The importance of lay descriptors of respiratory symptoms: a retrospective analysis of under-triaged emergency calls

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Abstract

Accurate triage of respiratory emergencies during emergency calls is critical but may be compromised when dispatchers misinterpret lay language. Nonspecific descriptors may be perceived as the presence of breathing despite indicating severe conditions like airway obstruction or agonal breathing. The objective of this study was to identify common descriptors used by callers in underestimated respiratory emergencies and assess how these terms may contribute to under-triage. This retrospective cohort study analysed 382 emergency calls received between 2018 and 2023 at the 118 Emilia Est Emergency Medical Communication Centre in Bologna, Italy. All included calls were initially assigned low-to-moderate urgency for a respiratory problem but were later classified as critical or in cardiac arrest by ambulance crews, requiring advanced life support interventions. Experienced dispatchers independently reviewed audio recordings to identify lay descriptors, dispatcher questioning patterns, and pre-arrival instructions. In 29.3% of cases, callers used vivid, nonclinical language to describe respiratory distress. The most frequent lay term was "phlegm" (n=68), followed by "rattle" (n=22), and "cough" (n=7). Dispatcher questioning remained limited, and prearrival instructions were rare (5.2%). Oxygen saturation was reported in 19.4% of calls. Terms such as "phlegm" may reflect severe respiratory compromise when used by lay callers but are often under-recognized by dispatchers. Training should emphasize the interpretation of informal language and encourage structured follow-up questions to reduce under-triage and improve the early identification of critical respiratory events.

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Ethics: the study was conducted in accordance with the Declaration of Helsinki, and approved by the Local Ethics Committee (CE-AVEC - Protocol 568-2023-OSS-AUSLBO).

Consent to participate: patient consent was waived by the Local Ethics Committee due to organizational impracticability. The study involved a retrospective analysis of emergency calls, where many patients were deceased or uncontactable, and callers were often not directly linked to the patients.

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Introduction

Abnormal respiratory patterns are often among the earliest warning signs of Out-Of-Hospital Cardiac Arrest (OHCA) and other life-threatening emergencies.[1] Yet, recognizing these signs during emergency calls remains a major challenge for Emergency Medical Communication Centres (EMCC) dispatchers.[2] Studies show that callers initially describe up to 60% of cardiac arrest victims as breathing, often using terms such as "snoring," "weak breathing," or "laboured breathing".[3] These ambiguous or misleading descriptions may delay or prevent the recognition of cardiac arrest.[4] Agonal respirations, in particular, are frequently mistaken for signs of life. They occur in nearly half of OHCA cases of cardiac origin and are associated with better survival outcomes compared to those without agonal breathing.[5] However, their presence often contributes to the under-recognition of cardiac arrest, affecting dispatcher decision-making in 15–25% of cases.[6,7]

Standard dispatcher protocols typically rely on brief, binary questions to assess consciousness and breathing *(e.g.*, "Is the patient breathing normally?"), which, although effective in many cases, may fail to capture more subtle indicators of severity.[8] The variability in how laypeople describe respiratory distress further complicates triage, as callers often lack medical vocabulary and report symptoms using nonspecific or nonclinical language.[9] Callers often provide non-medical or ambiguous descriptions (*e.g.*, "he/she's gasping" and "he/she's turning blue"), which may be misinterpreted due to protocol rigidity or linguistic mismatch.[10]

Dispatcher training and protocol design must therefore account for this linguistic variability to improve the early recognition of critical conditions.

Despite strong evidence that dispatcher-assisted cardiopulmonary resuscitation (DA-CPR) improves OHCA outcomes,[11,12] patients described as "still breathing" are significantly less likely to receive DA-CPR instructions.[8] This highlights a critical gap in the early chain of survival: misinterpreting abnormal breathing may lead to under-triage and missed opportunities for life-saving intervention.[13]

To improve early recognition, dispatchers must be equipped not only with better protocols but also with a deeper understanding of the verbal cues and descriptive language commonly used by the public. This study examines underestimated respiratory emergencies in EMCC calls to identify recurring lay descriptors and other elements that may help recognize high-severity cases.

Materials and Methods

This retrospective cohort study was conducted at 118 Emilia Est Emergency Medical Communication Center in Bologna, Italy: this wide-area emergency dispatch centre serves approximately 2 million people and handled 239,303 missions in 2024. In Italian Emergency Medical Services (EMS), dispatchers use a color-coded urgency scale (white, green, yellow, and red), while EMS crews assign a post-evaluation numerical severity score ranging from 0 (no need for transport to hospital) to 4 (death).

The analysis was based on a review of the audio files of all emergency calls received between January 2018 and December 2023 classified as under-triaged, that met the following criteria: i) the dispatcher identified a primary respiratory problem, ii) assigned a low-to-moderate priority code (white, green, or yellow), and iii) EMS responders on the scene documented the patient as critical or in cardiac arrest, requiring advanced life support interventions.

Two senior dispatchers independently reviewed all included call recordings using a standardized data collection form, specifically developed for this study. Reviewers focused on: i) spontaneous or prompted descriptions of respiratory distress by callers, beyond the standard question "Is the patient breathing normally?", including descriptions of respiratory sounds, alterations in skin colour, respiratory rate, and other lay terms or expressions used to describe breathing difficulty; notably, calls were flagged for "distinctive lay descriptors" if the caller used vivid, sensory, or metaphorical expressions to describe respiratory distress and if these were assessed by both researchers as potentially indicative of high clinical severity; ii) availability of home pulse oximeters and any oxygen saturation values reported by the caller; whether pre-arrival instructions were provided (*e.g.*, positioning, oxygen support). If discrepancies arose, reviewers reached consensus through discussion.

This study was approved by the local ethics committee (CE-AVEC - Protocol 568-2023-OSS-AUSLBO).

Results

A total of 382 emergency calls met the inclusion criteria. All were initially categorized by dispatchers as low-to-moderate-priority respiratory events; however, subsequent EMS evaluation revealed a critical condition or a cardiac arrest, indicating a misjudgement in initial EMCC triage. The median call duration was 127 seconds [IQR: 95-188].

Dispatchers' questioning was generally limited to basic prompts, primarily "Is he/she breathing normally?". More in-depth assessments were rare: the dispatcher actively listened to respiratory sounds by asking the caller to place the phone near the patient in 3.7% (n=14) of calls; abnormal respiratory sounds, either spontaneously reported or prompted, were identified in 26.4% of cases (n=101). Signs of cyanosis or abnormal skin colour were mentioned in 4.2% (n=16), breathing rhythm in 7.1% (n=27), and the quality of breathing (*e.g.*, accessory muscle use or open-mouth breathing) in 12.8% of calls (n=49) (Table 1).

Oxygen saturation was reported or asked in 19.4% of calls (n=74). Notably, during the post-pandemic period, reports of oxygen saturation values increased (from 15% in 2018-2019 to 26,1% in 2022-2023), often volunteered by the caller without prompting. Pre-arrival instructions were issued in 5.2% of calls (n=20) and mainly involved modifying patient's posture (4.5%, n=17) or advising to start or adjust oxygen therapy (0.8%, n=3).

Among all reviewed calls, 29.3% (n=112) featured one or more distinctive lay descriptions that the reviewers identified as indicative of possible high clinical severity. Within these, a series of recurring verbal expressions were identified (Figure 1A and 1B). The most frequent term was "phlegm" (n=68); other recurrent lay descriptors included: "rattles" (n=22), "cough" (n=7), "gurgling" and "make noise when breathing" (each n=5), "whistling" and "shortness of breath" (each n=4). Descriptors such as "soap bubbles in the throat" (n=3), "throat obstruction" (n=3), and "gasps" (n=2), while less common, were also reported.

Table 1. Dispatcher assessment of respiratory distress in under-triaged emergency calls (n = 382).

Dispatcher action / caller information (spontaneous or prompted)	N (%)
Listened to respiratory sounds or asked caller to bring the phone closer	14 (3.7)
Abnormal respiratory sounds reported or inquired	101 (26.4)
Cyanosis / abnormal skin colour reported or inquired	16 (4.2)
Breathing rhythm reported or inquired	27 (7.1)
Breathing quality reported or inquired	49 (12.8)
Oxygen saturation value reported or inquired	74 (19.4)
Pre arrival instructions provided	20 (5.2)
Modifying patient's posture	17 (4.5)
Administering / increasing oxygen therapy	3 (0.8)

Discussion

This study highlights a critical blind spot in emergency call triage: the under-recognition of respiratory distress when described using non-clinical or ambiguous language. Lay expressions such as "phlegm," "gasping," "making noises like choking," or "turning blue" may correspond to conditions requiring urgent intervention, like severe hypoxia, airway obstruction, or agonal respirations. Such terms often fall outside standard dispatch protocols or fail to trigger appropriate or additional questions. As a result, dispatchers may assign a low-priority code, delaying emergency response and potentially contributing to avoidable adverse outcomes.

The challenge of recognizing cardiac arrest during emergency calls is well documented and dispatchers' sensitivity in identifying cardiac arrest varies widely.[14,15] Agonal respirations are frequently misinterpreted as signs of life, especially when described with lay terms.[16] This misperception may hinder DA-CPR and delay life-saving interventions.[17]

Protocolized prompts such as "Is the patient breathing normally?" are often insufficient to detect severe respiratory compromise. A more nuanced approach could incorporate structured questions addressing rate, sound, posture, skin colour, and pulse-oximeter reading. For instance: is the breathing fast, slow, or noisy? Do you hear wheezing, gurgling, or rattling? Are the lips or fingertips pale or bluish? Do you have a pulse oximeter? Can you read the value?

Such additions could enhance the early recognition of life-threatening respiratory distress, reducing under-triage and improving outcomes. Beyond updating protocols, this study underscores the importance of training dispatchers to recognize and interpret common lay expressions that may be associated with life-threatening conditions, even if these do not align with standard clinical terminology. For example, healthcare professionals may interpret the term "phlegm" as indicative of a minor respiratory infection. However, in emergency calls, this term is often used by laypersons to describe loud, gurgling, or snoring sounds, potentially reflecting airway obstruction or agonal breathing. Such onomatopoeic descriptors, though informal, may offer critical diagnostic clues and should prompt further assessment.

These findings align with a recent work that analysed 375 emergency calls dispatched as OHCA, identifying 23 categories of breathing descriptors used by callers.[18] Its results demonstrated that even ambiguous or vague descriptors such as "barely breathing," "gasping," or "laboured" were associated with a high probability of actual cardiac arrest, often exceeding 60–70%. Notably, even expressions of uncertainty (e.g., "not sure if breathing") carried a predictive value of 76.8%, while descriptors like "dead" and "not breathing" exceeded 85%. These results reinforce the importance of adopting a precautionary approach when evaluating breathing in unconscious patients and support the argument that any qualified or non-normal breathing description should raise immediate suspicion of life-threatening compromise.

Further insight is offered in a state-of-the-art review by Riou (2024), which highlights how linguistic framing, caller epistemic positioning, and turn design influence the effectiveness of telephone triage in emergency calls.[10] For example, affirmative responses to the question "Is the patient breathing?" are often qualified with subsequent information indicating abnormal respiration, an interactional feature that may mislead dispatchers if protocols do not account for conversational nuance. Moreover, callers frequently make early epistemic claims (*e.g.*, "I think it's too late" or "he/she's gone"), which have been shown to correlate with reduced compliance to dispatcher-initiated CPR instructions.[9] Riou's synthesis also highlights the limitations of rigid scripted dispatch systems, which may fail to accommodate lay expressions and reduce opportunities for clarification and collaborative sense-making. In this context, under-triage should be understood not only as a clinical misjudgement but also as a communicative breakdown, highlighting the urgent need for dispatcher training that incorporates interactional and linguistic strategies.

Lastly, over the six years analysed, some changes in the tools available to callers were observed. The post-pandemic increase in spontaneous reporting of oxygen saturation values suggests a shift in how the public monitors and communicates respiratory symptoms.[19] While home pulse oximeters are not flawless, they offer a potentially valuable supplement to verbal descriptions, particularly when interpreted cautiously by trained dispatchers.[20]

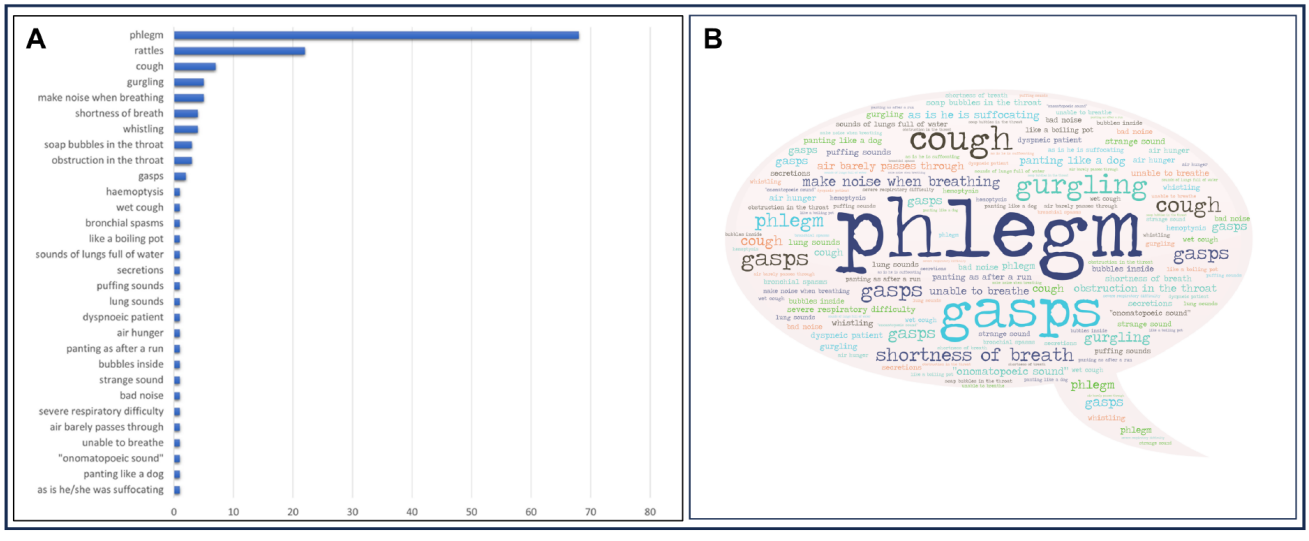

Figure 1. Recurring verbal expressions identified in under-triaged emergency calls. A: distribution; B: word cloud.

Limitations

This study, although based on systematic case selection and detailed audio review, has limitations. It was conducted at a single centre and focused exclusively on underestimated respiratory emergencies, potentially excluding cases where dispatchers appropriately escalated care. A comparator group of correctly triaged respiratory calls was not included, as identifying and reviewing a sufficiently large and representative sample posed substantial organizational challenges. Moreover, information volunteered by callers or elicited by dispatchers was not differentiated, as this boundary is often blurred in real practice. Additionally, linguistic and cultural variations may influence how respiratory distress is described, limiting the generalizability of specific lay terms identified in this study. Despite these constraints, the findings provide a strong rationale for improving how lay descriptions are captured and interpreted during emergency calls.

Conclusions

This analysis of 382 emergency calls related to respiratory complaints later deemed critical or fatal identified a consistent set of lay terms that may help recognize clinical severity early. Words such as "phlegm," "rattle," and "gurgles," though often dismissed as nonspecific, were frequently used by callers describing agonal breathing or airway obstruction. These expressions, alongside objective indicators like oxygen saturation, were present but underutilized. Sharing this knowledge with dispatchers and integrating these verbal cues into structured questioning protocols could prompt earlier recognition, additional questions, and more accurate prioritization. Developing a reference list of high-risk lay descriptors may improve training and bridge the gap between public language and clinical urgency. Further research should explore how integrating these terms into dispatch systems affects patient outcomes.

References

1. Berdowski J, Beekhuis F, Zwinderman AH, et al. Importance of the first link: Description and recognition of an out-of-hospital cardiac arrest in an emergency call. Circulation 2009;119:2096-102.
2. Viereck S, Møller TP, Ersbøll AK, et al. Recognising out-of-hospital cardiac arrest during emergency calls increases bystander cardiopulmonary resuscitation and survival. Resuscitation 2017;115:141-7.
3. Fukushima H, Imanishi M, Iwami T, et al. Abnormal breathing of sudden cardiac arrest victims described by laypersons and its association with emergency medical service dispatcher-assisted cardiopulmonary resuscitation instruction. Emerg Med J 2015;32:314-7.
4. Riou M, Ball S, Williams TA, et al. 'Tell me exactly what's happened': When linguistic choices affect the efficiency of emergency calls for cardiac arrest. Resuscitation 2017;117:58-65.
5. Debaty G, Labarere J, Frascone RJ, et al. Long-term prognostic value of gasping during out-of-hospital cardiac arrest. J Am Coll Cardiol 2017;70:1467-76.
6. Tanaka Y, Taniguchi J, Wato Y, et al. The continuous quality improvement project for telephone-assisted instruction of cardiopulmonary resuscitation increased the incidence of bystander CPR and improved the outcomes of out-of-hospital cardiac arrests. Resuscitation 2012;83:1235-41.
7. Vaillancourt C, Verma A, Trickett J, et al. Evaluating the Effectiveness of Dispatch-assisted Cardiopulmonary Resuscitation Instructions. Acad Emerg Med 2007;14:877-83.
8. Bång A, Herlitz J, Martinell S. Interaction between emergency medical dispatcher and caller in suspected out-of-hospital cardiac arrest calls with focus on agonal breathing. A review of 100 tape recordings of true cardiac arrest cases. Resuscitation 2003;56:25-34
9. Riou M, Ball S, Williams TA, et al. 'She's sort of breathing': What linguistic factors determine call-taker recognition of agonal breathing in emergency calls for cardiac arrest? Resuscitation 2018;122:92-8.
10. Riou M. Communication in prehospital and emergency care: a state-of-the-art literature review of conversation-analytic research. Res Lang Soc Interac 2024;57:55-72.
11. Sasson C, Rogers MAM, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest a systematic review and meta-analysis. Circ Cardiovasc Qual Outcomes 2010;3:63-81.
12. Bobrow BJ, Spaite DW, Berg RA, et al. Chest compression-only CPR by lay rescuers and survival from out-of-hospital cardiac arrest. JAMA 2010;304:1447.
13. Roppolo LP, Westfall A, Pepe PE, et al. Dispatcher assessments for agonal breathing improve detection of cardiac arrest. Resuscitation 2009;80:769-72.
14. Vaillancourt C, Charette M, Kasaboski A, et al. Cardiac arrest diagnostic accuracy of 9-1-1 dispatchers: A prospective multicenter study. Resuscitation 2015;90:116-20.
15. Drennan IR, Geri G, Brooks S, et al. Diagnosis of out-of-hospital cardiac arrest by emergency medical dispatch: A diagnostic systematic review. Resuscitation. 2021;159:85-96. doi:10.1016/j.resuscitation.2020.11.025
16. Alfsen D, Møller TP, Egerod I, Lippert FK. Barriers to recognition of out-of-hospital cardiac arrest during emergency medical calls: A qualitative inductive thematic analysis. Scand J Trauma Resusc Emerg Med 2015;23:70.
17. Syväoja S, Salo A, Uusaro A, Jäntti H, Kuisma M. Witnessed out-of-hospital cardiac arrest- effects of emergency dispatch recognition. Acta Anaesthesiol Scand 2018;62:558-67.
18. Perera N, Riou M, Birnie T, et al. How likely is the patient to be in cardiac arrest? Caller breathing descriptors in ambulance calls that were dispatched as cardiac arrest. Resusc Plus 2025;24:100990.
19. Alboksmaty A, Beaney T, Elkin S, et al. Effectiveness and safety of pulse oximetry in remote patient monitoring of patients with COVID-19: a systematic review. Lancet Digit Heal 2022;4:e279-89.
20. Cilloniz C, Simonds A, Hansen K, et al. Pulse oximetry is an essential tool that saves lives: A call for standardisation. Eur Respir J 2021;57:2100815.