First Responder

First Response AUSTRALIA

September '12 Newsletter

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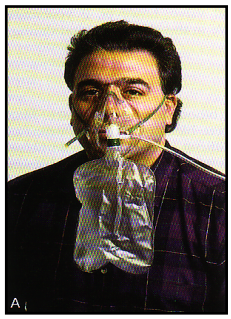
Can Oxygen Hurt ?

Emergency Medical Services (EMS) providers began giving oxygen not because it had medically or scientifically demonstrated benefits for patients, but because they could. Yet, inarguably, hypoxia (lack of oxygen) is bad.



John Scott Haldane, who formulated much of our understanding of gas physiology, said in 1917, "Hypoxia not only stops the motor, it wrecks the engine." Patients begin to suffer impaired mental function at oxygen saturations below 64 percent. People typically lose consciousness at saturations less than 56 percent, giving airplane passengers no more than 60 seconds to breathe supplemental oxygen when an airplane flying at 30,000 feet suddenly depressurizes.

More recent studies suggest that hyperoxia, or too much oxygen, can be equally dangerous. Hence the drug EMS providers administer most often may not be as safe as originally thought. Studies on benefits and dangers of oxygen therapy are not new; intensive care practitioners have long recognized the adverse effects of using high concentration oxygen.

The Guidelines for Emergency Cardiac Care (ECC) in 2000 and 2005 recommended against supplemental oxygen for patients with saturations above 90 percent. The current 2010 ECC Guidelines call for supplemental oxygen only when saturations are less than 94 percent, perhaps in an effort to soften the impact of change. What is new are prehospital research studies comparing outcomes of patients treated without oxygen or with oxygen titrated to saturations versus patients routinely given high flow oxygen. These data are frightening; they invariably show impressive patient harm from even short periods of hyperoxia.

We've known since 1999 that oxygen worsened survival in patients with minor to moderate strokes and made no difference for patients with severe stroke6. In fact, the American Heart Association recommended in 1994 against supplemental oxygen for non-hypoxemic stroke patients. The dangers from giving oxygen to neonates have also been long appreciated. The most compelling outcome studies of neonates published in 2004 and repeated in 2007 showed a significant increase in mortality of depressed newborns resuscitated with oxygen (13 percent) versus room air (8 percent). This led to the current neonatal resuscitation recommendations for use of room air positive pressure ventilation.

In 2002, a study of 5,549 trauma patients in Texas showed prehospital supplemental oxygen administration nearly doubled mortality. A Tasmanian study of prehospital difficulty breathing patients published in 2010 compared patients treated with oxygen titrated to saturations of 88 to 92 percent to patients treated with non-rebreather oxygen masks. It showed a reduction in deaths during subsequent hospitalization of 78 percent in COPD patients and 58 percent in all patients. New studies are showing a troubling pattern of worse outcomes associated with hyperoxia post cardiac arrest.

Why would oxygen worsen patient outcomes? One mechanism may be absorption atelectasis. Gas laws mandate that increases in the concentration of one gas will displace or lower the concentration of others. Room air normally contains 21 percent oxygen, 78 percent nitrogen, and less than 1 percent carbon dioxide and other gases. Nitrogen, the most abundant room air gas, is responsible for secretion of surfactant, the chemical that prevents collapse of the alveoli at end expiration.

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Premature infants often are not developed sufficiently to produce surfactant and require endotracheal administration of animal surfactant. "Washout" of nitrogen in adult lungs occurs when high concentration oxygen is administered. Lower concentrations of nitrogen can lead to decreased surfactant production with subsequent atelectasis and collapse of alveoli, significantly impeding oxygen exchange.

Oxygen is also a free radical, meaning that it is a highly reactive species owing to its two unpaired electrons. From a physics perspective, free radicals have potential to do harm in the body. The sun, chemicals in the atmosphere, radiation, drugs, viruses and bacteria, dietary fats, and stress all produce free radicals. Cells in the body endure thousands of hits from free radicals daily. Normally, the body fends off free radical attacks using antioxidants. With aging and in cases of trauma, stroke, heart attack or other tissue injury, the balance of free radicals to antioxidants shifts. Cell damage occurs when free radicals outnumber antioxidants, a condition called oxidative stress. Many disease processes including arthritis, cancer, diabetes, Alzheimer's and Parkinson's result from oxidative stress. The concept of free radical damage suggests the old EMS notion that, "high flow oxygen won't hurt anyone in the initial period of resuscitation" may be dead wrong. Tissue damage is directly proportionate to the quantity of free radicals present at the site of injury. Supplemental oxygen administration during the initial moments of a stroke, myocardial infarct (Heart Attack) or major trauma may well increase tissue injury by flooding the injury site with free radicals.

Finally, consider this: five minutes of supplemental oxygen by non-rebreather decreases coronary blood flow by 30 percent, increases coronary resistance by 40 percent due to coronary artery constriction, and blunts the effect of vasodilator medications like nitroglycerine1. These effects were demonstrated dramatically in cath lab studies published in 2005. Wonder why the 2010 ECC Guidelines recommended against supplemental oxygen for chest pain patients without hypoxia? Now you know: supplemental oxygen reduces coronary blood flow and renders the vasodilators ALS providers use to treat chest pain ineffective.

Where do we go from here? Knowing that both hypoxia and hyperoxia are bad, EMS providers must stop giving oxygen routinely. Oxygen saturations should be measured on every patient.

Protocols need to be aligned to reflect the 2010 ECC guidelines: administer oxygen to keep saturations between 94 and 96 percent. No patient needs oxygen saturations above 97 percent and in truth, there is little to no evidence suggesting any clinical benefit of oxygen saturations above 90 percent in any patient.

Modifications in prehospital equipment will be inherent in controlling oxygen doses administered to patients. In all likelihood, the venturi mask will make a comeback, allowing EMS providers to deliver varied concentrations of oxygen as needed to keep oxygen saturations between 94 and 96 percent.

Few patients will require non-rebreather masks which are prone to deliver too much oxygen (hyperoxia). CPAP (Continuous Positive Airway Pressure) devices will also need redesign as most conventional EMS CPAP delivers 100 percent oxygen. A study conducted by Bledsoe, et al in Las Vegas found that prehospital CPAP using low oxygen levels (28 to 30 percent) was highly effective and safe.

Bottom line: the drug we use most often can cause harm if we give it without good reason. In the absence of low saturations, oxygen will not help patients with shortness of breath and it may actually hurt them. The same holds true for neonates and virtually any patient with ongoing tissue injury from stroke, MI or trauma. Indeed, oxygen can be bad.

Is calling the Emergency Call Service via mobile reliable?

Mobile phones enable individuals to call the Emergency Call Service from most places in Australia. However, the nature of mobile handsets and mobile networks means that in some circumstances these calls are not as reliable as calls from the fixed network.

Problems that may be experienced when making a call from a mobile phone to the Emergency Call Service include :

- bad reception, making it difficult for the emergency service operators to understand the caller;
- a remote location may result in limited or no network coverage being available;
- running out of battery; and
- a lack of precise location information about the call.

Special roaming capabilities of the vast majority of mobile phones when calling Triple Zero (000) mean that when you are out of your service provider's coverage area but are in another carrier's mobile phone network coverage area, your call will be carried on the other carrier's network.

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However, it is important to realise that if there is no mobile coverage, you will not be able to reach the Emergency Call Service via a mobile phone, and alternative devices, such as personal location beacons (PLBs) should be considered. PLBs are equipped to send a distress signal with location details on a dedicated radio frequency that communicates with Search and Rescue operators.

Can the operator know where the Triple Zero (000) call is coming from if dialed from a mobile phone?

It is advised when calling Triple-Zero from a mobile phone you should be prepared to provide as much information as possible to emergency service operators about the location of the emergency.

If unable to identify your whereabouts, mobile carriers can provide emergency services with location information in most cases.

However, the accuracy of this information can be affected by factors such as obstructions to mobile reception or the number of mobile phone towers nearby. It should be noted that mobile location will only be possible where network coverage is present.

For people traveling into areas where mobile coverage may be poor or unavailable, it is advised to investigate carrying an alternative personal safety device. In remote areas, for example, a Personal Locator Beacon (or EPIRB – Emergency Position-Indicating Radio Beacon) is suggested.

Can emergency services locate a phone fitted with GPS?

Australia's mobile networks cannot automatically transmit GPS data from a handset to an emergency service call-taker at present. If you do have a GPS enabled handset, you can however verbally convey your estimated geographic position to emergency services and this may assist them to locate you. You should be aware that many GPS applications are very battery intensive which may result in you not being able to call Triple Zero (000) at all.

How can mobile coverage areas be ascertained?

Mobile phone service providers have coverage maps available from their point of sale locations, and upon request. All the carriers (Optus, Telstra and VHA) have good coverage in the major population centres, but in regional areas only one or two of these are likely to provide sufficient network coverage.

In these areas, if your mobile phone service provider does not have network coverage for normal phone use, or to enable a Triple Zero (000) call to be made, a call to Triple Zero (000) will be carried if another carrier has sufficient network coverage in the area.

What happens when 112 is dialed from a mobile?

112 is a secondary emergency number that can be dialed from mobile phones in Australia. Special capabilities, including roaming, once only existed when dialing 112, however mobile phones manufactured since January 2002 also provide these capabilities when dialing Triple Zero (000) to access the emergency call service. It is important to realise that if there is no mobile coverage on any network, you will not be able to reach the emergency call service via a mobile phone, regardless of which number you dialed.

Will a 112 call be carried by satellite if there is no mobile coverage?

No! Satellite phones use a technology which is different from that which is used by mobile phones, and your mobile phone will not be able to access a satellite network. It is important to realise that if there is no mobile coverage, you will not be able to reach the Emergency Call Service via a mobile phone. Satellite based networks are generally designed to provide coverage throughout Australia and, in particular, to places outside the coverage areas of land-based mobile phone networks.

Can I call 112 from any type of service?

No! Dialling 112 from a fixed line telephone in Australia will not connect you to the Emergency Call Service. It is only available from digital mobile phones.

Can I call 911 from my mobile phone in an emergency?

911 is used by emergency services in the United States. Not all mobile phones can access Australia's Emergency Call Service by dialing 911. You should use Australia's primary emergency service number, Triple Zero (000) or the secondary emergency service number of 112 which can only be dialed on a digital mobile phone. While dialing 911 from some mobile phones may provide access to the Emergency Call Service, such access is not a formal feature of Australia's telecommunications system and should not be relied upon in an emergency.

Can text message be used to contact Triple Zero (000)?

No! It is not currently possible to contact Triple Zero (000) or 112 using the SMS text facility on your mobile phone.

Can I call Triple Zero (000) from a locked handset?

From the vast majority of mobile handsets you can call Triple Zero (000) without having to unlock the keypad or key-in a security-protection Personal Identification Number (PIN). However, you should check your handset manual for information regarding emergency call dialing.

Pedestrians distracted by hoodies and ear phones at greater risk of injury

The number of US pedestrians who have been killed or badly injured while wearing headphones has tripled in six years, according to a new study. The researchers, led by Richard Lichenstein of the University of Maryland Hospital for Children in Baltimore, trawled through various sets of data to identify accidents that involved pedestrians wearing iPods, MP3 players and other musical devices. It did not include mobile phones. They found that the annual tally rose from 16 in 2004 to 47 in 2011, bringing the total of cases to 116 over this period. "Everybody is aware of the risk of cell phones and texting in automobiles, but I see more and more teens distracted with the latest devices and headphones in their ears," says Lichenstein. "Unfortunately as we make more and more enticing devices, the risk of injury from distraction and blocking out other sounds increases." More than half of the incidents involved pedestrians who were run down by trains, while two-thirds of the victims were males and under the age of 30 years.

The research, published in the journal *Injury Prevention*, warns of "inattentional blindness" when wearing headphones, meaning a distraction that lowers the resources the brain devotes to external stimuli. "Whenever you're running or walking around listening to music you're allocating some of your brain to listening to that music and the other part to the activity you are doing. You really can't do both of those activities at 100 per cent," says Lichenstein.

The researchers add that the distraction is intensified by sensory deprivation, so that the pedestrian's ability to hear an oncoming train or car is masked by the sounds produced by the headphones.

Once every three to four days, someone in Richmond, Pensilvania., is hit by a car while crossing the street, according to the Richmond Times-Dispatch, suffering an injury serious enough to warrant an ambulance transport.

Emergency Services vehicles in that city now use special sirens that part traffic quickly. What is used is a bass siren that's called a “growler”. It emits a bass tone so that way you can feel it as well as hear it, For example it may be used when an Emergency vehicle comes up behind a car that has its stereo on, or someone with headphones on is crossing the street, the normal siren they may well be ignored. But when the “growler” is used, the bass tone makes road user look up and see what's coming.

Limited data in Australia

In Australia, there is no formal gathering of data regarding headphone use in pedestrian accidents. Dr Bruce Corben, a senior research at Monash University Accident Research Centre says he like to see that change. "There is enough [evidence] to suggest that we should be understanding the problem more accurately than we currently do," says Corben. He says young people, particularly secondary school children and young adults, are more likely to be at risk. "If you're going to use [headphones while crossing the street] I think you should be very very careful."

NSW schools shun defibrillators

Public schools have been forced to decline the offer of free defibrillators – because the education department does not support their use at school. NSW is out of step with other states such as Victoria, which welcomes the lifesaving defibrillators into schools.

Grieving family and friends of Jamie Paraskevopoulos, 16, who collapsed and died after finishing an exam at Aquinas College, Menai, in 2012, last year raised about $50,000 for 18 defibrillators which they offered to 16 schools, along with two for Jamie’s football clubs.

Aquinas College had bought its own defibrillator unit but four public schools had to turn them down after the department said it would not support them.

Education Minister Adrian Piccoli declined to comment, and said he’d seek the department’s advice on its policy, regarding defibrillators, which can be used after basic CPR training, can only shock someone whose heart has stopped.

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Julia Juza helped with the fundraising, during which time she discovered the recent deaths of two other teens in southern Sydney from sudden cardiac death. "With this condition, and that is what happened to Jamie, going into cardiac arrest is the first sign something is wrong" Ms Zuza said. "If you have had CPR going, the defibrillator will kick in and shock and possibly bring the person back. Everyone wanted the defibrillators."Ms Zuza supports the Daily Telegraph's campaign for CPR training in all schools.

Sue Buckman, whose 19-year-old son Stephen died playing AFL in 2010, started Defib Your Club, for Life! In Victoria – which has since led to defibrillators in public schools.

A NSW Education department's spokeswoman said: "The Department's current policy does not support the use of defibrillators on school grounds but staff members at schools are trained to do CPR and ambulances respond immediately when contacted by a school"

The department has no centralised record of how many students had suffered a cardiac arrest at school, despite sudden cardiac death killing up to 500 fit, young Australians, mostly aged under 35, each year.

Editor's Note: Did you know:

- ***That every 16.8 hours an Australian child dies of Sudden Cardiac Arrest.***
- ***If you do nothing before the Ambulance arrives the probability of survival is 5%.***
- ***If CPR is applied before the Ambulance arrives the probability of survival is 9%.***
- ***If an AED is apply before the Ambulance arrives the probability of survival is 24%.***
- ***But the probability of an AED being available is only 2%***

The question is then note if, but when, the installation of AED's becomes mandatory part of health and safety procedures, and moreover a requirement in the workplace. The Government and others in authority may be content not making the provision of AED's and CPR training mandatory however, the public at large should not be.

Did you also know that FIFI (the international body representing soccer) has last month recommended that they want a defibrillator at every game and staff and team's medical officers should be trained appropriately.

200 Polish taxis equipped with defibrillators

In an innovative approach to Public Access Defibrillation 200 taxis have been equipped with ZOLL AED Plus Defibrillators. Ele Taxi Ltd. in Warsaw has equipped almost 20% of its fleet with the units. With more taxis available in the city than Ambulances it will mean that taxis can be despatched from a central location and reach the location of an emergency more quickly.

The Taxi company trained many of its drivers ahead of the EURO 2012 football championship, which it co-hosted. Shortly after installing the first AEDs, one of the company's drivers saved the life of a man who collapsed on the side-walk. The man was conscious by the time the ambulance arrived.

All Taxis equipped with the AEDs will display a prominent sign on the window. Sweden is the only other country in the world to have a similar program

Robot Lifeguards to the rescue

Designed to save distressed swimmers along busy beaches, an Arizona-based company has developed a robotic buoy that travels much faster than a typical lifeguard. Los Angeles County lifeguards at Zuma Beach in Malibu are currently testing a remote controlled, robotic rescue buoy that can be deployed to reach a stranded swimmer more quickly than a human lifeguard.

Called the Emergency Integrated Lifesaving Lanyard (E.M.I.L.Y.), the device is similar to a jet-ski in design and travels up to 25 miles per hour. It will act as a flotation device for up to six swimmers and a distressed swimmer can hang onto the buoy until a human lifeguard can reach their position. This allows lifeguards to cut down response time significantly and should help cut down on the number of drownings that occur when a swimmer gets pulled too far out into the ocean.

Developed by a company called Hydronalix, the robotic buoy was named after a thirteen year old girl named Emily Rose Shane that was killed along the Pacific Coast Highway in Malibu. While the speed of the buoy has been limited based on safe traveling speeds, the buoy can travel up to 40 miles per hour for a maximum of 35 minutes.

It can also patrol the water at a speed of five miles per hour for more than eight hours and weighs about 25 pounds. Compared to a human lifeguard, E.M.I.L.Y. can reach a drowning swimmer up to twelve times faster.

Over the past two years, E.M.I.L.Y. has been revised to include hand loops on the side of the buoy to help swimmers hang onto the device and some models use a rope to help drag a stranded swimmer closer to the shore. The company has also added a safety screen over the intake valve in order to avoid accidentally sucking hair into the device during operation.

Looking ahead, the company is investigating the possibility of adding sonar in order to find swimmers that have been pulled underwater, ideally to help human lifeguards locate a drowning swimmer caught a rip tide. The device can also be dropped from a helicopter in order to reach a swimmer's location at a more remote area of the ocean. E.M.I.L.Y. costs approximately $10,000 and is also being tested along the coast of Oregon and Rhode Island.

FRA launches new catalogue

First Response Australia has launched its new Catalogue, available in hard copy or as a downloaded file from our website via the link below.

www.firstresponseaustralia.com.au/publications/FRA_catalogue_Sept12.pdf

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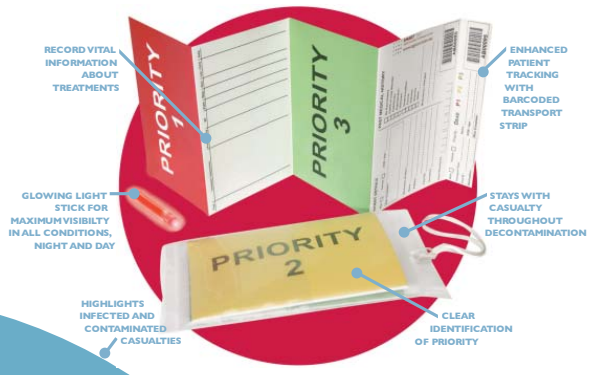

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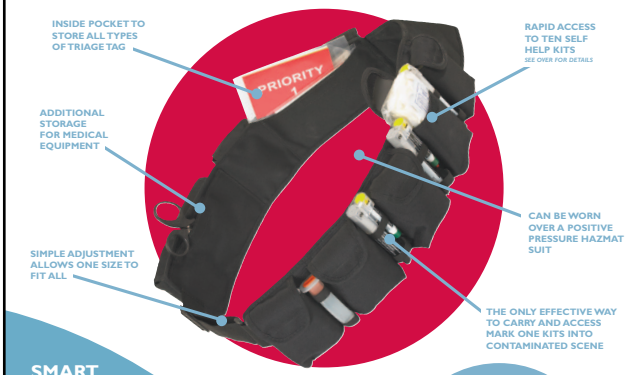

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The June 2005 report into the Tokyo Subway Sarin Attack states that "We are still challenged to develop new interventions and to modify current standard trauma interventions to better treat victims of the next sarin gas attack."

As the Scene of an MCI available medical equipment is limited to that carried by each medic. The Smart RAT Pack™ is specifically designed to decrease morbidity and mortality associated with Multiple Casualty Incidents.

Beaton et al. The Sarin Gas Attacks on the Tokyo Subway - 10 years later / lessons learned, Journal of Traumatology (June 2005)

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