

<b>Abstract Title:</b>	<b>Carboxyhemoglobin On Presentation: A Predictor Of Burn Patient Outcomes</b>
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<b>Objective:</b>	1) Understand the relationship between carboxyhemoglobin and burn patient outcomes.
<b>Abstract:</b>	<p><b>Background:</b> In the United States there is estimated to be more than 350,000 fires in urban areas resulting in more than 2,000 deaths, 13,000 injuries and billions of USD in property losses. Fire-related inhalation injury or smoke inhalation injury refers to the direct damage of the lungs and air-way caused by heat, smoke and chemicals produced by the combustion of fire and the systemic toxicity of substances formed by pyrolysis. Carbon monoxide (CO) poisoning is the most common cause of immediate death following inhalation injury. CO is a colorless, nonirritating, odorless, tasteless gas produced by the combustion of hydrocarbon products which diffuses rapidly across the pulmonary membrane and binds to heme molecules, 240 times more than oxygen, producing carboxyhemoglobin (COHb). As a result of its high affinity, there is shift of the oxyhemoglobin dis-sociation curve to the left, compromising oxygen transport and delivery to tissues without affecting the arterial oxygen tension (PaO<sub>2</sub>). Thus, making standard pulse oximetry inaccurate as an estimation of oxygen delivery to the tissues and an incorrect screening tool for CO poisoning.</p> <p>Carboxyhemoglobin levels in blood are related to the molar concentration of CO and oxygen in the environment, length of exposure and minute ventilation, but it is uncertain if there is a direct causal association with mortality and adverse outcomes in burn patients exposed to inhalation injury. There is no uniformly accepted safe time exposure threshold for CO gas. At a COHb level of 10 % a person may not feel any appreciable effect except mild shortness of breath on exertion. When the COHb level rises to 30-50%, persons may feel headaches, fatigue and dizziness, fainting and col-lapse. When sustained levels of COHb rise above 70-80%, they are almost always uniformly fatal.</p> <p>There are insufficient studies that correlate COHb levels as a prognostic factor for adverse outcomes in burn patients. Our study aim was to</p>

evaluate carboxyhemoglobin elevation on admission as a predictor of worse outcomes in patients with full thickness burn injury.

**Methods:** A 10-year retrospective review of the American Burn Association Burn Registry from 2002 through 2011. We compared the outcomes of all burn patients that meet our inclusion criteria. We stratified the patients into two groups: normal COHb on admission (group 1) vs. elevated COHb on admission (group 2). Elevated COHb levels were defined as > 10% on the first arterial blood gas (ABG). Demographic characteristics and outcome variables were collected and compared between each group. Outcome measures included in-hospital mortality rate, hospital length of stay (LOS), intensive care unit length of stay (ICU-LOS), and ventilator days. Chi-Squared and t-test analyses were used with significance defined as  $p < 0.05$

**Results:** A total of 9,982 burn patients meet our inclusion criteria. We had 8,045 patients (80.6% of total) in the low COHb group (group 1) and 1,937 patients (19.4% of total) with elevated COHb on admission (group 2). Group 1 had an average age of 30.65 years while the average age in group 2 was 34.58 years. There was no statistically significant difference between the two groups in terms of full thickness TBSA (1.37% vs 1.37%,  $p = 0.93$ , t-test) as shown in Table 1. There was a significantly higher ICU-LOS at 3.47 days in group 2 compared to 1.87 in the group 1 ( $p = 0.0001$ , t-test). The hospital LOS was not statistically different at 7.42 days in group 1 compared to 8.12 in the group 2 ( $p = 0.12$ , t-test). The ventilator days were also higher in group 2 at 1.74 vs. 0.71 in group 1 ( $p < 0.0001$ , t-test). The in-hospital mortality was also significantly higher in group 2 at 1.86% vs group 1 at 0.58% ( $p = 0.0001$ ,  $\chi^2$ ).

**Conclusion:** Elevated COHb on admission was associated with an increased ICU-LOS, average ventilator days, and in-hospital mortality. The presence of elevated COHb of > 10% on an initial ABG suggests worse outcomes and increased need of resource utilization during the index hospital admission.

**Keywords:** Burns; Outcomes, Critical Care, Carboxyhemoglobin, quality outcomes, patient safety.