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Managing Accessibility in Romania's 112 – Emergency Call Service

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Abstract. *Management of emergency call systems to be effective relies on the timely and inclusive reach of every individual. Often, in Romania, people with hearing and speech impairments face barriers when accessing the local emergency number (112). This paper looks at the data, regulations, and reports published on assistive technologies within Romania's emergency call management using a systematic literature review between 2015 and 2024. It examines Romania's 112 emergency call system, with a more in-depth lens on individuals with hearing and speech impairments. Romania introduced the Short Message Service at emergency number 113 in 2015, but only 11.75% of hearing-impaired people were registered eight years later, mainly because of the pre-registration system, low digital literacy, and socioeconomic disparities. The study compares the Romanian service with the one in the United States, Text-to-911, or the service in the United Kingdom, Emergency Short Message Service, to identify good practices for integrating assistive technologies. The article examines the resource allocation and the system's efficacy, and financial and operational metrics governing the 112 emergency call system in 2024, in the context of increasing demands. The analysis points out the role of emergency services in the public safety system, proposes an assessment of funding and user experience, and recommends investing more in the potential of assistive technologies to enhance the inclusivity of emergency response. In addition, the ongoing research advocates for more actionable policies that could contribute to the dialogue on inclusive and accessible emergency response systems.*

Keywords*:* emergency call, access, disability, technology, assistive.

Introduction

Emergency services on the globe aim to provide timely assistance for all in need, yet accessibility remains a persistent challenge for individuals with disabilities. In Romania, the reliance on verbal communication when calling on the 112 emergency system creates huge barriers for people with hearing or speech impairments. Although the SMS-113 service was introduced to mitigate the multiple challenges, its limited and slow adoption suggests that systemic issues need investigation. This study explores barriers and practical solutions to enhance the inclusivity of emergency response systems.

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In Europe, dialling 112 connects individuals to emergency services, including ambulances, fire departments, and the police, but the services seem to be less accessible to individuals with disabilities. The following question can be posed to answer the issue: What happens when a disabled person cannot communicate effectively? The present paper examines the challenges individuals with hearing or speech impairments face in expressing their immediate urgencies to the 112-call center or the associated responding agencies. In Romania, the current system has been designed primarily for verbal communication, becoming a barrier for those who cannot use voice calls.

The paper concludes that resolving the needs of individuals with disabilities and including them in emergency response is vital during crises. The Sendai Framework for Disaster Risk Reduction highlights the importance of inclusive disaster preparedness and response options to look at the intersectionality of disability with other overlapping vulnerabilities (Bennett, 2020). The social model of disability stresses the role of societal barriers, key in shaping policies and practices that promote more inclusion. This model reveals that addressing contributing factors from the context of the environment and systems aiding in the marginalisation of disabled individuals leads to developing more effective intervention systems (Mladenov, 2021). Emergency services serve as a lifeline and immediate help, especially for vulnerable populations, providing that access is a matter of convenience and human rights.

Previous studies have highlighted the successful response of text-based emergency communication systems (Chiu et al., 2010; Ellcessor, 2019). Services like Text-to-911 (United States) and Emergency SMS (United Kingdom) have improved accessibility for individuals with hearing and speech impairments. However, until now, very limited research has focused on the SMS-113 service from Romania, particularly related to user adoption, operational bottlenecks, and comparative efficiency. This study uses these perspectives by analyzing Romania's SMS-113 system, international best practices, and identifying actionable areas to improve the current version.

"SMS (Short Message Service) is a prevalent form of electronic communication among the deaf, with many utilizing it regularly. This highlights the need for mobile phones to robustly support text-based communication, as auditory functions are often inaccessible to these users." (Chiu et al., 2010, p. 174). The integration of text messaging into emergency communication systems, particularly through the Text-to-911 service, substantially increases accessibility for individuals with disabilities. This service enables communication with emergency services to users who are deaf, hard of hearing, or unable to speak, particularly in situations where speaking may not be safe or feasible. The communication during emergencies becomes efficient and enhances the speed and quality of responses, potentially saving lives. (Ellcessor, 2019)

This research provides an analysis of Romania's SMS-113 service, looking more in-depth at implementing efficiency, user accessibility, and other national systems. By identifying systemic barriers, such as limited public awareness and a cumbersome registration process, this study contributes to both academic literature review and policy-making design and implementation. The proposed recommendations aim to enhance service adoption and ensure more equity in accessing emergency response systems for all citizens. According to the Special Telecommunication Service (STS) 2015 report, Romania has taken key steps to enhance accessibility of the emergency response system by introducing the SMS-113 service. This service was designed to assist individuals with hearing and speech impairments, allowing them to communicate their emergencies via text messages. Despite the SMS-113 service enhancing inclusivity, challenges related to accessibility and user awareness persist, hindering the service's

full potential (Radu et al., 2019). The system further needs development and outreach initiatives to provide timely and quality access to emergency to all individuals.

Repanovici, R., and Nedelcu, A. have highlighted that mobile emergency alert applications will facilitate quicker resource dispatch during emergencies and a more efficient emergency response compared to traditional methods like SMS and voice calls (Repanovici & Nedelcu, 2022). A comparative analysis, conducted by domain experts, revealed that mobile applications proved to be a better choice than SMS in terms of the effectiveness of the response during emergencies and crises. This assessment was based on a multi-criteria analysis that compared and evaluated a variety of communication methods, ultimately favouring mobile applications as the most effective means of communication in crises. Despite the advantages of mobile applications, in some cases, the SMS still plays a vital role in responding to people's emergencies, particularly in areas with limited internet connectivity or in places where mobile applications may not be accessible. (Repanovici, 2021).

In order to enhance the understanding of the effectiveness of using mobile applications in emergency communication within Romania, a systematic literature review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. This approach was selected and preferred among others given its transparency, rigour, and capacity to create summaries of a variety of sources, thus enabling the formulation of two critical research questions. These questions are, firstly, on how individuals with disabilities can effectively communicate emergencies to the 112 emergency service in Romania, and secondly, whether the Romanian emergency SMS-113 can be considered an Assistive Technology (AT) instrument.

In 2024, Romania allocated 322,489,299 euros for the 112 emergency call system to enhance and improve, and potentially reach all citizens in time. An expenditure review of the entire system showed that 30 percent is allocated by European Union projects, while the state budget invests 41% in staffing costs, 12% in current operational expenditures, and 17% in capital investments. Excluding EU funding, the national expenditure was approximately €225,742,509. The system's capacity to handle 9,763,443 calls yielded an average cost of €23.11 per call, emphasising that Romania’s efforts in strategically investing in improving and modernizing the infrastructure as a quality support system of the emergency response and as well as enhancing capacity to use a robust and consistent emergency response framework. No particular data on accessibility for people with disabilities or the cost per call was found in other European countries.

Our research reveals a significant gap in the literature, particularly regarding the integration of assistive technologies into Romania's emergency services. The present study aims to present some of the missing evidence by broadly analysing the SMS-113 service and the potential for improving emergency accessibility, including for individuals with disabilities.

Methodology

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page et al., 2021), this study conducted a systematic literature review of sources published between 2015 and 2024. Databases such as Google Scholar and trusted Romanian websites (www.sts.ro, www.anpd.ro) were used. Search terms included 'emergency call Romania' and 'assistive technology in emergency management.' Inclusion criteria focused on studies addressing emergency communication for individuals with disabilities, while exclusion criteria

removed irrelevant or duplicate content. Data were analyzed by topics to identify trends in increasing accessibility, rate of technology usage, and inclusion policy gaps. The conclusions can improve transparency, facilitate literature synthesis, tackle biases, and bring into discussion a multidisciplinary approach, important elements for informed decision-making when using assistive technology to enhance the Romanian emergency call management.

Following the PRISMA framework outlined by Page et al. (2021), subsequent steps were implemented to conduct the literature review. Two inquiries were formulated, followed by establishing five criteria for inclusion and three for exclusion to refine the search methodology. The findings were systematically arranged in Table 1. The outcomes of the search strategy were organized into three tables, reflecting the specific terms employed during the investigation. Findings were also summarized before each table presented in the results section. In the discussion section each finding was analysed and summarized. A comparative analysis of a typical emergency call management system was carried out utilizing assistive technology, and the research questions were addressed. This research aimed to investigate the following key research questions:

1. How can individuals with disabilities effectively communicate emergencies to the 112 emergency service in Romania?
2. Can Romanian emergency SMS-113 be considered an Assistive Technology (AT)?

The literature and website data review included the following criteria: i) Studies, articles, trusted website data /statistics between 2015-2024 (characterized by their verifiability, reliability, and security measures), written in English and Romanian; ii) emergency calls flow chart Romania and iii) call management of disabled people in Romania

Some literature and website data reviews were excluded for the following reasons: i) irrelevant focus on the Romanian emergency call management, ii) duplicated works or website data, and iii) the team found the website source was not trusted.

Search Strategy

This research used the Google Scholar database to identify the articles. To access the websites, we used Google as our search engine. The set of search terms was emergency call Romania, assistive technology Romanian emergency call management; because we did not find articles according to our search criteria, we extended our search to GOOGLE, and we extracted articles from the following trusted Romanian websites such as www.sts.ro, www.anpd.ro, www.portal.just.ro. To explain terms like assistive technology, disability, or hearing impaired, we used the American Psychological Association (APA) dictionary from 2015. We also included data based on answer no.101176 from November 7, 2024, received from STS, related to the number of people who used SMS-113 in 2023 and the number of those registered in their database.

In Table 1 below, items are presented, reviewed, accounted for, and some were removed from the research. We found twenty-three articles on Google Scholar, applying our search criteria. However, after we studied their abstracts and conclusions, we eliminated them because of irrelevancy regarding Romanian emergency call management. Applying the same criteria on the Google search engine, we found twenty articles from trusted websites as follows: four articles about Romanian emergency call management from www.sts.ro, thirteen articles regarding disability frameworks, and two about 112 Romanian emergency calls from www.legislatie.just.ro; we also extracted one statistics about disabled people in Romania from www.anpd.ro.

Table 1. Systematic review, identification of studies via databases and websites

Phase	Number of items analyzed	Comments on items removed
Identification	Records identified from: Google Scholar n=23 Website data/statistics n=20 www.sts.ro n=4 www.legisltie.just.ro n=15 www.anpd.ro =1	Records removed *before the screening*: From Google Scholar=23 The website article was removed. (n=0)
Selection	Analysed Studies (n = 23) analyzed website data/statistics. (n=20)	Excluded Records From Google Scholar ER1 - Irrelevant Focus on the Romanian emergency call management =23 The website article was removed. (n=0)
Eligibility	Studies evaluated for inclusion. (n =0) Website data/statistics (n=20)	Exclusions after full-text analysis: N=0 (n=0) Nonrelevant for this review The website article was removed. (n=0)
Included	Studies included in the review. (n = 0) Website data/statistics (n=20)	

Source: Authors' own research adapted from PRISMA flow diagram Page et al., (2021)

Results and discussion

Table 2 explains terms such as assistive technology, disability, and speech delay (APA, 2015) to provide a clear understanding of the study's key concepts. These terms are useful for comprehending the role of assistive technologies in improving emergency service access for individuals with disabilities.

Table 2. Description of the terminology used

Source	Word/expression	Explanation
APA (2015)	Assistive technology (AT)	Any item or system designed to increase, maintain, or improve the functional capabilities of individuals with disabilities.
	Disability	A wide range of physical, mental, and emotional conditions significantly limit one or more major life activities.
	Deaf	It is a condition characterized by a partial or total inability to hear, which can vary in severity and impact communication and social interaction.
	Speech delay	Significant lag in the ability to produce spoken or understand language compared to peers of the same age.

Source: Adapted from APA dictionary (2015).

Based on the definition of Assistive Technology (AT) we analyzed the features of the SMS-113 Emergency service to determine if it meets the criteria for being classified as an AT. The definition of AT refers to any tool, device, or system specifically designed to increase, maintain, or improve the functional capabilities of individuals with disabilities. According to this definition, an AT must serve a clear purpose in assisting individuals with a specific functional limitation related to their disability.

SMS-113 supports communication during an emergency for people with hearing or speech impairments. The service was implemented in Romania to address the challenges faced by these people, who are often unable to communicate effectively through voice calls at the 112 emergency system.

The key features of SMS-113 position it in the class of Assistive Technology tools designed to enhance functionalities for users with disabilities, access to emergency services, system integration with other applications, and increased autonomy. SMS-113 significantly enhances the ability of deaf and speech-impaired individuals, offering reliable ways to access emergency services. It allows these individuals to transmit emergency messages via SMS to 113, which is then forwarded to the appropriate emergency responders. One of the capabilities of the SMS-113 system is explicitly designed to meet the needs of individuals with disabilities, particularly those who are deaf, hard of hearing, or have speech delays, by sending messages through SMS to the number 113. This function is designed with a clear intention to serve individuals facing challenges in verbal communication. SMS-113 embodies the main purpose of AT, to mitigate the functional limitations that disabilities can impose. By facilitating direct communication during emergencies, the SMS-113 enables individuals with disabilities to receive timely and quality assistance from the police, ambulance, or other emergency services, thus improving their safety and response times during critical situations. SMS-113 is integrated into the national emergency response system (112), which ensures direct contact with users without requiring the intervention of additional third-party intermediaries, such as a sign language interpreter, making the process quicker and more efficient. The service provides greater autonomy to individuals with hearing or speech impairments, as they no longer need to rely on others to make emergency calls on their behalf, reducing potential delays, especially in critical interventions. This aligns with the goal of AT, which is to enhance autonomy for individuals with disabilities, and it is illustrated in Figure 1 below, showcasing the enhanced accessibility.

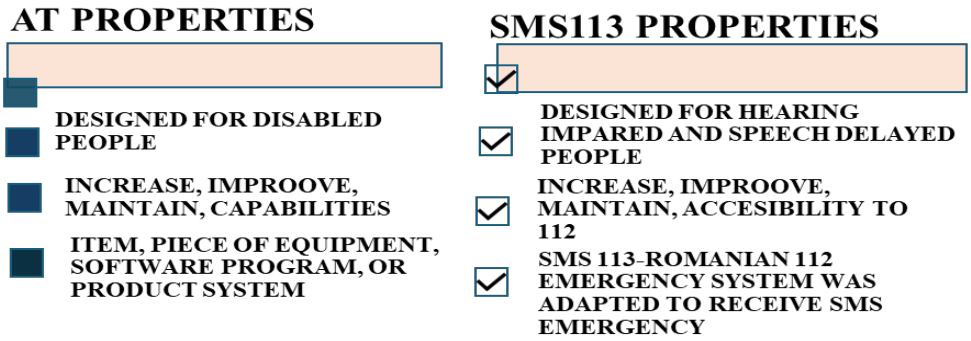

Figure 1. AT versus SMS113 Properties

Source: Authors' elaboration adapted from APA dictionary (2015)

Table 3 below summarizes the legal framework for Romanian disabled people and 112 emergency calls, found and extracted from the website https://legislatie.just.ro/. This table outlines a chronological list of key legal documents that have shaped the framework for disability rights and the inclusion of individuals with disabilities in Romania. The documents range from foundational laws established in the early 2000s to more recent legislative efforts aimed at improving accessibility and integrating people with disabilities into society.

The timeline begins with Law No. 272/2004, which focuses on children's rights and lays the foundations for policies related to disability inclusion. In 2006, Law No. 448 was introduced, marking a key milestone in Romanian legal history by providing a better approach for addressing the rights of people with disabilities. This law set out specific provisions for accessibility, education, rights, and employment, reflecting a significant shift in how the country approached disability rights. In the following years, further legal developments supported the alignment of

Romanian laws with international standards and good practices from other countries. Law no. 221/2010, ratifying the UN Convention on the Rights of Persons with Disabilities, was another milestone, proving that Romania's disability policies adhered to global norms, paving the way to more inclusion in the system. Subsequently, Law No. 292/2011 and Law No. 197/2012 established social assistance standards critical for supporting disabled individuals in their daily lives.

In recent years, Law No. 8/2016 and Law No. 7/2023 proved Romania's commitment to comprehensive support and protection for disabled people. They mainly focused on deinstitutionalization efforts and promoted independent living and dignity.

Additionally, several resolutions passed by the Romanian government, such as Resolution No. 268/2007 and Resolution No. 1543/2022, have provided the necessary regulatory framework and methodologies for implementing the laws. The regulations cover areas such as upholding rights for persons with disabilities, accelerating deinstitutionalization processes, and developing national strategies for disability rights.

Table 3 below also includes Government Decisions, like Decision No. 34/2008, which organized Romania's 112 emergency services and laid the foundation for the Special National Unified Emergency System (SNUAU). These decisions are critical for understanding how the country's emergency response framework intersects with its disability laws, ensuring that people with disabilities are included explicitly in the national emergency response system.

Table 3. The legal framework governing disabilities or the emergency call system

No	Title	Title of the legal document	Summary of the document
1	Law no. 272/2004 Government of Romania (GOV) (2004)	The law on the protection and promotion of children's rights	Establishes legal provisions for protecting, promoting, and respecting children's rights in Romania, ensuring their development in a family or family-like environment.
2	Law no. 448/2006 GOV (2006)	Law on the protection and promotion of the rights of persons with disabilities	It focuses on protecting and promoting the rights of persons with disabilities, ensuring their integration into society and equal access to services.
3	Law no. 221/2010 GOV (2010)	Ratification of the UN Convention on the Rights of Persons with Disabilities	Romania aligns the rights of persons with disabilities to the UN Convention and its Optional Protocol.
4	Law no. 292/2011 GOV (2011)	The Social Assistance Law	Defines the requirements and framework for social assistance services, as well as the policies around social inclusion and support for vulnerable groups.
5	Law no.197/2012 GOV (2012)	Law on quality standards in social services	Establishes the quality standards for social services to ensure efficiency, transparency, and protection of beneficiaries' rights.
6	Law no. 8/2016 GOV (2016)	Implementation mechanisms for the UN Convention on the Rights of Persons with Disabilities	Introduces mechanisms to align national legislation with the Convention, enhancing the protection and promotion of the rights of persons with disabilities.
7	Law no. 7/2023 GOV (2023)	Deinstitutionalization of adults with disabilities	Emphasizes deinstitutionalization, aiming to accelerate the process and prevent institutionalization of adults with disabilities through community-based services.

No	Title	Title of the legal document	Summary of the document
8	Resolution no.268/2007 GOV (2007)	Methodological norms for Law no. 448/2006	Approves the application norms for implementing the provisions of Law no. 448/2006, detailing procedures for granting rights to persons with disabilities.
9	Resolution no.118/2014 GOV (2014)	Methodological norms for Law no. 197/2012	Establishes procedures for applying quality standards in social services, ensuring proper monitoring and evaluation.
10	Resolution no. 867/2015 GOV (2015)	Approval of the Nomenclature of Social Services	Defines social services' classification, organization, and operation, ensuring standardized service delivery across Romania.
11	Resolution no. 234/2022 GOV (2022)	Organization of the National Authority for the Protection of the Rights of Persons with Disabilities	Regulates the duties, structure, and functioning of the authority responsible for disability rights protection.
12	Resolution no. 490/2022 GOV (2022)	National Strategy on the Rights of Persons with Disabilities "A Fair Romania" 2022-2027	Approves the strategy aimed at promoting equality, accessibility, and inclusion for persons with disabilities.
13	Resolution no. 1543/2022 GOV (2022)	National Strategy for the prevention of institutionalization and deinstitutionalization of adults with disabilities 2022-2030	Outlines measures to prevent institutionalization and accelerate deinstitutionalization, promoting community-based living alternatives.
14	Government Decision, no. 34/2008 GOV (2008)	Regulation of Romania's 112 emergency services	Governs the organization, operations, technology, and financing of the 112 emergency service, establishing the SNUAU and defining the responsibilities of involved institutions.
15	Government Decision No. 682/2009 GOV (2009)	Instructions for coordinating the Single National Emergency Call System (SNUAU)	Adopts organizational and operational instructions for the National Committee coordinating the 112 system, ensuring efficient emergency response management.

Source: Authors' elaboration based on the information extracted from the website https://legislatie.just.ro/

In Table 4, we grouped our findings about Romanian emergency call management and SMS-113 emergency service, as reported by the www.sts.ro website. This table provides a detailed comparison of the processes of managing emergency calls via voice and SMS-113 in Romania. Understanding the key differences between these two communication methods is key to understanding how the system assists individuals with disabilities, especially those who are hearing—or speech-impaired.

In order to use the SMS-113 system, individuals must pre-register their details in the Special Telecommunications Service's (STS) database, which includes personal details and the phone numbers from which they may initiate emergency SMS calls. This requirement ensures the system will process emergency messages for these individuals promptly, but at the same time, it limits access to those who have registered. It also creates a barrier for individuals who may not know the registration process or have not yet completed it, reducing the system's accessibility for those needing help.

Additionally, Table 4 shows how SMS-113 users must initiate an emergency call via voice before sending an SMS. This is the main difference from the standard voice call process, where the emergency call automatically connects the user to an operator. The requirement for SMS-113 users to first make a voice call enables the system to capture location data, but also introduces more complexity. Individuals with hearing or speech impairments may find it challenging to complete this step, especially if they are not in a location with strong network connectivity or are unable to communicate verbally during the call.

These additional steps for SMS-113 users may hinder the speed and efficiency of emergency response, revealing that although it was designed to enhance response, it still requires technology enhancement and steps in the response process to be removed. While SMS-113 provides an alternative communication way for people with hearing and speech impairments, the requirements for registration and voice call initiation may slow the emergency response process, especially in high-stress and difficult situations. Despite these potential challenges, SMS-113 remains at the core of policies and solutions to improve inclusivity within Romania's emergency management system. However, these limitations should be considered when evaluating the effectiveness of the service and exploring ways to streamline the process for users, guaranteeing that all individuals, regardless of their abilities and capabilities, can obtain a prompt response and effective assistance during emergencies.

Table 4. Voice call 112 and SMS113 management in Romania

No.	Title	Summary
1	Voice call 112 STS (n.d.)	This document describes how to manage a voice call and provides the flow of a call to 112 Romanian emergency numbers.
2	Instructions for using the SMS 113 STS (2015)	The instruction is addressed to all people with hearing and/or speech disabilities who have the legal right to send emergencies to the number 113 via short SMS messages associated with an emergency call to 112. They have the legal right to communicate via SMS to the number 113 the person with hearing and/or speech disabilities who has previously registered in the SNUAU database, applying the "Operational Procedure for the registration in the SNUAU database of people with hearing and/or speech disabilities and the telephone numbers from which they can call the "Emergency Service 112" by short messages (SMS) sent to the number 113" available on the website- www.112.ro.
3	Emergency number 113 STS (n.d.)	The SMS 113 service is the solution implemented by the Special Telecommunications Service to support people with hearing and/or speech impairments or with hearing and/or speech disorders proven by a medical document who need the help of intervention agencies: Ambulance, SMURD, Police, Firefighters, and Salvamont. They provide a video with a gestural mime interpreter who explains the flow of a 113 SMS call in sign language.
4	Advanced Mobile Location (AML) and sms-11, STS (n.d.)	AML, also available for SMS 113, supports people with hearing impairment and/or speech delays. The transmission of geographical coordinates from the phone is carried out only if you access the emergency service by calling 112 or by SMS to 113 (only from phones equipped with the Android operating system). After making the emergency call, AML automatically stops and no longer generates location data.

Source: Authors' elaboration based on information provided on the website www.sts.ro.

According to STS (2015), the SMS-113 emergency has been available since 2015. As we illustrated in Figure 1, the steps in managing the emergency call and SMS 113 are different. The last one requires deaf or speech-delayed persons to be registered in the 112 system and has three more steps than managing the voice emergency call. The SMS 113 emergency demands to

generate first a 112-emergency call because, like this, the 112 system receives the caller's location and, if generated from a smartphone with an internet connection, an Advanced Mobile Location (AML). STS (n.d.). After they generate an emergency call, if they are registered in the system, the 112 operators will send them an SMS with the following text:" Send an SMS to 113 with the emergency and the address of the event." The person needing help will send an SMS to 113 with the required information. The 112 operators are sending the information received from the text message to the dispatch agencies involved to resolve the emergency. A comparison between the two flows is presented in Figure 2 below.

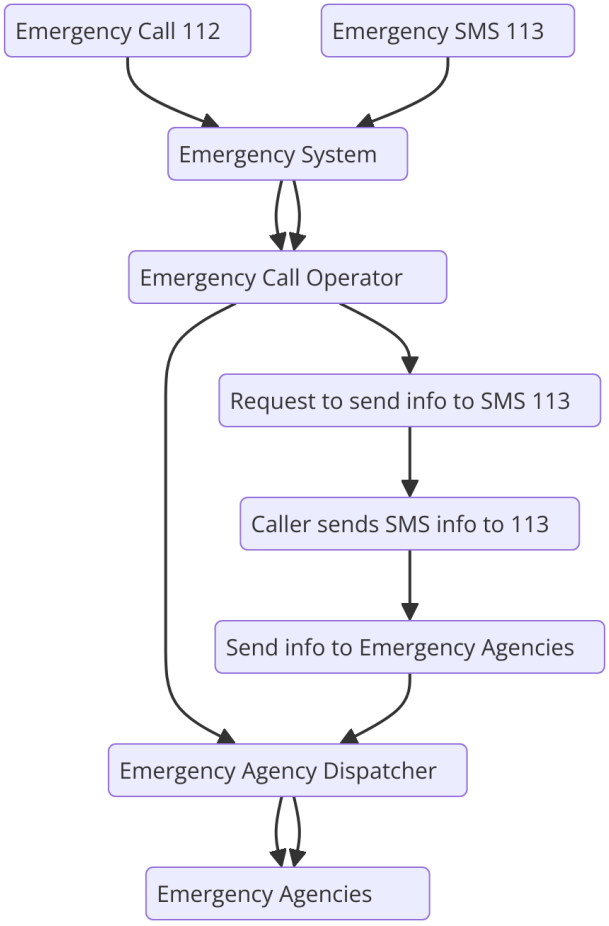

Figure 2. Emergency call flows – 5 steps versus 8 steps
Source: Authors' elaboration adapted from STS information.

According to the National Authority for Disabled People Romania (ANPD), in the last quarter of 2023, the number of people with hearing disabilities and deaf-blindness in Romania was 23.649; from this number, 1.987 were children. ANPD (2024)

Based on answer No.101176 from 07.11.2024, received from Special Telecommunication Service Romania (STS), the number of emergency cases received in 2023 associated with calls from emergencies sent to number 113 by people with hearing impairments and/or language delays was 41. The number of people with hearing impairments and/or language delays recorded in the SNUAU database is 2.546. According to these numbers, only 11.75% of deaf people from Romania were registered in the Romanian 112 Emergency System.

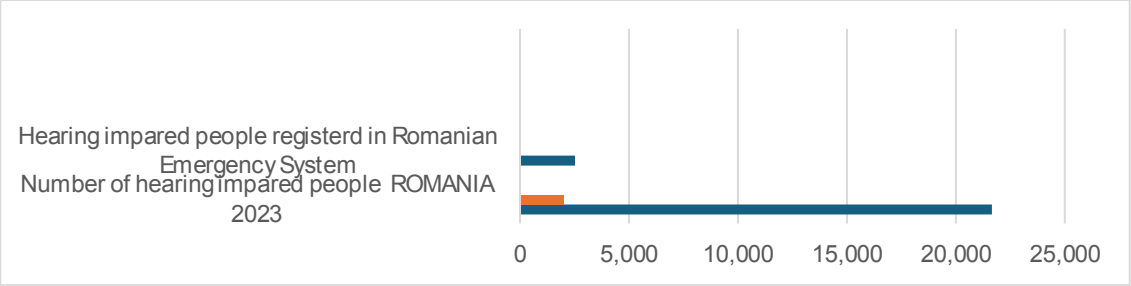

Figure 3. Hearing impaired people 2023 registered to the Romanian emergency system.
Source: Authors' elaboration adapted based on ANPD (2024) And STS answer No.101176.

Table 5 below compares the Romanian SMS 113 emergency with three other countries, highlighting that Romania is not the only country that requires registration.

Table 5. Compared SMS emergency systems

	Romania	Sweden	Hungary	The United States of America	United Kingdom
Name of the service	SMS 113	SMS 112	SMS 112	Text to 911	Text to 999/ Text to 112
First time launched	2015	2013	2019	2009 (Iowa)	2009
Need to register	Yes	Yes	No	No	Yes
Availability throughout the country	Yes	Yes	Yes	No It is not available in New Mexico	Yes

Source: Authors` elaboration based on European Commission Report (2024), NENA 911 (2014), GOV.UK (2024).

The literature highlights several potential obstacles to the adoption of alternative or assistive technologies, including digital literacy, socio-economic disparities, and institutional challenges. Numerous potential users may lack the requisite skills to send text messages or be unfamiliar with the specific protocols required for emergency communication. Research indicates that psychological barriers, such as fear of technology or lack of confidence in using digital tools, can impede effective communication in emergencies. Bobyreva et al. (2021) The socio-economic disparities were mentioned by Smith et al. (2021) "marginalized communities often face systemic barriers that hinder their access to essential services, including emergency response systems." Many emergency response systems are not designed with universal accessibility, which can lead to confusion and inefficiencies when individuals attempt to use these services. Gjøsæter et al. (2021)" Universal Design will be an evident and obligatory feature of any Emergency Management system."

The costs for the 112 Emergency Call Program have been distinctly captured in the balance sheets and annual statements of the Special Telecommunications Service since 2023, under the program called "Modernization, development, maintenance, operation, and ensuring the protection of special and cooperation networks and services, including the Single National

System for Emergency Calls 112". No data and information were available regarding the costs of the SMS 113.

The STS data demonstrated effective resource utilization by the emergency system, successfully aligned to global cost-efficiency benchmarks, proving that it managed approximately 9.7 million calls in 2024. Among these calls, 60% were classified as genuine emergencies. The distribution of service requests to different authorities showcases a predominance of medical emergencies (48%), followed by police-related incidents (25%), fire and rescue operations (19%), Gendarmerie interventions (6%), and other agency calls (2%). The prevalence of medical emergencies is consistent with trends observed across the European Union, where health-related emergencies constitute a substantial portion of 112 call traffic.

The average cost per emergency call varies across the EU, contingent on different national infrastructures and funding models. Romania's figure of €23.11 per call serves as an example of efficient resource allocation. This operational efficiency, indicated by the cost per call, is largely influenced by economies of scale; higher call volumes allow the distribution of fixed costs, including infrastructure, training, and technological investments, across a larger number of service units, thereby optimizing financial management.

The primary objective of the EU in standardizing the 112 emergency system is to facilitate uniform access to emergency services and to reduce response times. Romania's performance, particularly a response time of 5.1 seconds and cost efficiency, aligns with these objectives. Handling 5.86 million urgent calls at this cost level results in substantial economic and health-related savings, even decreasing the number of potential casualties. The effectiveness of prompt emergency responses is underscored by lower mortality rates and decreased hospital admission costs. This can yield broader economic benefits by minimizing disruptions from workplace accidents and road incidents.

Assessing the efficiency in emergency call systems covers key dimensions such as response times, resource allocation, and cost per call. Romania's 112 system adopts a balanced methodology, significantly investing in human capital and infrastructure while diligently leveraging EU funds to enhance technological capabilities. However, the high percentage of non-urgent calls, constituting 40% of total calls, signals a pressing need for public awareness on emergency and non-emergency situations and refined triage protocols to optimize resource deployment.

The EU investments in recent years have included expenditures amounting to 177 million euros in 2023 and 2024 for the Emergency Call System. Based on the STS data, these funds have facilitated the modernization of hardware and software infrastructure, resulting in reduced response times for emergencies. The investments are aimed at intelligently distributing calls to prevent congestion during spikes in caller activity, enhancing the precision of emergency localization, and improving coordination among public institutions. Furthermore, the upgraded infrastructure improves the quality of data received, offering additional information during emergency calls, such as video and image transmissions from the scene. This supports better decision-making for intervention and improves existing systems, including eCall, as well as the handling of calls from individuals with disabilities.

After we analysed all the resources included in this PRISMA-based literature review, Page et al., (2021), we answered the research questions of this study as follows:

1. How can individuals with disabilities effectively communicate emergencies to the 112-emergency Romania?

Hearing-impaired and speech-delay people must first register in the Romanian 112 Emergency System database. After that, they can communicate their emergency through SMS at the 113 emergency number.

2. Can Romanian emergency SMS-113 be considered an Assistive Technology (AT)?

SMS 113 can be named an Assistive Technology because it addresses hearing-impaired or speech-deficient persons by increasing and improving their access to the Romanian Emergency System.

Conclusions

This research compiles key insights into integrating assistive technology within Romania's 112 emergency system, detailing the current status, legal frameworks, and challenges observed in implementation. Despite the availability of SMS-113 as an assistive tool since 2015, its adoption remains limited to only 11.75% of the hearing-impaired population. This low uptake is attributed to system issues, including insufficient user awareness and burdensome pre-registration requirements.

The study emphasizes the role of legislation in shaping inclusive emergency response systems. It notes that Romania's legal framework provides a robust foundation for safeguarding the rights of individuals with disabilities and has progressed over the years. However, it identifies operational and awareness gaps preventing the full realisation of these laws, limiting their impact on the most vulnerable groups.

The research provides a comprehensive understanding of assistive technology's potential in emergency response by categorising findings into operational workflows, accessibility barriers, and legal frameworks. SMS-113 has proven to be useful, yet its effectiveness is limited by implementation issues and low user engagement.

Romania's €23 per call represents an investment with profound social implications. Current operations efficiently prioritize critical incidents, yet there is potential for further improvement through public education initiatives and enhanced triage systems. Balancing operational costs with life-saving outcomes remains an important aspect of public policy. Underutilisation of resources in this area could lead to unintended consequences, including increased fatalities and property damage. The latest investments include more access for citizens with disabilities, which can reflect the system's effectiveness.

A notable limitation of this study is the lack of existing research specific to Romania's 113 emergency call management systems. This gap restricted the depth of comparative analysis and required reliance on limited official data and trusted websites. Addressing the gap will require future studies that incorporate a user satisfaction survey, interviews with 112 operators, and cost-benefit economic analysis.

This study highlights the importance of addressing systemic barriers within Romania's SMS-113 service. Recommendations include removing the compulsory pre-registration, increasing public awareness through more targeted campaigns for people with impairments, and streamline the SMS communication process. Policymakers are advised to consider adopting international best practices, such as automatic location detection without requiring a voice call initiation. Future research should incorporate user satisfaction surveys and operator interviews to refine service delivery further and ensure equitable access for individuals with disabilities. A strategic approach to awareness campaigns, policy refinement, and technological upgrades is essential to enhance accessibility and ensure equitable emergency services for all citizens.

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