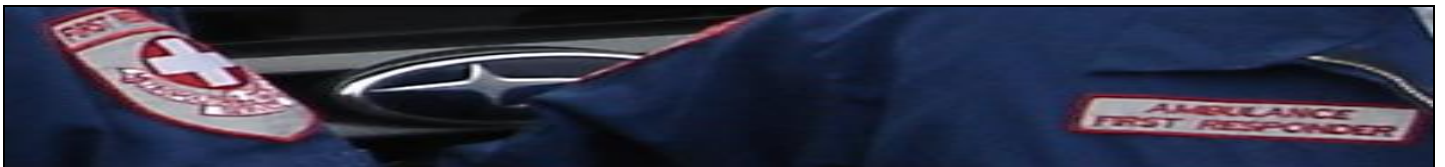


STRENGTHENING THE CHAIN OF SURVIVAL



**Emergency Services Foundation - Scholarship
Strengthening the Chain of Survival**

**Rosie Keane
Ambulance First Responder
Ambulance Victoria**

March 2011

STRENGTHENING THE CHAIN OF SURVIVAL

My scholarship to learn more about strengthening the Chain of Survival, has taken me to the United States, where I visited Ambulance and Fire personnel in the State of Virginia at the counties of Virginia Beach, Prince William County, and Richmond. I also travelled to Baltimore and San Francisco and spent time with all levels of staff, including basic EMT's, Paramedics, Division Chief, Chief Executive Officer of an ambulance Authority and the Assistant Medical Director of the State of Virginia Department of Health.

I have talked with staff in Dispatch Centres, travelled with Supervisors to cases, worked with patients en route to hospital and talked with hospital staff about Emergency wards.

All of these people are dedicated to their work and their training whether they are career staff or volunteers.

This report looks at how Early Access, Early CPR, Early Shock and Early Advanced Life Support contribute to improving the 'Chain of Survival.'

Virginia Beach

The City of Virginia Beach covers approximately 307 square miles and population of 450,000 and during summer this rises to over one million people. The EMS division is made up of 956 Emergency Medical Technicians (EMT), with 56 career paramedics and 900 volunteers. The system is fully supported by Fire Rescue Squads.

Richmond

Richmond is approximately 62 square miles with a population of 200,000 people. Richmond is a standalone Ambulance Authority that is made up of career staff and volunteers as a third person on a vehicle before they begin their career training. The outer lying areas of Richmond have Volunteer Ambulance Rescue Squads with some career paramedics doing a volunteer shift per week. The Fire Services support the Richmond Ambulance Authority and the fire vehicles have a paramedic on board.

Prince William County

Prince William County is approximately 348 square miles with a population of 402,000 people. Dale City is in Prince William County and has 4 Volunteer Rescue Squads in a 40 square mile radius with career and volunteer rescue squads working together. There are approximately 56,000 people in Dale City.

Baltimore

Baltimore is 81 square miles with a population of 640,000 people. In Baltimore City there is only career staff with combined Fire and EMS.

San Francisco

San Francisco has a population of 775,000 people over 58 square miles. They too, have a combined Fire and EMS, and support each other well. They also have private ambulances to assist at cases if needed.

The Chain of Survival

Strengthening the links to the Chain of Survival will have a more structured approach in delivery of patient care in pre hospital by Paramedic and First Responder systems. The links to the chain of survival are Early Access, Early CPR, Early Shock and Early Advanced Life Support.

Early Access is to get help, call Ambulance 000

Early CPR is to buy time, bystander or First Responder

Early Shock restarts the heart by Public Access Defibrillators, First Responders or Paramedics

Early ALS is to stabilize the patient by Paramedics and MICA Paramedics

Chain of Survival

Early Access ♥ Early CPR ♥ Early Shock ♥ Early ALS



The success of outcome is in strengthening the Chain of Survival

Patient outcome from Sudden Cardiac Arrest in Victoria 2006

Patient outcome from Sudden Cardiac Arrest (SCA) return of spontaneous circulation from ventricular fibrillation (VF) and ventricular tachycardia (VT) in 2006 in Victoria, Rural Ambulance Victoria (RAV) Return of Spontaneous Circulation (ROSC) on scene of 2%, Metropolitan Ambulance Service (MAS) ROSC on scene of 57%.

Patient outcome from Sudden Cardiac Arrest in Victoria 2009/10

Patient outcome from witnessed Sudden Cardiac Arrest in ventricular fibrillation (VF) and ventricular tachycardia (VT) are now at 51.4% state wide with Rural Victoria moving from 21.2% in 2008 to 37.8% 2010

Melbourne Cricket Ground

In strengthening the links to the Chain of Survival the Melbourne Cricket Ground (MCG) has achieved a patient outcome from Sudden Cardiac Arrest with a venue outcome of 91.93% and discharged from hospital outcome of 75.8%. This highlights the effectiveness when the links have been strengthened to support patients in Sudden Cardiac Arrest (SCA).

**STRENGTHENING
THE
CHAIN
OF
SURVIVAL**



Station 14
Virginia Beach
Rescue Squad
EMS Volunteer



Company 1
San Francisco Fire
Department EMS
1 Paramedic and 3
EMT's

Station 10
Dale City Fire
Department EMS
2 EMT's with
Paramedic support



Training and Qualifications

Education is a vital part to Early Access in the Chain of Survival. Across numerous states in America there are varying levels, in comparison to Ambulance First Responders in Victoria. The United States have Emergency Medical Technician Basic (EMT-B), EMT Enhanced, (EMT-E), EMT Intermediate, (EMT-I), then Paramedic. Our equivalent as First Responder would be EMT Intermediate, as these qualifications enable both First Responder and EMT to administer some medications. These qualifications are the same whether you are a volunteer or career staff.

A basic course for EMT is 110 hours training plus driving and 36 hours over 4 years of compulsory training. Ambulance First Responders have approximately 80 hours training plus driving but have 21 hours of compulsory training every year.

For every level you reach as EMT, your compulsory training will increase. Once you have reached Paramedic level, training is increased to 72 hours every 2 years, plus your 36 hours over 4 years. Critical Care is all of the above plus 36 hours every 3 years. An EMT will be trained for Ambulance or Fire Rescue Squad. In Victoria the Metropolitan Fire Brigade (MFB) train for their First Responder course over 80 hours, and re-accreditation every 3 years (approximately 16 hours) and skill maintenance of 5 training sessions annually. The MFB train for CPR, defibrillator, oxygen therapy and medical/trauma events. They do not carry any drugs on their vehicles.

The Country Fire Authority (CFA) is currently trialling a First Responder program for volunteers. This is 4 days training of CPR, defibrillator, oxygen therapy and medical/trauma with 1 day re-accreditation every year, with a pre-requisite of Level 2 First Aid.

As an EMT or Paramedic in the United States both Ambulance and Fire Rescue Squads are interchangeable, in as much that on fire vehicles there will always be a minimum of EMT-Basic on each vehicle to respond.

Paramedics in Victoria are a 3 year University based course (60 weeks). Graduate Paramedics are accepted as Student Paramedics with a 12 month curriculum required by Ambulance Victoria before graduating as an Ambulance Paramedic of Ambulance Victoria.

All volunteers in the United States train on a weekly basis but still have to maintain their compulsory training hours every year. The EMT's also having a higher skill level as they are going out every day to cases with a workload similar to that of branches in Metropolitan Melbourne.

**STRENGTHENING
THE
CHAIN
OF
SURVIVAL**

Ambulance Victoria Paramedics and First Responders seem to be on a par with American EMT's/Paramedics as far as Early Access to patients. Education of First Responders in America seems to be on a broader level to those in Victoria. By starting as an EMT and taking a step up the ladder as soon as you are capable, you are increasing your skills on the job every day at a faster rate than in University and skill maintenance will be higher.

The Patient in Sudden Cardiac Arrest

The delivery of care by type and city was Basic Life Support to Advanced Cardiac Life Support with Columbus Ohio BLS EMT having the use of Intra Muscular Adrenaline for Sudden Cardiac Arrest

Delivery of care and type by City EMS	Career Volunteer ACLS	Career Volunteer ALS	Career Volunteer EMT 2	Career Volunteer EMT 1
Virginia Beach	ACLS	ALS	EMT 2	EMT 1
Richmond	ACLS	ALS	EMT 2	EMT 1
Dale City	ACLS	ALS	EMT 2	EMT 1
Baltimore	ACLS	ALS	EMT 2	EMT 1
San Francisco	ACLS	ALS	EMT 2	EMT 1
Columbus Ohio	ACLS	ALS	EMT 2	EMT 1
Ambulance Vic	MICA	ALS		AFR/ACO

**STRENGTHENING
THE
CHAIN
OF
SURVIVAL**

A number of CFA Stations are taking part in a trial under a State Government Project with Ambulance Victoria in Pre Ambulance Basic Life Support (PABLS)

Emergency Medical Service

A review of Emergency Medical Service (EMS) type in the US and Ambulance Victoria

- Virginia Beach EMS
- Richmond Ambulance Authority EMS
- Prince William Country Dale City EMS
- Baltimore Fire Department EMS
- San Francisco Fire Department EMS

- **Ambulance Victoria Metropolitan Region**
- **Ambulance Victoria Rural Region**
- **Ambulance Victoria**

Type of service delivery Ambulance/Fire US EMS

Fire EMS AV Metro MFB Career and CFA Volunteer

City	Virginia Beach	Richmond	Dale City	Baltimore	San Francisco	AV Metro	AV Rural
Service Type EMS	Fire EMS	Amb	Fire EMS	Fire EMS	Fire EMS	Amb	Amb
Support Type 1		Fire EMS				Fire EMS	
Support Type 2		Amb Vol				Amb FR	Amb FR

EMS Staff Career or Volunteer

City	Virginia Beach	Richmond	Dale City	Baltimore	San Francisco	AV Metro	AV Rural
Career	Career	Career	Career	Career	Career	Career	Career
%	6%					1800 Staff	1000 staff
Volunteer	Vol	Vol	Vol			Vol	Vol
%/Number	94%					55 Staff	800 staff
Career/Volunteer	Career/Vol	Career/Vol	Career/Vol	Career	Career	Career/Vol	Career/Vol

**STRENGTHENING
THE
CHAIN
OF
SURVIVAL**



Station 1
Baltimore Fire
Department
1 Paramedic and 3
EMT's



Richmond Ambulance
Authority EMS
2 Career Paramedics

Richmond Ambulance
Authority
EMS vehicle



Early CPR



Early CPR is vital in supporting the patient in Sudden Cardiac Arrest (SCA). By having a dual response with other agencies, this provides greater man power/support for CPR.

In America they respond both Ambulance and Fire Rescue to a cardiac arrest patient.

In metropolitan Melbourne they too, send Ambulance and the Metropolitan Fire Brigade (MFB), and in some outer metropolitan areas the Country Fire Authority (CFA) are dispatched to support Ambulance with cardiac arrest patients. In rural areas in Victoria Ambulance will also be supported by Community Emergency Response Teams (CERT), as Ambulance First Responders. All of these agencies are working together to provide early CPR to an arrested patient.

The effectiveness of CPR is the number one concern in pre-hospital care and a number of Fire and Ambulance services in the United States are using the Auto-Pulse or Lucas to deliver the most effective compressions possible. The Auto-Pulse and Lucas are devices that have been developed to deliver cardiac compressions during resuscitations. The devices give a consistent compression depth and rate during resuscitation.

Auto-Pulse has been used by Ambulance Victoria in recent years within rural areas.

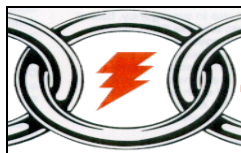
“I have observed the Auto-Pulse on two cardiac arrest patients in Richmond, Virginia. It proved to be most effective in the delivery of compressions, on scene, through to the Emergency Department in hospital. This freed up paramedics to provide assistance with airway and drug therapy en route to hospital.”

Type of CPR received by Patient in Ambulance Victoria

Type of CPR	Metro Region	Time to CPR	Rural Region	Time to CPR
Public	Yes	Min	Yes	Min
Other	Yes	Min	Yes	Min
Phone Instruction	Triple Zero	ESTA	Triple Zero	ESTA
First Responder Fire	Yes	ESTA		
First Responder AV	Yes	ESTA	Yes	ESTA
Paramedic	Yes	ESTA	Yes	ESTA
Device Auto-Pulse	Trial*	ESTA*	Trial	ESTA

***Ambulance Victoria is about to commence a trial with the Auto-Pulse in Metropolitan Region**

Early Shock



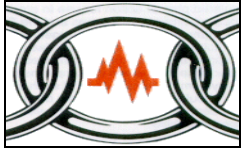
Early Shock is to support the patient in Sudden Cardiac Arrest to reduce time from collapse to shock. There are First Responder programs all over the world to support these patients. Most of these programs are for Public Access Defibrillators (PAD) available in high risk locations such as airports and shopping centres. This is a Victorian Government funded program.

In the States as well as Victoria there are defibrillators with signs identifying the locations of Automatic External Defibrillators (AED). The access of these defibrillators is greater in America than Victoria due to the Victorian program, where people are trained in the use of and AED (Public Access Defibrillator program) as opposed to America, where anyone can take the unit and use it for Sudden Cardiac Arrest. A number of organisations, sporting clubs, and community groups are now purchasing their own AED to support public areas and workplaces in the event of Sudden Cardiac Arrest.

Cardiac Monitor type used by Career and Volunteer EMS

Cardiac Monitor type by City EMS	Career Volunteer ACLS	Career Volunteer ALS	Career Volunteer EMT 2	Career Volunteer EMT 1
Virginia Beach	12 Lead	12 Lead	12 Lead	AED
Richmond	12 Lead	12 Lead	3 Lead	AED
Dale City	3 Lead	12 Lead	12 Lead	AED
Baltimore	3 Lead	3 Lead	3 Lead	AED
San Francisco	12 Lead	3 Lead	3 Lead	AED
Ambulance Vic	12 Lead	3 Lead		AED

Early Advanced Life Support



Early Advanced Life Support is to reduce time from collapse in a Sudden Cardiac Arrest patient to drug therapy.

In Melbourne Advanced Life Support programs are supported by Mobile Intensive Care Ambulance paramedics (MICA) who can support the patient with advanced airway management and advanced drug therapy. MICA Paramedics have been involved in trials in the past and currently for more advanced therapy to support the cardiac arrest patient. Those trials include Minimally Invasive Device for Cardiac Massage (MID-CM), Rapid Infusion of Cold Hartman's (RICH) and currently the Prophylactic Hypothermia 2 Lessen Traumatic Brain Injury (POLAR) trial, which is cold fluid during resuscitation.

In greater Melbourne we have a dual car response which is an ALS ambulance, MICA resource and utilisation of Fire Services. In outer metro Melbourne, this response includes First Responder, ALS and MICA resources. This could be an Ambulance First Responder or a fire vehicle response.

In a number of areas in the United States, EMT's (First Responders) have been given the authority to practice Intra-nasal (IN) adrenaline for the patient in Sudden Cardiac Arrest. In Ohio this is a basic frontline management for Sudden Cardiac Arrest for Fire and EMT First Responders. This program has been continued for Midazolam for the continuously fitting patient. Other IN drugs include Ketamine, Glucagon, Narcan and Fentanyl.

The importance of ALS/MICA paramedics is to gain IV access and drug therapy in the pre-hospital setting with the means to stabilise the patient. With the implementation of more advanced technology with 12 lead cardiac monitoring, the hospital receives ECG's of the patient in real time from paramedics.

By having a tiered response from Ambulance with First Responders, ALS and MICA paramedics and utilising Fire services from the MFB and CFA First Responders, this gives a better outcome for the patient.

Introducing IN drug therapy for use by First Responders to a patient in Sudden Cardiac Arrest will decrease the time for commencement of IN/IM Adrenaline. This could be seen as part of basic life support until the intervention of ALS/MICA paramedics. Ambulance First Responders are currently trained in Intra Muscular (IM) Adrenaline for Anaphylaxis, because this is considered to be a life-threatening situation. Therefore the introduction of IN or IM Adrenaline for Sudden Cardiac Arrest could be seen as being a major step forward in treating this life-threatening condition by First Responders.

Conclusion

By observing how other organisations deliver their multi-level pre-hospital care within each link of the Chain of Survival in comparison to Victoria, I have seen how we under-utilise Fire Services and under-estimate the potential skill level of Ambulance First Responders.

By implementing the use of MFB and CFA as First Responders, we already have a structured organisation, with communications and vehicle resources. However the initial outlay is only based on equipment and training.

In identifying that First Responders, through education and skill maintenance, are capable of initial management of a patient in Sudden Cardiac Arrest with defibrillator, oxygen and CPR, and with the implementation of drug therapy, there is a possibility of an earlier outcome of return of spontaneous circulation (ROCS) in a cardiac arrest patient.

Whether First Responders are employed by Ambulance or Fire Services, observations and conversations show that working with other agencies is a common everyday practice and everyone works well together and socially.

The community benefits from all these agencies and in places such as Virginia Beach over 94% of emergency health services are volunteers. The community quite often does not know whether they have a career or volunteer squad on their doorstep. Like all patients, they are just happy that someone is there to help.

First Responders are treated on a par with career staff, and are supported with Critical Incident Stress Management the same as Peer Support for Ambulance Victoria, for certain cases. In the US many career staff volunteer at least one shift per week, to support the volunteers.

For most staff, being part of the Emergency Services, whether in the States or here in Victoria, career or volunteer, is an achievement that benefits ourselves and helps in the knowledge that we are making a difference in the community.

Recommendations

- An education group to look at training and education of First Responders within Ambulance Victoria. Retainment of Ambulance First Responders with training and acknowledgement. Education group to include all Stakeholders of Ambulance Victoria (First Responders).
- Further expansion of Country Fire Authority trial to more locations with a high priority to isolated communities in rural Victoria.
- Implementation through the Medical Standards Committee Ambulance Victoria, for a trial of IM/IN Adrenaline for the patient in Sudden Cardiac Arrest.
- Implementation through the Medical Standards Committee, Ambulance Victoria, for a trial of IM/IN Midazolam for the continuously fitting patient.

**STRENGTHENING
THE
CHAIN
OF
SURVIVAL**



Station 1
Baltimore Fire
Department EMS
2 Career Paramedics



San Francisco
Fire Department EMS
1 Career Paramedic
and 1 Career EMT



Ambulance Victoria
Metro Region
Volunteer
Ambulance First
Responder Team

References

- The Hazards of Watching Football
Dr Jeff Wassertheil
State Medical Officer, St John Ambulance Australia
- Dr Karen Smith,
Emergency Medical Response by MFB
Ambulance Victoria
- Chain of Survival
Jerry Nolan, Jasmeet Soar, Harlald Eikelanc Resuscitation (2006)71,270-271
- London Ambulance Service NHS
[Hyyp://www.londonambulance.nhs.uk_working_for_us/volunteering_with_us_.aspx](http://www.londonambulance.nhs.uk_working_for_us/volunteering_with_us_.aspx)

JEMS Conference

- Lt James Fallar - Fire Department City of New York
- Dr David Keseg - Medical Director Columbus Ohio
- Vickie Herr Goschen Fire Company, Chester County Pennsylvania
- New Castle County Paramedics DuPont

Acknowledgements

Virginia Department of Health

- Scott Winston Assistant Director Virginia Department of Health

Virginia Beach EMS

- Chief Bruce Edwards EMS
- Division Chief John Bianco City of Virginia Beach EMS
- Brigade Chief John Fusco
- Melanie Dunn Administrative Intern

Richmond Ambulance Authority

- Chief Operating Officer Rob Lawrence
- Chip Decker Chief Executive Officer
- Lt. Brian Talty Assistant Operations Supervisor
- Dempsey Whitt Supervisor

Bon Secoeurs Hospital Group and Virginia Medical Centre

- Cam Crittenden EMS Coordinator
- Michael Kutz M.D. Director of Emergency Cardiac Care

Prince William County Dale City

- Sergeant Jay Lalond

Baltimore Fire Department EMS

- EMS Division Chief Lloyd Carter

San Francisco Fire Department

- Division Chief Jeff Myers
- Lt. Frank Circose

Index

AED	Automatic External Defibrillator
ALS	Advanced Life Support
ACLS	Advanced Cardiac Life Support
ACO	Ambulance Casual Officer
AMPDS	Advanced Medical Priority Dispatched Systems
AFRS	Airport Fire Rescue Service
Auto-Pulse	Device for performing cardiac compression
AV	Ambulance Victoria
AVL	Automatic Vehicle Location
BLS	Basic Life Support
CAD	Computer Aided Dispatch
CERT	Community Emergency Response Team
CFA	Country Fire Authority
COS	Chain of Survival
CPR	Cardio-Pulmonary Resuscitation
ECG	Electro-Cardiograph
EMS	Emergency Medical Service
EMT	Emergency Medical Technician
Fire Rescue	Emergency Ambulance
IM	Intra Muscular
IN	Intra-nasal
Lucas	Device for performing cardiac compression
PAD	Public Access program
PABLS	Pre Ambulance Basic Life Support
POLAR	Prophylactic Hypothermia 2 Lessen Traumatic Brain Injury
MAS	Metropolitan Ambulance Service
MID-CM	Minimally Invasive Device- Cardiac Massage
MICA	Mobile Intensive Care Ambulance
MFB	Metropolitan Fire Brigade
MDT	Mobile Data Terminals
RICH	Rapid Infusion of Cold Hartman's
RAV	Rural Ambulance Victoria
ROCS	Return of Spontaneous Circulation
SCA	Sudden Cardiac Arrest
SFFD	San Francisco Fire Department
VF	Ventricular Fibrillation
VT	Ventricular Tachycardia