

Detecting Carbon Monoxide Poisoning

Using advanced technology against a silent killer



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Carbon monoxide (CO) is the number one cause of poisoning in industrialized countries. Each year, approximately 6,000 Americans die from CO poisoning and another 40,000 to 50,000 people seek ER care for CO-related problems.

CO is an odorless, colorless, tasteless gas that results from the incomplete combustion of carbon-containing fuels. Often called the “silent killer,” CO’s initial symptoms are often vague, subtle and easily misdiagnosed. The gas is so lethal because it readily displaces oxygen from hemoglobin and forms a compound called carboxyhemoglobin, which does not carry oxygen. As carboxyhemoglobin levels rise, the amount of oxygen transported in the blood progressively declines, depriving the victim of oxygen and eventually resulting in death.

As exposure levels increase, more

significant signs and symptoms include mental clouding, severe headache, confusion, dizziness, and fainting. If exposure is severe or prolonged, coma and death may ensue.

Groups with an increased risk of CO poisoning include firefighters, children, the elderly, pregnant women, and people with heart and/or with respiratory disease. Individuals with pre-existing medical conditions can develop moderate to severe symptoms, even with low levels of CO exposure.

Firefighters are at greater risk of developing CO poisoning. Poor-fitting SCBA gear or entering fire zones without an SCBA can significantly raise CO exposures. Recent research has shown



“The signs and symptoms of CO poisoning include malaise, flu-like symptoms, headache, shortness of breath on exertion, and fatigue.”

that firefighters without SCBAs can develop elevated carboxyhemoglobin levels during the overhaul phase of fire operations. Research has also shown that both acute and chronic CO exposure can increase the risk

of developing long-term permanent complications (primarily neurological and cardiac).

Fortunately, the innovative new Masimo Rad-57 Pulse CO-Oximeter can monitor carboxyhemoglobin levels in the field. The non-invasive Rad-57 works like a conventional pulse oximeter (and has pulse oximetry capabilities), but this sophisticated monitor uses 7+ wavelengths of light to detect carboxyhemoglobin and other compounds. Detected

carboxyhemoglobin is displayed as a percentage and can guide subsequent care. Because the signs and symptoms of CO poisoning are vague and subtle, EMS personnel and firefighters should routinely screen all persons for possible CO exposure.

Thanks to Masimo Rad-57 technology, EMS and firefighters can now quickly and accurately screen patients for possible CO poisoning. If elevated carboxyhemoglobin levels are detected, informed care decisions can rapidly

be made. When dealing with patients suffering from CO poisoning, speed of treatment is the key to a successful outcome and reduced risk of long-term neurological and cardiac damage.

Since CO poisoning is easy to miss, even for emergency department personnel, the Masimo Rad-57 can serve as a risk management tool. By screening all possible victims for CO exposure, emergency personnel can now quickly identify CO poisoning and prevent victims from returning to toxic environments.



Detecting carbon monoxide poisoning in seconds with Masimo Rad-57

The Masimo Rad-57 is the only FDA-cleared noninvasive way to detect elevated levels of carbon monoxide in the bloodstream in seconds, letting EMS and fire professionals quickly and easily diagnose carbon monoxide poisoning on the scene.

Just slip the sensor on a firefighter or patient's finger and press a button. The Masimo Rad-57 will detect the percentage of carbon monoxide in the bloodstream in just seconds, allowing for prompt and possibly life-saving treatment.

To find out more about how the Masimo Rad-57 can help you quickly and accurately detect carbon monoxide poisoning, call 1-800-257-3810 or go to: www.masimo.com/rad-57

The Averted Tragedy

Tim Bradley, Captain
Aurora Fire Department
Aurora, IL

The call: Heat exhaustion

At 1242 hours on a very hot, humid summer afternoon in June 2006, the Aurora Fire Department responded to a report of a male with heat exhaustion. The call originated from a large factory where this person had been working for the past four hours. Engine 9 and Medic 4 arrived on scene and were taken by security to the patient who was on a second floor landing at one end of the factory. He appeared confused and agitated. We placed the patient on O₂ with a non-rebreather mask. ALS care was initiated and the patient was removed to the ambulance. At this point, everyone thought it was a normal case of heat exhaustion.

Masimo Rad-57 identifies CO poisoning

Once in the ambulance, the paramedic used the Masimo Rad-57 to check the patient's SpO₂ when he noticed a carbon monoxide reading of 9%. Once the medic advised me of the patient's CO level, I sent my crew into the building with a handheld gas meter. Immediately we found CO levels between 40 and 55 ppm. The levels continued to increase as we walked farther into the structure, eventually getting as high as 556 ppm.

Immediate evacuation of 100+ employees

A truck company and battalion chief were requested to the scene as we immediately began evacuating over 100 employees from the structure. Some of the people being evacuated began

complaining of headaches and fatigue, including some pregnant females. These people were taken to an ambulance where their vitals and CO levels were evaluated.

CO source identified

The CO originated from propane- and gasoline-operated power lifts used to install rack storage. The lifts were removed from the building and the CO levels slowly dropped to 0 ppm. About three hours later, the employees were allowed to re-enter the building.

Masimo Rad-57 prevents a serious situation

The original patient was transported to a local hospital where he was treated and released. The Masimo Rad-57 made a huge difference, preventing a serious situation from spiraling out of control. It also saved the local hospitals from an avalanche of patients. Fortunately we were able to handle it all on scene, without overwhelming our system's resources. This incident was mitigated with only one minor injury, but I am left to wonder what would have happened if we did not have the Masimo Rad-57 that day.



City of Aurora Fire Department, Aurora, IL

The City of Aurora Fire Department is responsible for a 39 square-mile area about 40 miles west of Chicago. They serve a population of 157,267 with three battalion chiefs, 203 career firefighters, nine pumpers, three aerial/platform units, and six medic units.

Hospital Alerted to Lethal Threat

Glenn Joseph
Boca Raton Fire Rescue
Boca Raton, Florida

Mary Russell
ER nurse
Boca Raton Community Hospital
Boca Raton, Florida

The call: Security guard complains of dizziness, headache

On September 7, 2006 at 1350 hours, a security guard from a construction site at a nearby condominium complex presented to the ED at Boca Raton Community Hospital complaining of dizziness and a headache.

Aware and prepared...with a Masimo Rad-57

"Carbon monoxide was already very much on our radar screen," said Mary Russell, an ED nurse at Boca Raton. After hurricanes Frances and Jeanne, the hospital had admitted entire families with CO poisoning caused by generators.

"We had just gotten a Masimo Rad-57, and I thought that this would be a great opportunity to put it to the test and verify my suspicion that CO poisoning was responsible for the symptoms," said Russell. "Before getting the Rad-57, testing CO levels in patients had been a long and painful process, involving drawing blood from an artery and waiting for lab results."

The results of the Rad-57 test confirmed Russell's suspicion of elevated CO levels, and she had the presence of mind to ask the patient whether there were any generators being used on the construction site. After the patient confirmed there were multiple generators in use, the hospital called Boca Raton Fire Rescue, which rushed its HazMed

unit to the site at 2800 S. Ocean Blvd.

CO levels 100 times higher than normal prompt evacuation of 100

"When they arrived at the site, our HazMed unit got a CO reading of 900 ppm in the lobby," said Glenn Joseph of Boca Raton Fire Rescue. "That's 100 times higher than normal. Other areas showed readings of 500 ppm."

The 20-story condo had been undergoing hurricane damage repairs, and the construction crews had generators going in the garage area. "We had them stop all operations," said Joseph. "Rescue crews went floor by floor, telling the 100 or so persons in the building they needed to leave." After field triaging each of the building's occupants with the Rad-57, only one other person was taken to the hospital. That person and the security guard were given oxygen and recovered quickly.

The ability to quickly assess the CO levels of all of the building's occupants meant that the HazMed team was able to speed treatment to those who needed it. And, just as importantly, the team could avoid unnecessarily transporting the 99 unaffected patients to the hospital, freeing up valuable clinician time and bed space at the ED, and avoiding the cost and time associated with a large scale transport operation.

Boca Raton Fire Rescue

The Boca Raton Fire-Rescue Services Department provides fire suppression, fire safety inspections, fire investigations, fire and emergency medical service education, hazardous materials response, and emergency medical services to the community of Boca Raton in southeast Florida. The department is comprised of 207 certified professionals. Over 90 percent of the personnel are licensed paramedics, 10 percent are certified emergency medical technicians. The department serves approximately 83,760 year-round residents.

Boca Raton Community Hospital

Located an hour away from Miami on Florida's southeast coast, Boca Raton Community Hospital is a 394-bed not-for-profit health care organization with more than 750 primary and specialty physicians on staff who provide preventative and acute hospital care. Nearly 2,100 employees and over 1,200 volunteers enable the hospital to provide quality healthcare to its patients.

The Converted Paramedic

JD Postage
Firefighter/Paramedic
Violet Township Fire Department
Pickerington, OH

The call: An ill person at restaurant

In November 2006, Medic 593 was called out for an ill person at a local restaurant. We found the patient sitting in the back of a police car. He had been driving erratically and ended up striking a parked car and trash can in the restaurant parking lot. The patient was alert but very confused, complaining of a headache, nausea, vomiting, weakness and dizziness. The patient's physical exam was normal, with no signs of trauma.

Hypoglycemia? Possible medication overdose?

At this point, I was sure I knew what was wrong with the patient--it was hypoglycemia. A check of the patient's blood sugar quickly proved me wrong. His sugar was 232 mg/dL. I thought about a medication overdose, but couldn't find anything to support that after searching the patient and his car. We had tried everything we could think of to determine why this patient was so altered, each time coming up blank.

Then someone suggested we try "that new piece of equipment." I was not one of the Rad-57's biggest fans; I thought it was just one more thing we had to carry around, taking up space on the truck. However, as we had gone through everything else with this patient, I didn't think it could hurt. Within 20 seconds, the Masimo Rad-57 had changed the entire direction of the call.

Masimo Rad-57 reveals the problem

The patient had a CO level of 40% with a SpO₂ of 94%. Now that we knew exactly what was wrong with the patient, we immediately began treatment with high flow O₂. With the patient's condition under control, we needed to find the source of the CO, in case there were others who were being poisoned along with the patient.

CO source: not in the home

As the patient was transported to the hospital, we had another engine respond to check the man's house and disabled wife. Fortunately, there was no CO found in the patient's residence and the wife was okay. Eventually, the source of the CO was attributed back to a bad exhaust system on the vehicle the patient had been driving.

Man might have been released back to a CO-poisoned environment

There was nothing about this patient, as he initially presented, which would have led us to suspect CO poisoning. If not for the Masimo Rad-57, he would have been just another altered mental status with unknown cause. We would have taken him into the ED where it is likely they would not have discovered the true cause of the patient's condition because he didn't have a history that would make carbon monoxide poisoning an obvious diagnosis. He would have been released from the ED back to his poisoned environment.

The Masimo Rad-57 took the guesswork out of diagnosis

The treatment for CO poisoning in the field is oxygen. That's the easy part. It is a matter of detection. Can you tell if it is food poisoning, the flu, a headache or is it actually CO poisoning? What about when your patient is too confused to appropriately answer your questions? The Masimo Rad-57 took the guesswork out of it for us. I thought it was just one more piece of equipment until I saw what a difference it made on this call. Now I wouldn't be without it.

Violet Township Fire Department

The Violet Township Fire Department in Pickerington, Ohio is about 20 miles outside of Columbus in Fairfield County. They cover 42 square miles and serve 30,000 residents in Pickerington, parts of Canal Winchester and Reynoldsburg. The department has 39 career firefighters, 22 part-time and 12 volunteers who respond to about 4,000 medical and fire calls per year.

The Rescued Mother

Shaughn Maxwell
Captain/Paramedic
Medical Services Officer
Fire District 1
Everett, WA

The call: Unconscious female

On a fall morning, Snohomish County Fire District 1 received an emergency call from two young children who said their mother had passed out. Fire District 1 responded with an ALS Ladder, Medic Unit and an MSO (EMS supervisor). On arrival the children sent us to the upstairs bathroom where we found the mother unconscious but breathing, with signs of seizure activity.

The source of the problem

While moving her into the bedroom, one of the firefighters/paramedics noted a faint odor of exhaust. After 5 minutes in the house, other firefighters started to complain of headaches. Some of the crew searched the house and discovered a running car inside the closed garage, directly below the upstairs bedroom.

Masimo Rad 57 reveals high CO level

The Masimo Rad-57 was placed on the patient. Her initial CO reading was 80% (manufacturer's note: the Masimo Rad-57 accuracy is specified to a range of 0-40%). The four gas meter read 400ppm inside the bedroom. We evacuated the patient and her children from the residence. The kids were evaluated with the Masimo Rad-57 and found to have very low levels of CO.

Patient transported to ER, CO level drops to 37%

Inside the medic unit the patient was RSI'ed and transported to an emergency room 20 minutes away. A later Rad-57



Snohomish County Fire District 1

Located 20 miles north of Seattle, along the I-5 corridor, Snohomish County Fire District 1 serves a community of 160,000 residents, including the cities of Mountlake Terrace and Brier. The district has eight stations, 150 firefighters, a HAZMAT and rescue team. They respond to over 13,000 calls annually and provide BLS and ALS transport. The district originally bought two Masimo Rad-57s to monitor their own firefighters during fire rehab, but they're now used mainly for EMS responses.

reading showed that the patient's CO level had dropped to 37% while the hospital's blood gas CO-Oximeter read 36%.

Masimo Rad-57 showed mild CO exposure in response team

While still at the hospital, the firefighter/paramedics that had been in the house checked their own CO levels with the Rad-57. The battalion chief, who carries our second Rad-57, responded to the station where the ladder is housed to evaluate the crew for CO exposure. Our responders did have a mild CO exposure; however we did not

have to place any units out of service. The battalion chief returned to the station a few hours later to assure that the crew's CO levels had dropped to normal.

Masimo Rad-57 provided fast, accurate CO diagnosis

The Rad-57 helped to quickly, and with certainty, diagnose a very sick patient. By knowing the identity and severity of what we were dealing with, it allowed us to provide treatment for the carbon monoxide poisoning much more effectively than if we weren't able to measure for CO.

Just in Time for Holiday Inn

Allan R. Goodwin, B.Comm., EMT-P
A/Superintendent
Incident Response Planning & Preparedness
The City of Calgary
Emergency Medical Services (165)
Calgary, Alberta

The call: Hotel guests dizzy, nauseated

On August 13, 2006 at approximately 1000 hours, Calgary EMS responded to a sick person call at the Holiday Inn at Macleod Trail and 42nd Avenue S.E. Paramedics arrived to find guests in the hotel's banquet room who were dizzy, weak and nauseated. Paramedics quickly called the fire department when they suspected potentially deadly CO poisoning. "These were symptoms consistent with CO poisoning," said Calgary EMS spokesman Doug Odney. Upon arrival, firefighters confirmed high levels of gas throughout the building, especially in the kitchen where CO levels were over 1,000 ppm. Evacuations are triggered when CO concentrations reach 50 ppm.

200 guests evacuated, 16 hospitalized

Hotel guests eating breakfast, swimming in the pool, and some still sleeping were rushed outside while firefighters ventilated the building. Firefighters searched the hotel room by room to ensure all guests were outside. Once evacuated, paramedics assessed 45 patients and transported 16 people with CO poisoning to three city hospitals.

Masimo Rad-57 quickly triaged patients

Using a Rad-57 Signal Extraction Pulse CO-Oximeter--which Calgary EMS had acquired just two weeks before--paramedics quickly triaged all 45 patients for CO poisoning. "Hopefully,

we'll see these devices soon on every ambulance," said Odney, crediting the equipment for the speedy triage.

In addition to the ability to speed treatment to the affected patients, using the Masimo RAD-57 allowed Calgary EMS to avoid tying up valuable pre-hospital and ED resources by unnecessarily transporting 29 unaffected persons

Venting problem in mechanical room

Fire department spokeswoman Deb Bergeson said the source of the carbon monoxide appeared to be a venting problem in the hotel's mechanical room.

City of Calgary Emergency Medical Services

Calgary EMS, an entirely ALS system, is responsible for over 96,000 emergency responses a year, and operates 44 advanced life support (ALS) response vehicles during peak times of the day when call volumes are highest. They operate 20 full-transport units 24 hours per day, 19 units 12 hours per day and a 24-hour air medical crew, stationed at the Calgary International Airport. Additionally, the department operates 3 Paramedic Response Units 24 hours per day. On certain time-dependent life threatening calls, the department receives backup by Calgary Fire Department First Responders.

Saving Lives in Anchorage

Mike Melchert, Captain
F. X. Nolan, Chief Medical Officer
Anchorage Fire Department
Anchorage, AK

The call: Family perished

In 2005, an entire family died in Anchorage, Alaska when deadly amounts of carbon monoxide leaked into their house in the middle of the night. Their tragic deaths caused a heightened awareness of carbon monoxide poisoning and brought about the passage of a new law making carbon monoxide detectors mandatory.

193 calls found CO in Anchorage homes

So far this year, the Anchorage Fire Department has responded to 580 carbon monoxide calls, 193 of which actually revealed elevated carbon monoxide in the home. Fire officials recommend people have a working carbon monoxide detector in their home. They insist it's not only the law but it can save lives. The tragedy in 2005 also prompted the city's fire department to take another critically important step.

Anchorage first city in U.S. to include Pulse CO-Oximeters in ambulances

The Anchorage Fire Department has added Masimo's Pulse CO-Oximeters to its ambulance units. AFD is hoping the new devices will help save lives throughout the city.

The department says the devices will come in handy for calls where symptoms are vague, letting response teams accurately measure CO levels in the blood in less than 30 seconds. "It will allow us to assess people

suspected of CO exposure in the presence of only vague symptoms," said F. X. Nolan, AFD's chief medical officer. "Airborne CO meters allow us to measure how much CO is in the air, but when we are called to a scene, our first concern is how much CO is in the patient's blood."

"The Rad-57s give us an idea of how much CO is in the body. This helps paramedics and emergency workers determine how badly you've been exposed and guides them in administering the right treatment," said AFD's Captain Mike Melchert. The meters are also being used in Girdwood and in Chugiak. Funding for the new gear came from a federal grant.

Anchorage Fire Department

The Anchorage Fire Department encompasses 12 fire stations and 391 personnel. There are seven Basic Life Support and five Advanced Life Support engine companies, four truck companies, three aeriels, a heavy rescue company and four tankers that serve as front line suppression and EMS response units. Seven Mobile Intensive Care Units, Fire and EMS battalion chiefs complete the 24-hour unit staffing. An additional rescue company and a variety of specialized units, including dive, foam, hazmat, mountain and water rescue are also available through cross-manning. Each engine company serves as a non-transport Basic Life Support unit equipped with a semi-automatic defibrillator to enhance response to cardiac emergencies. The engine companies assist the Department's 66 firefighter/paramedics who provide Advanced Life Support care and transport in conjunction with firefighter/emergency medical technicians.

The Transport Decision

Karen Gibbins
Firefighter

Greenfield Center Volunteer Fire Company
Greenfield, NY

The call: Carbon monoxide alarm/man down

On January 16, 2007, in the midst of a brutal winter storm where over 1600 homes lost power, I was at the firehouse coordinating field teams to go door to door checking on our large population of elderly residents and answering phone calls from those who weren't home when the field teams stopped by. Among those in the field teams were my husband, Gary Gibbins (Assistant Chief and EMT), and my sons Jason (Captain and EMT) and Joshua (Lieutenant). At ~1730, a 911 call came in for a carbon monoxide alarm with illness/ man down. Gary & Jason responded immediately in the chief's vehicle with our rescue truck and pumper following.

Propane stove left on

Once on scene, they found a 76 year old male conscious but very confused. He was not complaining of anything, but was answering all questions inappropriately. The patient's wife stated she had just returned home and found her husband acting strange, so she opened all the doors and windows and called 911.

Gary noticed that the propane stove was on and shut it off. Jason went immediately to the patient and put him on 12 liters per minute of oxygen via NRB and then took the patient's vitals.



Greenfield Center Volunteer Fire Company No. 1

Greenfield Center Volunteer Fire Co. #1 is one of four departments that make up Greenfield Fire District, located an hour north of Albany, NY. Greenfield Center Fire Company has 40 members and operates two engines, one heavy rescue, one medical vehicle and one brush truck. They cover a mostly rural area and are usually first on scene with EMS calls, since the nearest ambulance is 5- 20 minutes away.

42% carboxyhemoglobin level, man flown to hospital for hyperbaric treatment

The Masimo Rad-57 showed that the patient's SpCO was 42%, so Jason increased the oxygen to 15 liters. Gary informed the crew on the incoming ambulance about the patient's CO level and while still en route, the ambulance called for a helicopter to fly the patient out. EMS continued giving the patient oxygen and prepared him for the short trip to the waiting helicopter. The patient was flown to Westchester Medical Center where he went to the hyperbaric chamber and fully recovered.

Masimo Rad-57 allowed fast decision on best method of transport

While we suspected that the patient was suffering from carbon monoxide poisoning, the Rad-57, allowed us to quickly identify just how severe the poisoning was and use that knowledge to select the most appropriate form of transport and destination for the patient. This decision was instrumental in saving his life.

The Missed Diagnosis

John Andrews, EMT-P
Field Training Officer
Tuolumne County Ambulance
Sonora, CA

The call: Dizziness

On November 11, 2006 at 2307 hours, Tuolumne Medic 41 and a California Department of Forestry engine were dispatched out to a 58 year-old female complaining of dizziness. Upon arrival, we found the patient sitting in a recliner in her mobile home, complaining of severe dizziness that had caused her to fall four days ago. The prior fall resulted in an ambulance transport and an emergency room visit with repair of soft-tissue injuries to her face. She returned home after the ER visit and continued to have problems with dizziness which remained undiagnosed.

Masimo Rad-57 reveals SpCO level of 13%

The patient had a very extensive respiratory and cardiac history. She answered questions appropriately (GCS 15) and did not appear to be in severe distress. When the Masimo Rad-57 sensor was applied to obtain the SpO₂ reading, the alarm began to sound due to a SpCO level of 13%. Given that the patient's SpO₂ was 83%, her fractional saturation was at best 70%, so it was no surprise she was dizzy. The room was filled with cigarette smoke and after further questioning, we discovered that her husband had turned on their furnace for the first time that season about five days before.

The problem finally diagnosed

The patient was removed from the house, placed on a non-rebreather oxygen mask at 15 liters and taken to

the local hospital. She continued to improve throughout transport. Her O₂ saturation came up to 96% and her SpCO fell from 13% to 7% over the 45 minute transport. Upon our arrival at the hospital, the patient had no complaint of dizziness and continued to improve during her emergency department stay. The hospital did not have a CO-Oximeter in the facility and relied on the Masimo Rad-57 readings to make their assessment and treatment decisions.

Masimo Rad-57 saves wife and husband

The Masimo Rad-57 helped us identify the CO poisoning that had most likely been missed four days prior by fire, EMS and ER crews. While a SpCO of 13% by itself is not terribly high, combined with her complex medical history the patient's condition became dangerous. The positive CO reading from the Masimo Rad-57 led to the woman's prompt diagnosis and treatment, prevented her condition from continuing or worsening, and kept her husband from becoming the next patient.

Tuolumne County Ambulance

Tuolumne County Ambulance service is the exclusive ambulance provider for Tuolumne County and is based in Sonora, California. They are located in the Sierra Nevada mountain range of Central California which includes a large portion of Yosemite National Park. Ambulance services are provided from four locations throughout the county including a new joint operations center for both ambulance and fire service in Sonora. The ambulance service covers over 2,000 square miles with an annual call volume of just over 6,000 calls.

The Triage Tool

Russell Chisholm
Firefighter /Paramedic
Miami Beach Fire Rescue
Miami Beach, FL

The call: Food poisoning

On October 23, 2006 Rescue 1 'C' shift was dispatched to a suspected food poisoning call at a hotel on Ocean Drive. Upon arrival, we knocked on the door and had to wait several minutes before the guest, who could barely walk, was able to answer the door. He was very altered, complaining of nausea and a really bad headache. We found the patient's wife, who was on the commode, in the same state of mind as her husband. Both patients

were severely incontinent and their skin was a blotchy red color.

Patients' SpO2 saturations in the low 90's, crew suffer headaches

Both patients' SpO2 levels were in the low 90's. Our crew had only been in the room for about five minutes before we started getting headaches. There was a distinct stale odor in the room so the windows were opened for some ventilation. Both patients were moved into the hallway, placed on high flow O2 and within 5-10 minutes started to feel better.

of four who were transported to the hospital, with the parents' CO levels in the low teens and the children anywhere from 6% to 10%. In total, 14 people were transported for CO poisoning. All patients taken to the hospital had blood gas CO levels almost identical to the Masimo Rad-57 readings.

The cause: hot water heater venting stack

The suspected cause of the incident was a hot water heater on the north side of the building whose venting stack ran under the crawl space and up the south side of the building. The facility was closed for three weeks while repairs were made.

Masimo Rad-57 proved invaluable to patients, rescue personnel and hospital

The City of Miami Beach is now actively trying to get an ordinance passed that would require CO detectors in all buildings and would be part of the annual fire inspection. This call could have had a disastrous outcome if everyone from the hospital staff to the rescue crews, engine and ladder crew, and the command staff didn't work together. The Masimo Rad-57 was immensely helpful with the triage of a large number of patients. If we only had the four gas meter to base treatment decisions off of, we could have tied up rescue units transporting patients who did not need transport or worse yet, left people on scene who really needed to go to the hospital.

Miami Beach Fire Rescue

Miami Beach Fire Rescue serves a 7.1 square mile barrier island in Dade County, Florida, which hosts over 7.5 million tourists annually. Beach populations usually run from 90,000-92,000, swelling to 200,000 on a normal weekend, and rising to 500,000 on holidays and special event weekends. The department is comprised of 200 firefighters divided into 3 shifts, with each shift running 6 ALS ambulances with three medics onboard. They have two 100 ft. ALS ladder trucks and four ALS engines--all staffed with firefighters/paramedics. The department responds to 20,000 calls per year, 85% of which are medical.

Masimo Rad-57s called to the scene

We called for the four gas meter and one of two Masimo Rad-57s in field that night to be brought to the scene. (The other nine Rad-57s were going into service the next day.) The equipment arrived as the two rescue units were transporting the patients to Mt Sinai Medical Center in Miami Beach. Upon arrival at the ER, we alerted the nursing supervisor to the suspected CO poisoning. She took the initiative to run ABGs.

Rad 57 helps triage 60 guests

We transported another patient to the same hospital 45 minutes later. The RN showed us the blood gas report on the two patients- the male was 38%, the female 37%. The hotel was immediately closed down and the guests evacuated. The Rad-57 was used to triage the 60 guests, who ranged from a low of 3% to a high of 21%. There were two families

Rapid Triage

Anthony Butkus and Micheal Daly
Battalion Chiefs
Bridgeview Fire Department
Bridgeview, IL

The call: An ill person at printing company

On January 18, 2007, the Bridgeview Fire Department responded to the report of an ill person at a commercial printing operation. Upon arrival, fire and EMS personnel were met outside by company employees with vague flu-like symptoms that, given the environment, were thought to be the result of carbon monoxide poisoning or exposure.

Masimo Rad-57 reveals elevated CO—29% in one patient

Using a Masimo Rad-57 monitor, the patients were quickly examined and triaged. EMS personnel determined that all patients had an elevated level of CO—the highest being 29%. While patients felt their symptoms were improving, their CO levels had not diminished to normal ranges; subsequently, three of the four patients were transported to area hospitals.

Bridgeview Fire Department

Located in a suburb of Chicago, the Bridgeview Fire Department is a full time department providing fire, rescue, and ambulance services to the more than 5,000 households in the area. The department currently employs 1 fire chief, 3 battalion chiefs, and 35 firefighters/EMTs, and operates two strategically-located fire stations.

400 ppm CO level traced to faulty propane forklift

A check of the building with the four-gas monitor revealed a CO level exceeding 400 ppm. The source of the carbon monoxide was traced to a malfunctioning propane forklift operating in the building's storage area. The high CO level was mitigated through simple ventilation of the work area.

Masimo's non-invasive diagnostic tool speeds patient assessment

The Rad-57 proved to be a valuable component of patient treatment. Its diagnostic capabilities aided EMS personnel in rapidly and accurately assessing patients exposed to elevated CO levels. The non-invasive nature of this technology is an asset to our department and the EMS field in general.

A Day for Making a Difference

Mark Brewer
Masimo Corporation
Account Executive

The incident: Demo reveals danger

Masimo's Mark Brewer was recently performing a pulse-ox demo at the Phoenix Indian Medical Center for their Director of Respiratory, Karen Chief Onesalt and her supervisor Wanda. "When I placed our Rad-57 on Wanda's finger, her CO reading was 6," said Mark. Then I placed the probe on Karen's finger and got the same CO reading—a 6. Finally, I put the probe on my finger and got a 1. Linda Lopez, supervisor for OR/PACU, joined us and I placed the probe on her and got a reading of 1. Something didn't add up."

Complaining of flu-like symptoms

Karen and Wanda had recently noticed feeling ill whenever they spent time in the break room. Both complained of flu-like symptoms. "As I continued my

presentation—Linda and I had now been in the break room for over 30 minutes—I stopped and retested our CO levels. Both of us were now reading a 3 and Linda began complaining that she was now feeling ill," said Mark.

Mystery solved

"I asked Karen if the department was located next to a boiler or furnace room, and it turns out their office is next to the delivery dock," said Mark. "Karen called Facilities and they are now having the area tested for elevated CO levels. Karen was very thankful for what I had done for her today, but I responded that it's not what I did; it's what Masimo can do for your hospital. And yes, Karen and Linda are convinced that the hospital needs and will be converted to Masimo Pulse CO-Oximetry."

Race Against Time Prevents CO-Related Tragedy

Brandon Johnson
Firefighter/Paramedic
Hebron, Kentucky Fire Protection District
Hebron, Kentucky

The call: Allergic reaction

In February 2006, firefighter/paramedics with the Hebron, Kentucky Fire Protection District were called to a local hotel in response to a young girl experiencing a potential allergic reaction to chlorine. The girl had been in the hotel's indoor pool for about an hour when she started feeling sick. Upon arrival, firefighter/paramedic Brandon Johnson tried to assess the situation, "I think the kids were a little nervous to talk to our crew, so we didn't get too good of a read from them." The crew quickly requested an engine company to perform CO screening on victims. While waiting for the engine to arrive, the crew's air monitors began detecting high levels of CO—at least 900 ppm in the indoor pool area and more than 1,200 ppm in the adjacent boiler room.

Masimo Rad-57 arrives, patients gone

When the engine company arrived with the Masimo Rad-57, the families had already left the hotel--despite the crew's warnings. "Luckily they gave us some cell phone numbers and contact information," said Johnson. The crew began testing hotel staff and detected 16% SpCO in a maintenance worker who'd been working in the boiler room for about 20 minutes. Johnson and his crew became extremely concerned at that point, knowing the children had been in the pool for about an hour. The crew quickly called dispatch and requested that an ambulance respond to the hotel where the families had returned.

Kids sick with 22% CO, mothers 18% CO

En route to the hotel, Johnson's crew contacted one of the mothers via cell phone and explained the danger they were in. By the time the families returned to their hotel, all four children had vomited. When Johnson and his crew arrived, they immediately tested the families with the Rad-57 and detected COHb levels of 20% to 22% in all four kids and 17% to 18% percent in the mothers. All were immediately taken to hospitals and recovered without incident.

Rad-57 quickly quantified seriousness of the problem

Johnson gives much of the credit for the patients' fortunate outcome to the Rad-57, adding that other than taking the patients to an ED or actually witnessing symptoms, there wouldn't have been any way to quantify the seriousness of the problem. "It couldn't have been done without that instrument," Johnson said of the Rad-57. "It's been really beneficial for us, especially in responding to incidents when air monitors can't find the source." Johnson's experience underscores the complexity of CO-related incidents and the need for vigilance by first responders in dealing with them.

Hebron, Kentucky Fire Protection District

Hebron Fire Protection District is located in the northern part of Boone County, KY, and covers approximately 42 square miles. The fire district has 2 stations, 32 full-time personnel with 13 of those being paramedics. There are also about 20 volunteers that serve the district. The district maintains 3 engines, 1 tower ladder, 1 rescue, 2 ambulances, 2 utility trucks, 3 staff vehicles, and 1 regional hazmat unit that responds throughout Northern Kentucky stations.



She doesn't know she's been poisoned by carbon monoxide.
You can't afford not to.

Why risk misdiagnosing patients with carbon monoxide poisoning when you can quickly and easily detect it on the scene? Too often, even the most skilled first responders miss the chance to treat carbon monoxide poisoning early because until now there hasn't been a fast, accurate and noninvasive way to detect elevated levels of CO in the blood. With the Masimo Rad-57 you can easily detect carbon monoxide poisoning on the spot in just seconds with the push of a button, allowing for prompt and possibly life-saving treatment that can also limit the likelihood of long-term cardiac and neurological damage.

To find out more, call 1.800.257.3810 or go to www.masimo.com/rad-57



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