

# Incidence and significance of gasping or agonal respirations in cardiac arrest patients

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## Purpose of review

This review examines the clinical significance of agonal respirations associated with cardiac arrest.

## Recent findings

Observational data indicate that agonal respirations are frequent (55% of witnessed cardiac arrests and probably higher) and that they are associated with successful resuscitation. They also are found more commonly in ventricular fibrillation compared with other rhythms. Agonal respirations pose the greatest challenge to bystanders at the scene and to emergency dispatchers. Bystanders are often lulled into thinking the person is still breathing thus identification of cardiac arrest may be missed by the dispatcher. In a study from King County, Washington, cardiopulmonary resuscitation instructions were not provided by emergency dispatchers in 20% of cardiac arrest cases because the caller reported signs of life – typically abnormal breathing.

## Summary

Agonal respirations occur frequently in cardiac arrest. Emergency dispatchers and the general public must be more aware of their presence and significance.

## Keywords

agonal respiration, cardiac arrest, cardiopulmonary resuscitation, dispatcher, heart arrest

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## Abbreviation

**CPR** cardiopulmonary resuscitation

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## Introduction

Agonal respirations are an important sign associated with cardiac arrest, yet they are difficult to define and difficult to study. They are commonly seen in sudden cardiac arrest yet they are often falsely perceived as a sign of life. They are strongly associated with successful resuscitation yet they pose the greatest challenge to lay rescuers and emergency dispatchers [1•]. This review will describe the complex, contradictory, and sometimes confusing issues circulating about agonal respirations.

## Definition

The term agonal refers to something occurring at the time of death. Thus agonal respirations are those at the time of or shortly before death. Laypersons probably associate the term with ‘death rattle’, presumably caused by partially occluded airways from secretions or mucus. When laypersons are asked by emergency dispatchers to describe what they see or hear when reporting cardiac arrest, they use terms such as barely or occasionally breathing, problem or irregular breathing, heavy or labored breathing, sighing, noisy, gurgling, moaning, groaning, or snorting [2,3]. To clinicians, agonal respirations are characterized as being on a continuum from slow, shallow respirations seen in respiratory demise to ineffective, gasping respirations seen in sudden cardiac arrest. I will confine this discussion to agonal respirations associated with sudden cardiac arrest.

## The physiology of agonal respirations

Agonal respirations are difficult to study in humans given the need for other therapeutic interventions during cardiac arrest. Animal experiments [4] suggest distinct patterns of abnormal respirations localized to specific levels in the brainstem. Depending upon the level of malfunction, breathing may become apneustic, gasping, or ataxic [5]. It is doubtful that there is a stereotypic pattern in all patients given the dynamic state of brain oxygenation in the period immediately before and shortly after cardiac arrest. Clearly, during cardiac arrest the brain and brain stem are deprived of forward blood flow and thus oxygen and glucose. The pattern and duration of agonal respiration may likely vary depending on whether the arrest is truly sudden (such as with ventricular fibrillation) or more gradual (such as with certain arrhythmias or during cardiogenic shock). It is unclear whether or to what extent agonal respirations result in air exchange. It is possible that some types of agonal breathing lead to minimal

respiratory function while other types may be totally ineffective.

### **The incidence and duration of agonal respirations**

The emergency medical service system in King County, Washington studied agonal respirations [2]. The researchers listened to recordings of every cardiac arrest call to emergency dispatch centers. Of 445 calls reporting cardiac arrest, agonal respirations occurred in 196 (40%). For witnessed cardiac arrest agonal respirations occurred in 55% compared with 16% of unwitnessed arrests. The identification of agonal breathing came from the callers' descriptions (and actually hearing agonal sound in some recordings). There was, of course, no independent observer at the scene. Thus the true incidence of agonal respirations is likely higher than reported since a knowledgeable observer would likely have recognized additional cases of agonal respirations. The authors also had the opportunity to compare agonal respirations with the rhythm associated with cardiac arrest. Of the patients in ventricular fibrillation, 56% had agonal respirations compared with 34% of patients without ventricular fibrillation. The duration of agonal respirations was estimated by determining the number of times emergency personnel noted agonal activity when they arrived. Of the 196 cases with agonal respiration described by the caller, continued agonal activity was noted upon arrival of emergency medical service personnel in 60 cases. The median response time for these cardiac arrests was 4 min. Thus it may be estimated that agonal respirations last approximately 4 min in at least one-third of cases.

### **The significance of agonal respirations**

The study from King County found a very strong association of agonal respirations with survival. Twenty-seven percent of patients with agonal respirations were discharged alive compared with 9% of patients without agonals. Among discharged patients, 68% had agonal respirations.

### **The conundrum of agonal respirations**

The data indicate that agonal respirations are frequent (55% of witnessed cardiac arrests and probably higher) and that they are associated with survival. They are also found more commonly in ventricular fibrillation compared with other rhythms. Witnessed cases of ventricular fibrillation are the type of cardiac arrests with the very best survival likelihood. In some communities this survival is as high as 40% [6]. Yet, agonal respirations pose the greatest challenge to bystanders at the scene and to emergency dispatchers. Bystanders are often lulled into thinking the person is still breathing, thus identification of cardiac arrest may be missed by the dispatcher. In another study from King County, cardiopulmonary

resuscitation (CPR) instructions were not provided by emergency dispatchers in 20% of cardiac arrest cases because the caller reported signs of life – typically abnormal breathing [7]. Similar findings were reported in Goteborg, Sweden [3]. Because of this finding, dispatchers are trained to specifically ask all callers 'Is the person conscious?' If the answer is no or there is uncertainty, the dispatcher asks, 'Is the person breathing normally?' Dispatchers in King County, Washington are specially trained in the incidence and significance of agonal respiration and they understand the significance of the word normally. If there is doubt, the dispatcher will ask the caller to move the phone by the patient or will probe with questions such as 'Does the chest rise?' Many communities do not have dispatchers asking the question 'Is the patient breathing normally?' for possible cardiac arrest cases. It is possible that in these communities many cases of cardiac arrest are missed. It is ironic since cardiac arrests with agonal respiration have the highest likelihood of survival and are the cases in which bystander CPR may be crucial to a good outcome.

### **What is to be done?**

There is currently much controversy over when and whether CPR should precede defibrillation. Some investigators recommend a defined period (such as 2 or 3 min) of CPR prior to defibrillation [8,9]. Others have found no benefit with this strategy [10]. It may be that in some instances immediate defibrillation may be the best strategy and in other instances a period of CPR may be useful. For example, perhaps in witnessed cardiac arrests immediate defibrillation is the best option but for unwitnessed cardiac arrest CPR may be needed to fill the left ventricle and provide oxygenated blood for the coronary arteries. Determining whether the collapse is witnessed is sometimes problematic. The presence of agonal respirations as reported by the caller, however, may be a surrogate for witnessed collapse. Such a finding may suggest the order of resuscitation interventions.

Whether the presence of agonal respirations should prompt certain interventions remains to be seen. For the moment it seems prudent that all emergency dispatch agencies have special training in the recognition and significance of agonal respirations. It also seems prudent to emphasize agonal respirations during CPR training of the general public.

### **Conclusion**

Agonal respirations occur frequently in cardiac arrest and they are highly correlated with ventricular fibrillation and survival. Emergency dispatchers and the general public must be more aware of their presence and significance.

**References and recommended reading**

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 279).

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