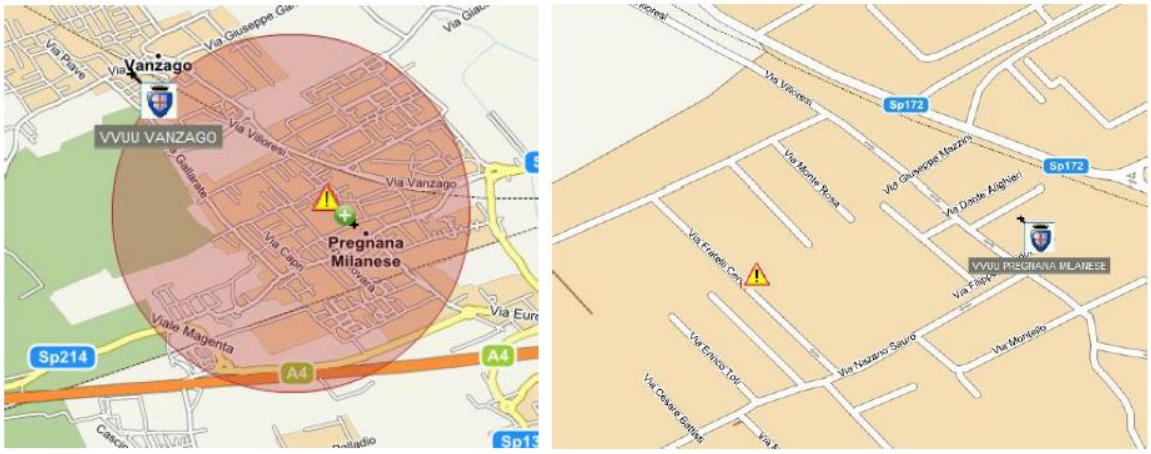


Figure 4: Caller location - mobile phones (LEFT), landline phones (RIGHT)

In both cases, the 112 PSAPs receive this location by requesting it to the MoI central geolocation datacentre using the CLI (Calling Line Identifier) and the OP-ID[3] (telecommunication provider identifier). This second parameter is particularly useful, because it allows the MoI to query for the location of the correct telecommunication provider instead of polling all of them, looking for the location information. The location information is retrieved in approx. 2-3 seconds and displayed directly in the 112 CAD software.

This technology was activated in 2011 in the first pilot 112 PSAP in Varese and is currently available in all other 112 PSAPs in Italy. In time, it was empowered by different geolocation methods described below.

3.2.1 | eCall

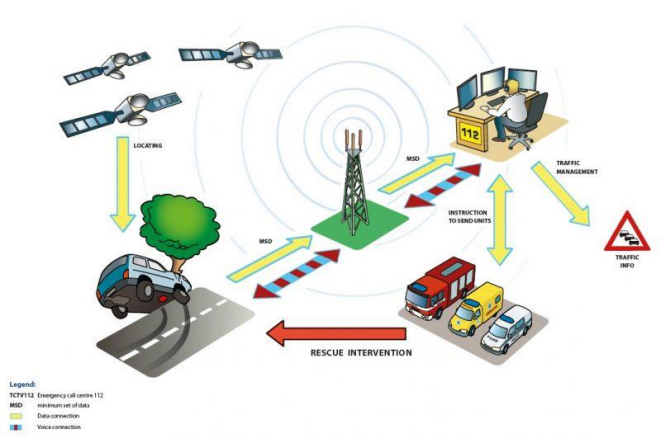
As the DECISION No 585/2014/EU[4] requires from all EU member states, AREU implemented eCall reception in 112 PSAP in Varese before the due date of March 2018. Furthermore, through an agreement with the MoI and other regions who already implemented 112 PSAPs, AREU is currently the manager of all eCalls for Italy. However, this agreement may be changed in the future, as other PSAPs are beginning their certification as eCall-enabled services.

Focus on: eCall

eCall is the European standard created to respond to an emergency requested from a car. Every newly homologated car, starting March 2018, must be equipped with an eCall in-vehicle system (IVS) able to send an in-band transmission during a car crash, or press an alarm button, to a 112 PSAP. This call is like a regular 112 call: free of charge and routed according to the national plan.

[3] The OP-id is carried on telephone signalling by telco operators, processed at the PBX level and passed to the 112 CAD system.
[4] For details about the EU regulation 2015/768 in matters of eCall, please click *here*.

The in-band message includes the three latest positions of the car, plus a series of other useful information to define the rescue plan for that incident. More information on eCall can be found in the references chapter at the end of this document.



3.2.2 | Smartphone app "Where Are U"

In July 2014, AREU launched its smartphone app for calling 112, "Where Are U". The app, available for iOS and Android phones, is used to call 112 and automatically send its GPS coordinates (or whatever location data is currently available on the phone) to the 112 datacentre. This geolocation data is much more precise than the regular MNO cell triangulation information, allowing more accurate results, especially in rural areas. Geolocation with Where Are U is in the range of a few meters, rather than 100-1000-5000 meters precision with regular cell triangulation.

The app evolved in time, and the latest version also includes the possibility of:

- Placing "silent calls": a particular type of call made by people who are not able or are in a situation where they cannot speak. The 112 PSAP call-taker will be signalled about a silent call being received, and they will follow a special procedure to handle this type of call and make sure the rescues will be provided.

- "Chat with 112": another function especially created for the community of deaf peoplebut available to anyone, "Where Are U" allows citizens to chat with 112 and explain their emergency. The chat is not automatically established.
- Regarding Italian law, when using the chat functionality, a regular phone call is placed and the 112 PSAP call taker is alerted of a chat request.
- It is the call taker who enables the chat session.

"Where Are U" requires an active data plan to enable the special functions described above. However, it can send its GPS position even without a data plan: when the app detects no data, it will automatically create an SMS with minimum data regarding the caller's position. AREU is the owner of the app infrastructure and agreed with the MoI to automatically make the app available to other 112 PSAPs. Every 112 PSAP in Italy can query both the MoI database for "traditional" geolocation and "Where Are U" servers.

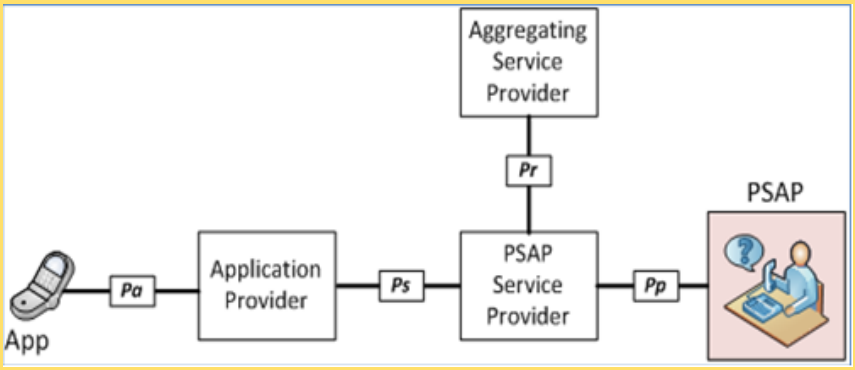
"Where Are U" is available worldwide on Apple's and Google's app stores, but it is tied to the Italian territory since it requires a connection to other PSAPs who would want to use its services. For this reason, AREU decided to join the PEMEA network to overcome the issue, deploying

standard[5] PEMEA servers that allow "Where Are U" to be used in other PEMEA-compatible countries.

Focus on: PEMEA

In Europe, several apps like "Where Are U" have been developed with the same scope: to provide accurate geolocation during an emergency call. But they all suffer from the same limitation: they are bound to the PSAP(s) who have commissioned them or decided to use them.

PEMEA (Pan European Mobile Emergency Application) is a standard protocol for data exchange between PSAPs and smartphone apps. The PEMEA logic is to remove such barriers by defining network nodes that connect apps and PSAPs, and make sure that any app can send geolocation information to any PSAP of the same network, wherever it is used not just inside their borders.



3.2.3 | AML

As of February 2022, Italy entered the final phase of testing for AML[6] deployment and the technology should be ready before the end of the year for AREU and all other 112 PSAPs in Italy, as required by the EU Directive 2018/1972[7].

3.3 | End of call handling

The duty of the 112 call-taker ends when:

- The emergency call is forwarded successfully to a dispatcher
- The incident form created on the CAD software by the call-taker is successfully forwarded to the same dispatcher. The integration developed on the 112 PSAP CAD software allows the call-taker to know if the data is received and read by the dispatcher on his screen.

Once these two actions are performed, the call-taker can close the incident and archive it (at 112 PSAP level).
From now on, the emergency is the responsibility of the dispatcher, who has to confirm with the citizen the data received from the call-taker (location of the call and general reason for the emergency) and continue the interview, to get a detailed description of the event, in order to create the most appropriate dispatch.

[5] For PEMEA standard, please refer to document *ETSI TS 103 478 V1.1.1*
[6] For AML standard, please refer to document *ETSI TS 103 625 V1.1.1*
[7] For the EU Directive regarding the implementation of geolocation sources, please read *here*.

4 | EU EMERGENCY NUMBER 112: MANAGING THE CHANGE

AREU's pilot project in Varese resulted in the decision made at the Ministerial level, to apply the same model to the rest of the Regions: The Italian Ministry of Interior created a special Commission (no. 75-bis), to discuss, define and approve the process on a national level assigning the responsibility (including responsibility on budget and planning) to implement it in every Region. AREU, as the pioneer of this new service, has acted as a mentor to the regions that decided to start their migration to their new 112 model, providing project management, training on procedures and technology.

11 years later, in 2022, 11 regions on 20 have implemented the 112 Model 3 described before and introduced by AREU. However, the adoption process is slow, due to the resistance to the change of well-established authorities that already had their tested protocols and procedures. Nevertheless, the remaining 9 regions are approaching the change faster, as now the 112 Model no.3 process has been validated and and the best practice of 11 regions proves it.

Figure 5: Regions with 112 PSAP model 3 implemented in Italy, February 2022

The main concern/reason to resist the change was:

"Adding a first level PSAP that receives all types of emergency calls and that has to filter them based on the type of incident will increase the emergency response time, making it less efficient and potentially dangerous for citizens, especially for medical emergencies."

This thesis was challenged by several explanations.

1) Accurate emergency filtering: 112 call-taking PSAPs helped other emergency dispatch agencies (fire, ambulance, police, Carabinieri) filter real emergency calls from everything that was not an emergency (prank calls, unappropriated calls, requests for information,

etc., especially during COVID times – see dedicated chapter below). Unappropriated calls are filtered by 112 call-takers, who forward only emergency calls to the dispatch agencies, together with the incident data collected by the software installed in the 112 PSAPs. This saved a lot of time for professional dispatchers who were often stuck with non-emergency calls directed straight to their PSAPs, before introducing first level 112 PSAPs. In 2018, during the conference "Unique Emergency Number: a model to be recognised", the National Chief of Police, Franco Gabrielli, the National Chief of Fire brigades, Bruno Frattasi and General Antonio De Vita from Carabinieri have all confirmed the increased quality of call response in their departments, after the introduction of Model 3[8].

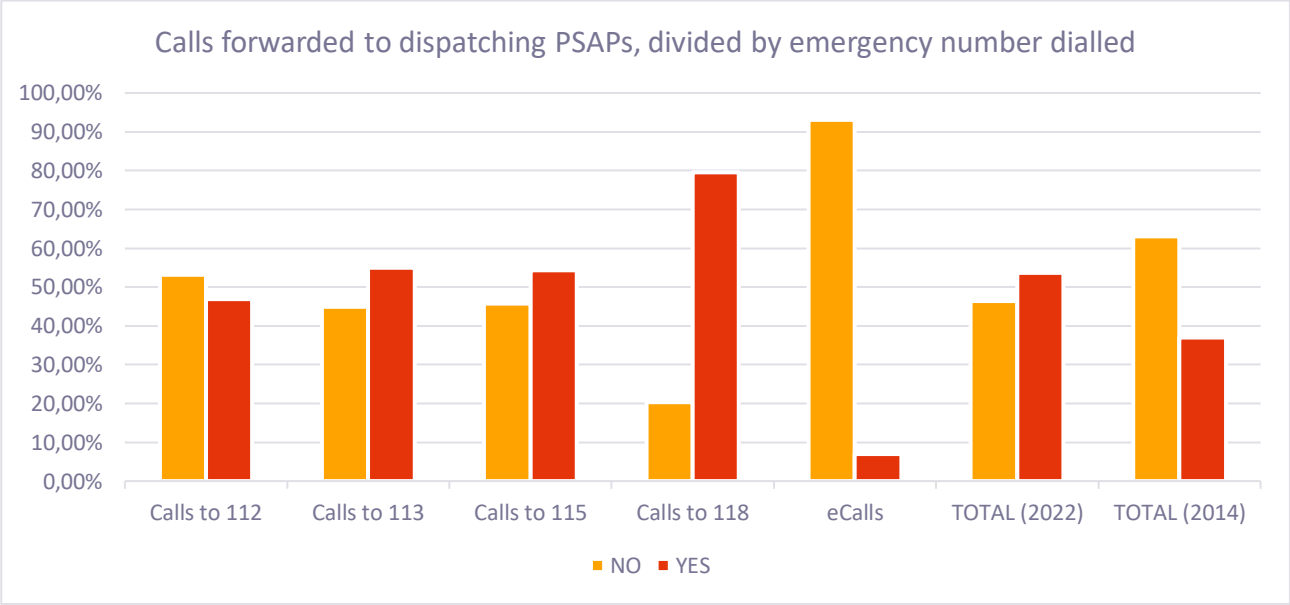


Figure 6: Calls forwarded to dispatching PSAPs.

Figure 6 shows that:

1)

a. Nearly 50% of the calls are not forwarded to dispatching PSAPs, reducing their workloads. Exceptions are 118 calls (health-related cases) whose majority is forwarded to dispatching PSAPs and eCalls, which seem to be primarly unappropriated calls instead of real emergency calls from cars.
b. Italians are still used to dialling the traditional emergency numbers (especially 118 for ambulances), although all calls are taken by the same 112 call-taking PSAP.
c. Comparing the total forwarded calls from 2022 and 2014, we can notice the reduction of unappropriated calls, thanks to the citizens' education and awareness of the existence of the 112 number.

2) Accurate call forwarding: as explained in the previous chapter, all emergency numbers still exist: 112 PSAP can determine which number was dialled and is can understand if the citizen dialled the correct number for his type of emergency or if they made a mistake. In that case, the call-taker can redirect the call to the proper dispatcher, avoiding a

[8] For more details on the conference, please refer to *this* article (Italian language).

misrouting of the call, which could land on the wrong type of emergency service, without a first level 112 PSAP.

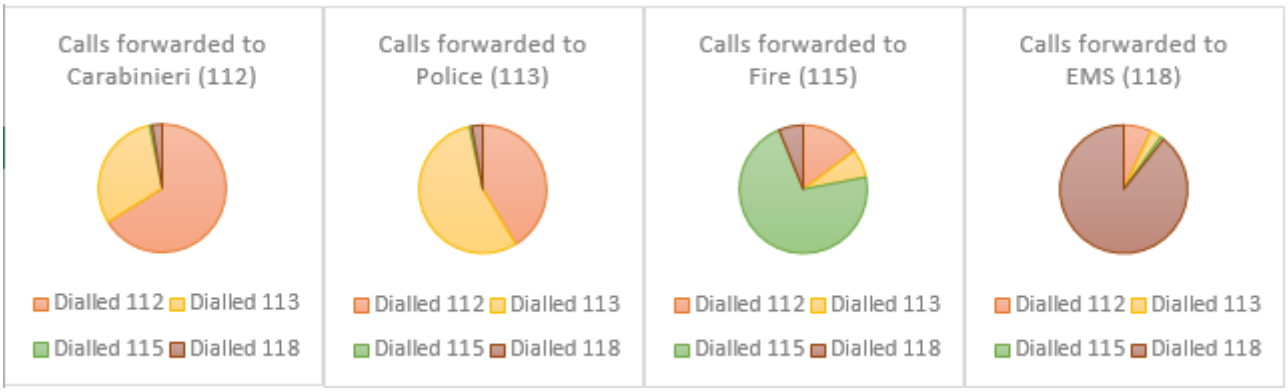
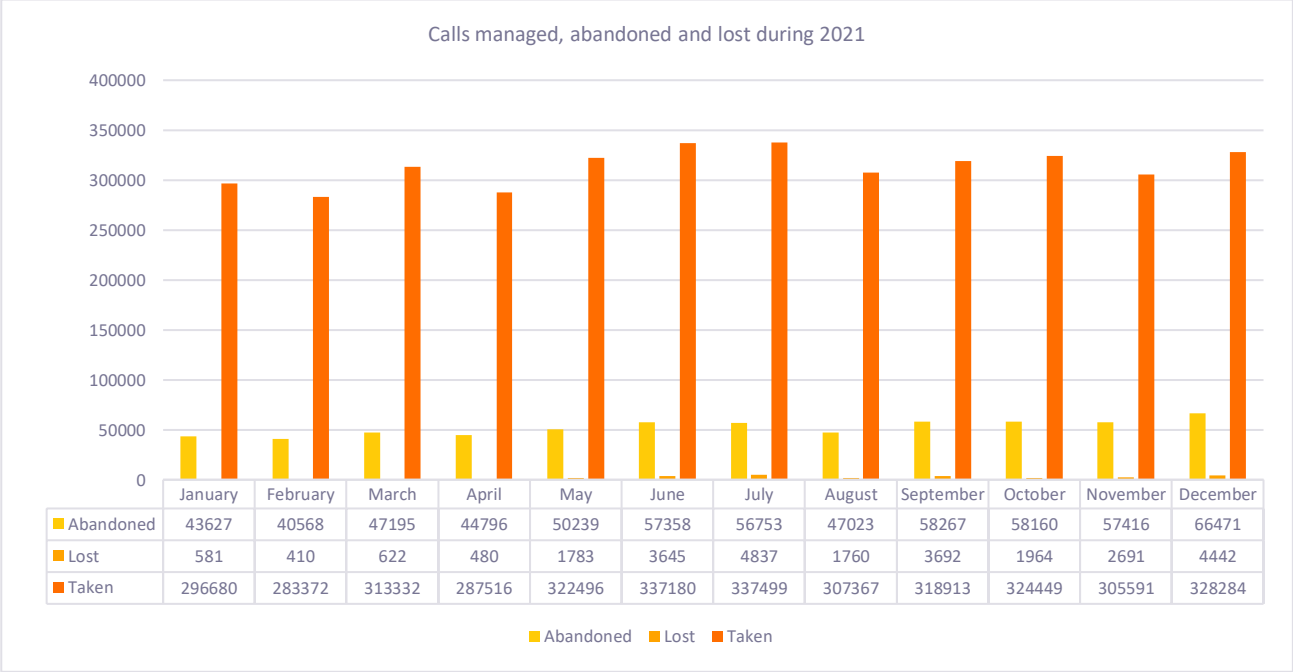


Figure 7: calls forwarded to dispatching PSAPs versus the original number dialled by the citizen

The previous graph shows how most emergency calls are being made using the appropriate existing number. However, a percentage of them (tiny in case of the Police/Carabinieri but reaching almost 25% in the case of firefighters) was made dialling a number different from the "desired" service. The 112 call-taker was able to identify the real reason for the call and eventually forward the call to the correct dispatching PSAP. Without the 112 call-taker, these calls would have landed directly on the wrong dispatching PSAP, slowing down dramatically the chain of rescue.

3) Proper data gathering: The two previous points resulted in a much more appropriate calculation of the engagement time of emergency agencies, their dispatchers, and their resources. Finally, proper information gathering forced a joint working plan and harmonisation of data among the several dispatching PSAPs that used to work independently, with different procedures and terminology.
4) Proper resource distribution: Redistribution of calls among the dispatching PSAPs also allowed an efficient redistribution of resources and shifts, optimizing the employment of human resources.
5) Increased perceived quality of service: 112 PSAPs can take almost 100% of the incoming calls, ensuring that citizens do not need to wait with the feeling of being left alone. The average answering time is 3 seconds, and the number of unanswered calls is around 2%. AREU can also determine the number of calls abandoned by citizens before a call-taker can pick it up. Citizens perceive a higher quality of the service offered, especially when compared with long waiting times when trying to reach some small overloaded PSAP, before the introduction of 112 PSAPs.

Figure 8: Average call waiting time throughout 2021



	January	February	March	April	May	June	July	August	September	October	November	December
Abandoned	43627	40568	47195	44796	50239	57358	56753	47023	58267	58160	57416	66471
Lost	581	410	622	480	1783	3645	4837	1760	3692	1964	2691	4442
Taken	296680	283372	313332	287516	322496	337180	337499	307367	318913	324449	305591	328284

Figure 9: Calls managed, abandoned, and lost throughout 2021

AREU can distinguish "abandoned" calls by a citizen and "lost" calls by the call-takers by defining the number of rings before a call is released:

a. If a call is released before 4 rings, it is considered abandoned by the citizen.
b. If a call is released after 4 rings, it is considered lost by the call-takers.

6) Last but not least, the very statement that "adding a 1st level filtering PSAP, would delay calls, compared to the previous model based on direct contact with a PSAP for every discipline", has been proven wrong by the collected data: AREU is the manager of ambulance services since 2008, so they have been able to compare call handling data from the period pre-Model 3, with the period post-Model 3, witnessing the improvement in the quality of service for citizens. The next chapter will explain this comparison in detail.

4.1 | Call management quality before and after the introduction of 112 Model 3

To demonstrate how the initial scepticism towards the introduction of Model 3 was probably the result of a feeling rather than a real case analysis, AREU decided to dig into its ten-years data warehouse, retrieving information to compare the average call duration in the pre-and post-age of Model 3 introduction.

The samples for the analysis were taken from the metropolitan city of Milan, that alone counts for almost half the population of Lombardy (even if the territory is divided into four macro-areas for medical emergency services), based on population density and geographical conformation.

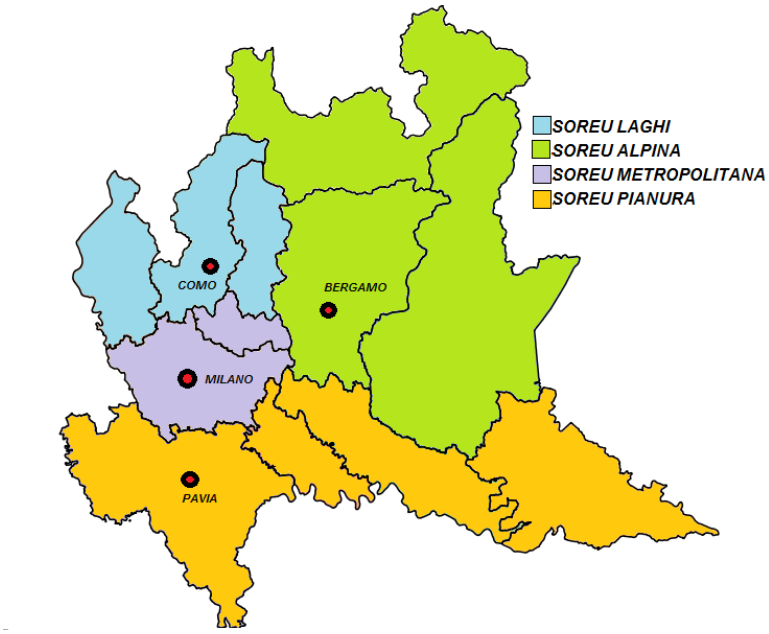
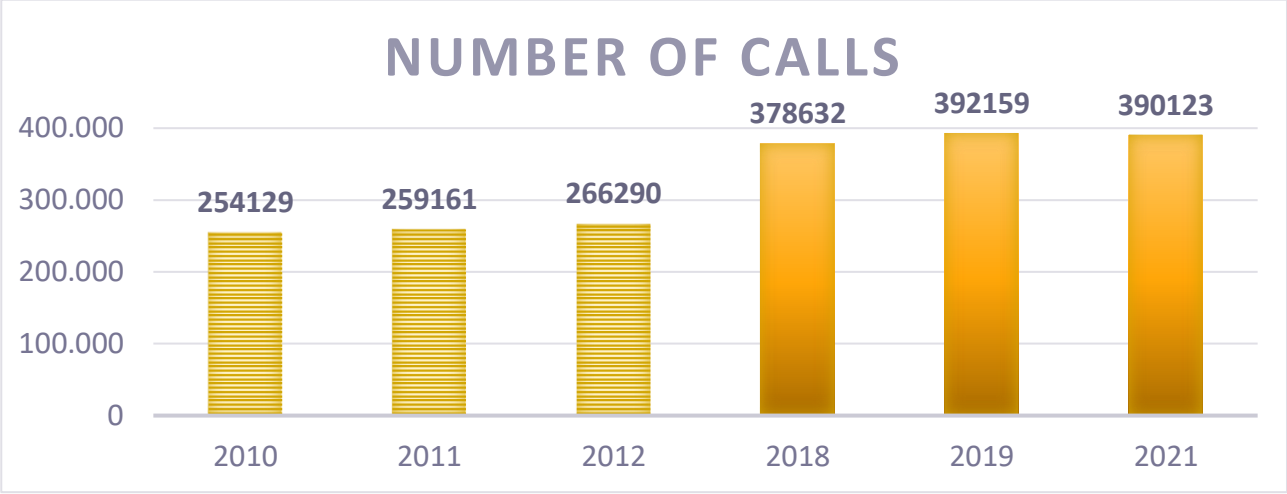


Figure 10: Subdivision of Lombardy based on emergency medical services jurisdictions

The number of calls analysed from that territory is the following:



The most relevant analysis was made on the time spent by call-takers, from call pick-up, until the end of the call geolocation process.

It has to be considered that in Pre-Model 3 times, this operation was done by ambulance call-takers/dispatchers, directly picking up the calls directed to the emergency number 118. Furthermore, the automatic location services introduced with Model 3 did not exist.

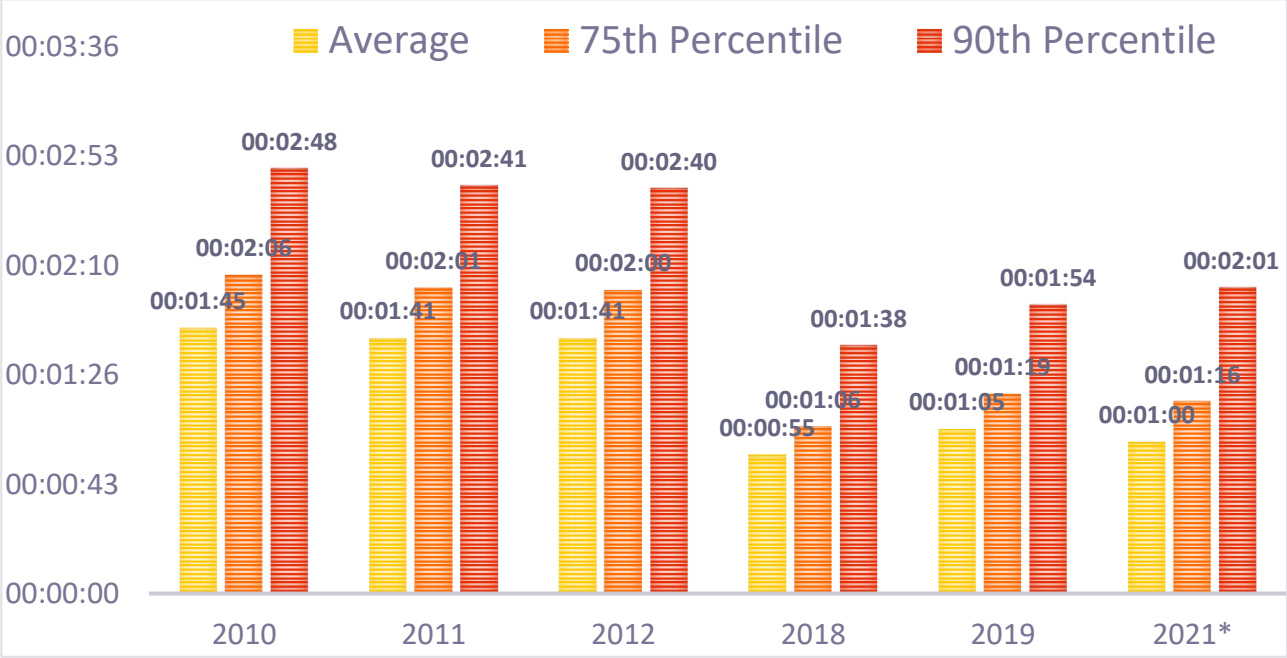


Figure 11: Time spent between call pickup and complete geolocation of the call

To better read those numbers, here's a summary of the situation:

Years	Sample	Average	75th Percentile	90th Percentile
2010/11/12	779.580	00:01:43	00:02:03	00:02:43
2018/19/21	1.084.950	00:01:00	00:01:14	00:01:51
Variation	+381.334	-43''	-49''	-52''
Improvement %		42%	40%	31%

Model 3 introduces a double-stage emergency call management, **but it does not extend the call management time. Instead, it reduces it by an average of 42%**, as the information gathered professionaly by call-takers allows the emergency professionals to concentrate only on the analysis of real emergency rather than spending time on inappropriate calls and non-emergency call related details.

5 | THE RESPONSE TO COVID

AREU was the first agency in Europe (and probably in the western world) to face a COVID outbreak after the World Health Organisation officially declared a global pandemic at the beginning of 2020.

All emergency agencies were preparing for the impact, but nobody suspected such a significant consequence on the medical services, hospitals and, in general, healthcare infrastructures.

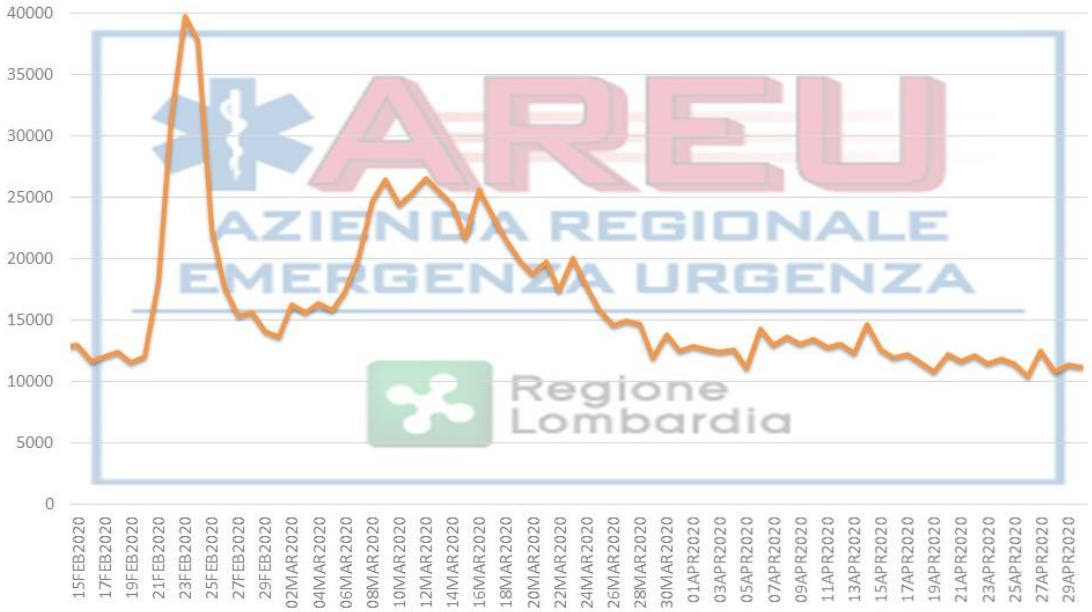
EENA dedicated an entire document[9] to explain how AREU faced the situation, so here we will just mention how one of the key factors to face the outbreak was the enormous work of adaptation of the 112 call interview filter made by AREU's healthcare experts.

In a matter of a few days, the healthcare team reviewed a dozen times the regular interview made by call-takers, trying to shape reasonable questions that would detect COVID symptoms rapidly. The flexibility and responsiveness of the technological platform used by AREU to respond to those optimisation efforts was a key element to putting in place the new procedures rapidly.

In parallel with interview filter optimisation, AREU worked on empowering ambulance dispatch, creating a temporary new dispatching PSAP, only for COVID cases, as well as a dedicated COVID information centre.

These measures allowed AREU to face an unprecedented situation, trying to keep the quality of emergency call response as high as possible without increasing dramatically the number of call-takers per shift and, at the same time, without creating a bottleneck on ambulance dispatchers.

During the first days of the COVID outbreak, with standard traditional procedures, the number of received calls overwhelmed the 112 PSAP, with waiting times reaching 10 minutes. However, in a matter of days, through the non-stop work of AREU, it went downto 12-15 seconds. Still higher than their average 3 seconds in non-pandemic times, but still a fantastic optimisation result.



[9] For more information on AREU's COVID approach, please read the document *here*.

Figure 12: Number of calls per day received by AREU 112 PSAPs in the initial period of the COVID outbreak. The peaks represent the two main outbreaks in Lombardy at the beginning of 2020.

All of that was possible thanks to the coordination between 112 and ambulance agencies granted by the deep integration that exists in Lombardy. As a result, each agency was able to be monitored in real time about their performances and the development of the contagion. It is a great lesson about the necessity of coordination between forces (especially medical emergency and the rest of the chain of command on the call emergency procedure, to avoid collapsing in such unpredictable times). It also shows how an integrated process, where every stakeholder performs its duties in combination with the others, can face a dramatic decrease in quality of service and climb back to a situation that can be considered outstanding, despite the medical crisis all around it.

6 | REFERENCES

EU Council Decision 91/396/EEC for matters concerning the introduction of 112 in EU Member States

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31991D0396

DECISION No 585/2014/EU for matters regarding eCall implementation in EU Member States

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0585&from=EN

EENA Document (2020) Emergency Call Handling Service Chain Description V 2.0 –

December 2020

https://eena.org/wp-content/uploads/2020_12_07_ServiceChainV2.0-final.pdf

ETSI standard document on PEMEA

https://www.etsi.org/deliver/etsi_ts/103400_103499/103478/01.01.01_60/ts_103478v010101p.pdf

ETSI standard document on AML

https://www.etsi.org/deliver/etsi_ts/103600_103699/103625/01.01.01_60/ts_103625v010101p.pdf

EENA document (2020) triage procedure in lombardy region, Italy

https://eena.org/knowledge-hub/documents/covid-19-triage-procedure-in-lombardy-region-italy/

Magazine article from *Quotidianosanità.it* about the 112 conference held in 2018 with all the emergency disciplines Chiefs.

https://www.quotidianosanita.it/lavoro-e-professioni/articolo.php?articolo_id=64288