AP annual report

Introduction

The Scottish Ambulance Service predominately has two main levels of response to acute life threatening emergencies: a paramedic response or a pre-hospital critical care team. The paramedic response has grown and evolved over the years and can now competently manage a large range of life threatening conditions in all ages of patient. This has been further enhanced by more sophisticated and targeted PRU type responses such as the 3RU project for OOHCA.

Pre-hospital critical care is provided by one of three consultant led teams. EMRS are tasked direct from their ScotSTAR base and Medic 1 and Tayside Trauma Team are diverted from duties at their respective ED. These teams aim to assist patients suffering complex and life threatening illness or injury. All three pre hospital teams provide critical care including anaesthesia, blood and surgical interventions as well as medical and leadership support at major incidents.

It is recognised that a gap exists between these two levels of currently deliverable care, which can result in a mismatch of skills to patient need. Commonly, this may equate to high dependency level care such as advanced analgesia in trauma and inotropic support in post cardiac arrest and sepsis. Over provision can also occur with critical care teams being called to deliver advanced analgesia only, often to facilitate an otherwise difficult and painful extrication after injury, but not requiring the advanced surgical or anaesthetic skills that reside within these specialist teams.

The Advanced Paramedic Practitioner project seeks to address this gap by developing a new tier of practitioners with enhanced skills and training. They will be able to administer a range of procedures and medications, to patients suffering life threatening illness or injury that previously were confined to the medical teams.

With the instigation of the Scottish Trauma Network (STN), the opportunity has arisen to catalyse this development. It is hoped that this group ultimately will provide a SAS resource across the country that will support both the roll out of the STN and also provide life saving interventions to patients suffering with sepsis, trauma and cardiac arrest. Consequently enabling them to reach hospital in the best condition possible with potential reduction in morbidity and mortality.

This APP capability will complement and facilitate both the standard paramedic response and the work of the critical care teams. By introducing this new advanced level of care, it would be anticipated that this would enhance career opportunities, the knowledge base across the workforce and the reputation of the Scottish Ambulance Service.

Background

The Scottish Ambulance Service currently employs Advanced Retrieval Practitioners (ARPs) within the ScotSTAR division working for the Emergency Medical Retrieval Service (EMRS).

These ARPs come from either a paramedic or nursing background. For the past 6 years the ARPs have been working on a one to one basis with a consultant providing advanced treatment and transfer to some of the sickest and most injured patients throughout Scotland.

This apprenticeship style of learning has been formally consolidated with a postgraduate qualification in critical care. The ARPs also hold two postgraduate diplomas in Immediate Medical Care and Retrieval and Transfer Medicine from the Royal College of Surgeons in Edinburgh.

This Advanced Paramedic Practitioner (APP) pathfinder project aims to allow Jeff Proctor (JP) and Alistair Kennedy (AK) to operate as advanced paramedic practitioners and deliver advanced pre hospital care to the ILT group of patients.

The APP is ideally placed to assist with the augmented chain of survival that is mentioned in the OHCA national strategy including:

- The **early recognition** link in the chain is one where the APP could use their enhanced clinical skills to prevent the peri-arrest patient from progressing into cardiac arrest.

- The **early CPR** link is where the lessons learned from the successful 3RU project in Edinburgh could be implemented in the West of Scotland by the AP. The AP would provide senior clinical decision making and clinical leadership at these incidents.

- The **post resuscitation care** link is perhaps the area where the AP will provide the most benefit to the patient. The AP can initiate care usually only provided in hospital (see section on skills) this includes post ROSC sedation, inotropic support, pacing and cardioversion.

Skills atrophy is recognised as a potential contributor to sub optimal performance during resuscitation of cardiac arrest patients. This can be a particular problem in geographical areas where frontline clinicians do not have regular experience/exposure to high acuity incidents. The ARP’s, have accumulated a wealth of experience with which to refine their skill set and are well placed to deliver interventions on scene and perform a leadership role during the treatment of ILT patient groups.

The qualities required of a successful OHCA team leader; confidence and competence in clinical practice, awareness of human factors, capacity to provide a leadership role in stressful and complex clinical scenarios, would be

equally useful at a complex trauma event. The APP model may also facilitate the provision of enhanced clinical care at scene for trauma patients. Interventions may include advanced analgesia, procedural sedation and thoracostomy where applicable.

It is expected that data gathered during this trial would help inform SAS strategy around the future role of advanced paramedics in a Scottish Trauma Network.

Test of concept

Following approval of our business case and funding from the Scottish Trauma Network, two APPs (AK & JP) have staffed a response vehicle in the west of Scotland region for 75 hours a week for the past 12 months. We carry additional equipment and have capacity to carry out a range of clinical interventions, currently beyond the ceiling of practice of SAS clinicians.

The list below shows the interventions that we felt would be most useful for an Advanced Paramedic Practitioner to provide:

- Advanced airway management including surgical airway and video laryngoscope.
- Surgical chest intervention – Thoracostomy.
- Mechanical ventilation.
- PEEP valve for ventilation
- Dysrhythmia treatment including transcutaneous pacing and DC cardioversion.
- Inotropic support for any critical patient (Adrenaline 1;100’000)
- Mechanical CPR device.

- Post ROSC management including inotropic support, sedation, mechanical ventilator, PEEP & ultrasound.
- Checklist driven PLE of PEA patients with top cover support when necessary.

- Drugs out with AACE guidelines:
    - Ketamine
    - Midazolam
    - Adrenaline 1:100,000
    - Salbutamol
    - Magnesium
    - Methoxyflurane (Penthrox)

- Procedural sedation to align displaced fractures and for acute behavioural disturbance.
- POCUS for cardiac, lung, FAST & vascular access.
- Definitive triage decision making.
- Clinical leadership at scene during complex resuscitation attempts.

- Clinical team lead, hot debrief, patient follow up and crew feedback.

Patient Group Directives:
PGDs were required to be approved for APP Ketamine and Magnesium use. We were also approved to use intravenous 1: 100'000 Adrenaline, Midazolam & Salbutamol. Use of these medications is reviewed at the quarterly SAS Medicine Management Meetings. To date all drugs have been administered within PGD guidance with no reports of any adverse events.

Governance Guidelines & Pocket Book:
Several new clinical guidelines were required to be signed off prior to starting the project. These were approved by the SAS associate medical director and clinical lead for the project. A pocket book style reference guide was also created to assist as an aid memoire and checklist tool when delivering APP interventions or using specific equipment.

Data Collection & Feedback:
Data on the type and frequency of interventions will be collected during the trial. The three areas listed below are ones which we think can best chart the success or otherwise of the project so far:

- ROSC rates & survival to discharge.
- Crew feedback & comments.
- Correct and appropriate tasking.

A comprehensive APP database is kept up to date with all activity including types of patients, locations, interventions and patient outcomes. We adhere to SAS GDPR guidelines regarding security this information. Feedback to ambulance crews regarding patient outcome is achieved via email and we invite all recipients to complete a short survey relating to their views on working with the APP.

Tasking:
Initially the ILT patient groups were identified as those who we felt would benefit most from the APP skill set. With the assistance from the Trauma Desk (TD) and Specialist Service Desk (SSD) we relied on staff in ACC to identify appropriate patients for us. Whilst this worked reasonably well, it was labour intensive for the staff involved and relied on prolonged periods of C3 system scrutiny to identify relevant patients. The remit of the TD also meant that clinicians may often be focused on competing priority incidents and therefore relevant APP taskings may be delayed or missed.

A review of tasking in April 2018 allowed for a refinement in the number and types of patient groups we attended. Work was also started to explore semi automation of tasking with the help of the Alternative Response Desk based in East ACC. This involved programming the patient groups into C3 and marrying this with a polygon area of operations for the APP. In essence this allowed for relevant patients to be automatically identified and consequently the ARD dispatcher would be prompted to task the APP.

We were able to trial tasking via ARD in June 2018 for an initial 2 month period. This proved very efficient with C3 identifying relevant patient groups and us attending a higher number of calls. However, with this increased activity we lost some sensitivity within the tasking and found several issues including:

- Significantly increased stand down rate.
- No requirement for additional APP skills once on scene.
- Long blue light drives for limited or no APP intervention.

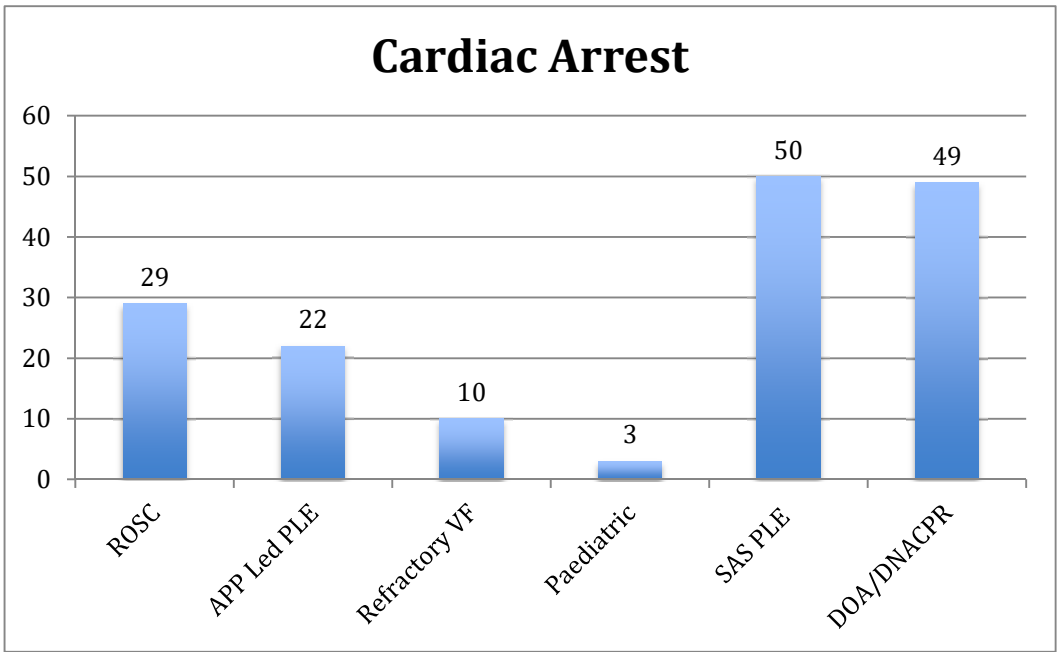
To further explore options regarding the most effective tasking model, AK & JP are currently monitoring all calls within ACC to identify relevant patient groups. This is will be a 2 month trial during November and December 2018. We hope to marry the assistance of the ARD and SSD with our own considerable experience of working in ACC in identifying relevant patient groups.

So far this method has proved very effective at making sure we are tasked to patients where we can clearly offer additional assistance. However a major drawback is that we can cover fewer shifts on the road due to one APP working in ACC and the other operational in the PRU.

Benefits:

Cardiac Arrest

The single largest patient group we attend are cardiac arrest patients. SAS receives a large volume of calls (~6000 per annum) to such patients and as mentioned previously, the APP is well placed to assist with and optimise resuscitation efforts and ROSC care when it occurs. In the preceding 12 months a breakdown of our activity treating these patients is below:



Total patients attended to in cardiac arrest = 164.

Of the 29 ROSC patients we escorted to hospital, 10 did not survive to discharge. Of the remaining 19 patients, unfortunately we are unable to locate data on 8 of them. The remaining 11 are noted to have been discharged or have records showing upcoming out patient appointments, suggesting they were fit for discharge in the past.

Only 1 of the refractory VF patients survived to discharge. Unfortunately all other patients in this category were PLE in the ED.

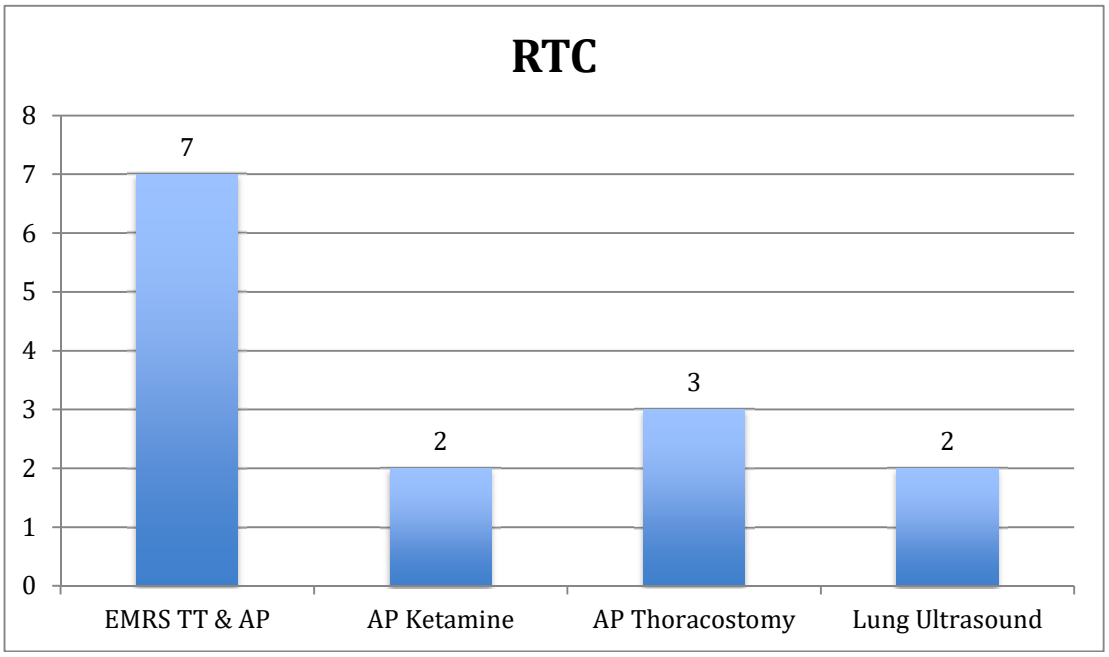
APP led PLE allows for us to terminate PEA rhythm arrests when patients meet set criteria. This procedure in checklist driven and has top cover consultant support when necessary. This intervention has proved beneficial for a number of reasons:

- No requirement to extricate patient, reducing associated risks to patient and staff.
- No requirement for ED resus team to be stood up, only to PLE patients once in department.

- No need for continued resuscitation attempts whilst in a moving ambulance.
- Patient's family can be supported, spend time with their relative at home prior to assistance from Police and or GP.

RTC

The second largest patient group we attend to are those involved in a RTC. SAS receive multiple calls for this patient group and often these calls match the criteria for APP dispatch. However, we face some challenges with this patient group and how best to identify those who may benefit from APP intervention.



Total patients attended = 89.

As you can see from the figures above and the interventions listed, we attend a reasonable number of RTC incidents but carry out very few APP interventions. We are however, well placed to assist EMRS TT with critical care interventions for these patients when required.

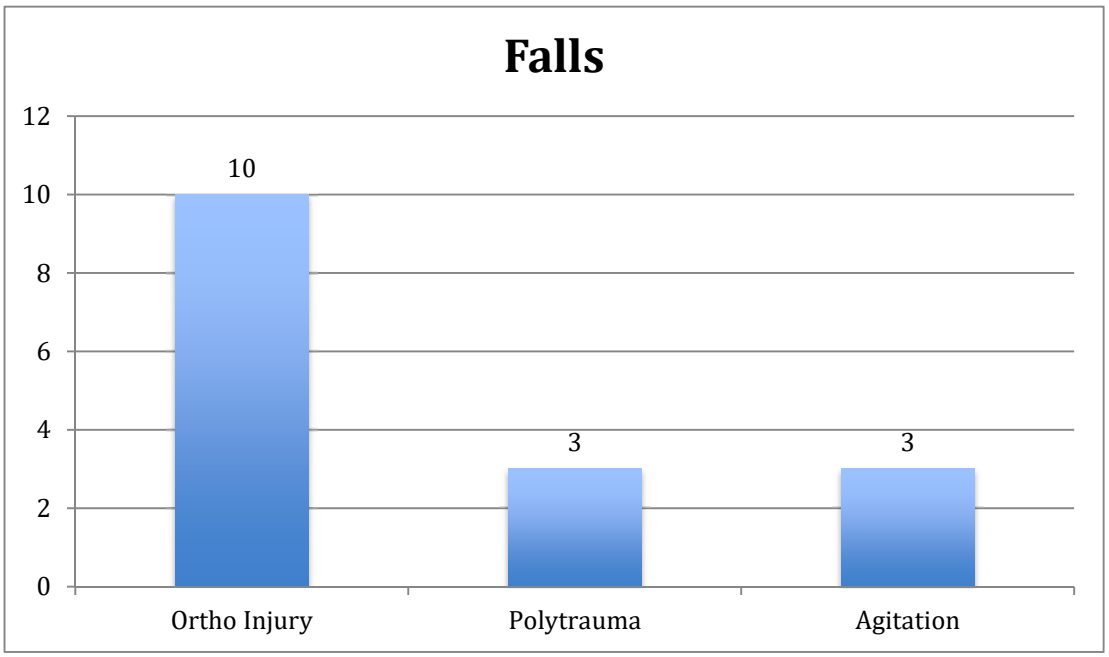
Whilst this data may suggest most patients suffer only minor injury following a RTC, this is not necessarily the case. Patients will often require analgesia, splinting, immobilisation and possibly extrication. However these interventions are available to all paramedics and technician crews. Anecdotally the APP promotes the use of such equipment and interventions, as sometimes crews may be unfamiliar with the indications for its use.

Tasking to the RTC patient group requires further refinement as to how best allocate the APP. With our current tasking trial based in ACC we are able to

actively interrogate calls and hope to identify patients who may benefit from APP intervention or indeed attend and begin treatment prior to the arrival of EMRS TT.

Falls

We attend a fairly large group of patients who have suffered a fall, either from a standing height or higher. Much of our experience of delivering advanced analgesia or sedation has been with these patients. This is normally to assist with extrication, splinting and or fracture reduction. We have also attended to a small number of patients who have suffered a high fall but who are also suffering with acute behavioural disturbance.



Total patients attended = 64.

All orthopaedic injury patients were admitted under the relevant teams with 4 being treated and discharged within 24 hours.
One of the polytrauma patients died in the ED. The other two spent prolonged periods in ICU.
The 3 patients suffering with acute behavioural disturbance also had isolated orthopaedic injuries. All have been subsequently discharged.

Other patient groups:

We also attend smaller numbers of various other patient groups. These can include:

- Unconscious/Agonal breathing.
- Status Epilepticus.
- Penetrating trauma.

- Respiratory distress.
- Burns/smoke inhalation.

Activity & Interventions

We have now been tasked to just over 1000 incidents in 12 months with an average stand down rate of 46%. A more detailed summary of activity can be found in Appendix 1.

Discussion around AP interventions will follow. Some we have used multiple times to good effect whilst others have yet to be required. Appendix 1A details the frequency of AP interventions over the past 12 months.

Medicines:

We carry standard SAS Paramedic & General medicine pouches as well as a stock of Morphine and a cylinder of Entonox. We also carry Ketamine, Midazolam & Adrenaline 1: 100'000 for intravenous administration.

The following table shows number of patients receiving these medicines:

Medicine	**Patients**
Ketamine	19
Midazolam	31
Adrenaline 1: 100'000	31

We have recently been approved for using Methoxyflurane (Penthrox) and have administered this to 3 patients so far. This worked well in 2 cases and the third would not tolerate using the applicator.

We have also been approved for use of intravenous Magnesium and Salbutamol and are awaiting supplies to arrive.

APP Project Presentations, CPD & Awards

We have been invited to attend and present at various training and CPD events during the past 12 months. Some examples include:

- Lanarkshire Emergency Department's CPD evening.
- College of Paramedics CPD evening.
- Presentation at SPHECC 2018.
- Poster presentation at Retrieval 2018 conference.
- Poster presentation NoS Scotland Trauma Network event.
- Key note speaker at College of Paramedics Conference 2018.
- Lanarkshire SFRS & SAS training evening.
- Attended Stryker cardiac arrest symposium, Sweden.
- Hypothermia management training evening.
- Nominated for SAS Chief Executive Award 2018.

Non technical skills

Both JP & AK have spent the last 6 years working with EMRS. Team training has always recognised the importance of and placed an emphasis on, development of non-technical skills. In essence this is, the general cognitive and social skills that allow healthcare professionals to;

- Monitor situations.
- Make decisions.
- Take on leadership roles.
- Coordinate actions within a team to achieve higher levels of safety and efficiency in complex clinical scenarios.

Although it is difficult to capture quantative data to show application of the elements listed above, it has been reported through staff feedback that the APs have successfully applied these skills and staff have recognised their value in improving patient outcomes. Please see Appendix 2 for examples of this.

What's next?

Arterial Lines

Recent training at a cardiac arrest symposium in Sweden showed us other potential clinical approaches to what is a largest patient group, cardiac arrests. Specifically we are currently exploring the following additions to our AP skill set:

Arterial line placement in patients suffering cardiac arrest or ROSC:
This will allow for a better understanding of CPR quality, allow real time acquisition of ROSC when it occurs and offer a more accurate picture of the patient's blood pressure and consequently allow for an improved safety margin when titrating inotropic support.

Tasking

Systems for identifying appropriate patients continue to be refined. The first month (November 2018) with AK & JP in ACC showed 86 potential patient groups but whom we only tasked to on 33 occasions (average of 2.3 jobs per shift over 14 shifts). This was due to our ability to actively interrogate calls and make intelligent tasking decisions based on clinical and logistical experience. Even with this capability however our stand down rate for these taskings remained high at 54%. Of the patients we did attend, 38% required an APP intervention.

When comparing the above with September when neither AP was working in ACC there were 137 identified patient groups. 64 patients were attended to and a total of 25% of these patients required an AP intervention. The stand down rate was similar to November, at 53%.

Although the data is limited it so far suggests an advantage to having an AP in ACC as part of the tasking process. We will continue to gather this data in

December and January 2019 to hopefully inform a more detailed understanding of the optimal tasking model.

Patient follow up

Certain challenges surround obtaining patient follow up. The AP project serves a large area and triages patients within 4 different health boards. It is sometimes difficult to track patients once they are admitted into one of the many hospitals within these health boards. We aim to try and improve the quality and quantity of patients follow up & discharge information in the next 12 months.

Measuring outcomes

More work is required to help quantify the benefits of the APP model for patients, staff and wider NHS. We aim to explore our impact on safety, effectiveness including costs, interventions and decision making. Identifying how this is done in other advanced allied health professions will hopefully guide us on how best to achieve this.

Conclusion

We have shown positive results in terms of patient outcomes and staff feedback, we hope to continue this. There are also several points to consider for the future of the AP role.

Certain interventions are frequent and others less so, with those such as transcutaneous pacing and surgical airway yet to be delivered to any of our patients.

Two of the clinical interventions, which were AP only at the start of the project, are now being rolled out nationally across SAS. These include Adrenaline (1: 100 000) for inotropic support and Midazolam for agitation in traumatic brain injury patients.

PLE for PEA patients may also be a capability, which SAS is soon to offer to all paramedics. However the scope of practice for this may have a narrower focus and allow for less flexibility than that available to the AP.

Feedback regarding our delivery of non technical skills demonstrates the frequent use and appreciation of this as an AP intervention.

Recruitment for an AP group in Edinburgh is completed and these practitioners are awaiting the start of their supervised training in February, hosted by Edinburgh Royal Infirmary,

Funding for the Glasgow based AP project remains at 2 wte until December 2019. Work to extend this and support the expansion of a west AP cohort continues.

Appendix 1.

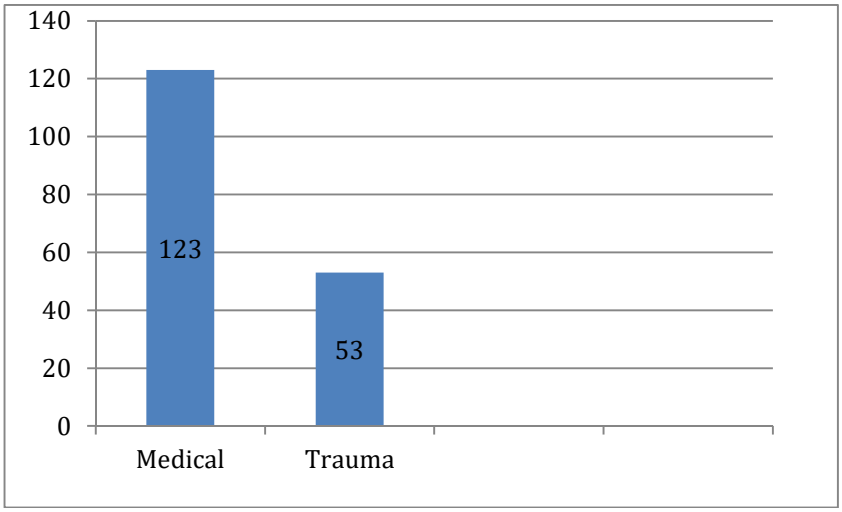


Figure 1: Dec to Mar Case Mix

Activity December 4th to March 23rd

- Total Tasking = 271.
- Stood Down = 95 (S/D rate 35%).
- Medical Cases = 123
- Trauma Cases = 53

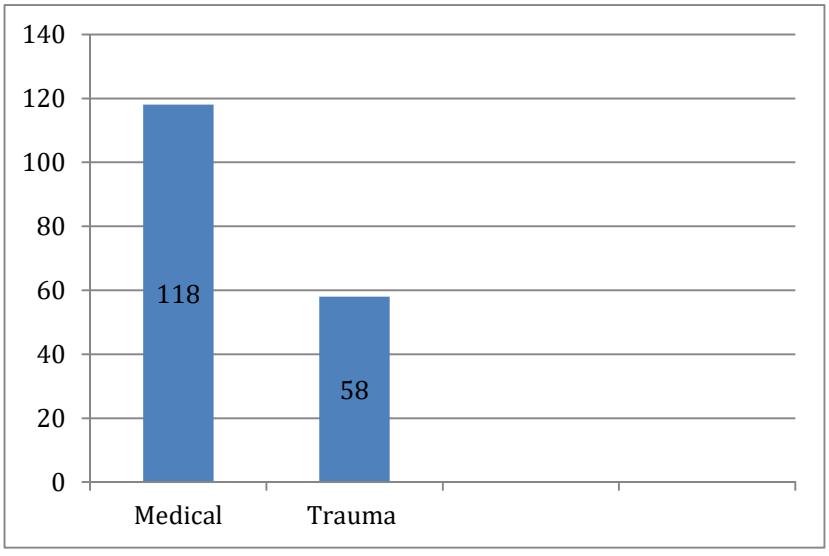


Figure 2: Mar to July Case Mix

Activity March 24th to July 14th

- Total Tasking = 328
- Stood Down = 152 (S/D rate 46%)
- Medical Cases = 118
- Trauma Cases = 58

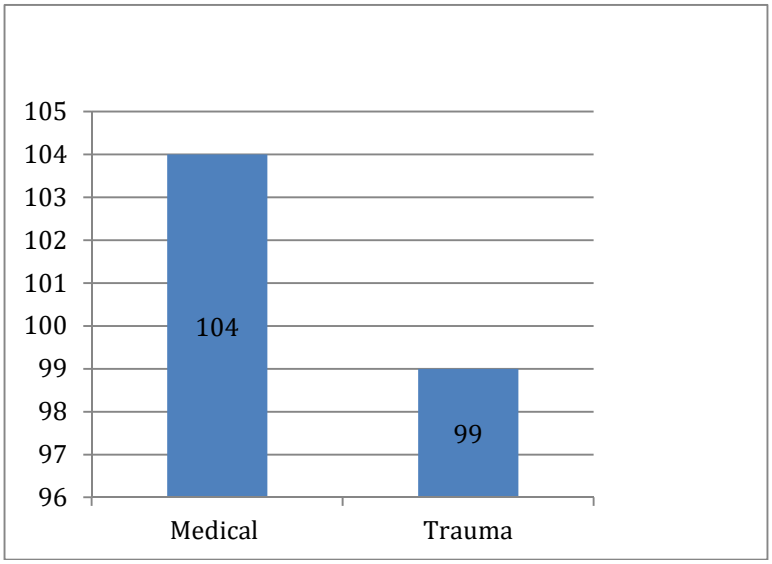


Fig 3: July to November case mix.

Activity July 15th to November 30th
Total tasking = 463
Stood down = 265 (S/D rate 57%)
Medical cases = 104
Trauma cases = 99

Activity summary

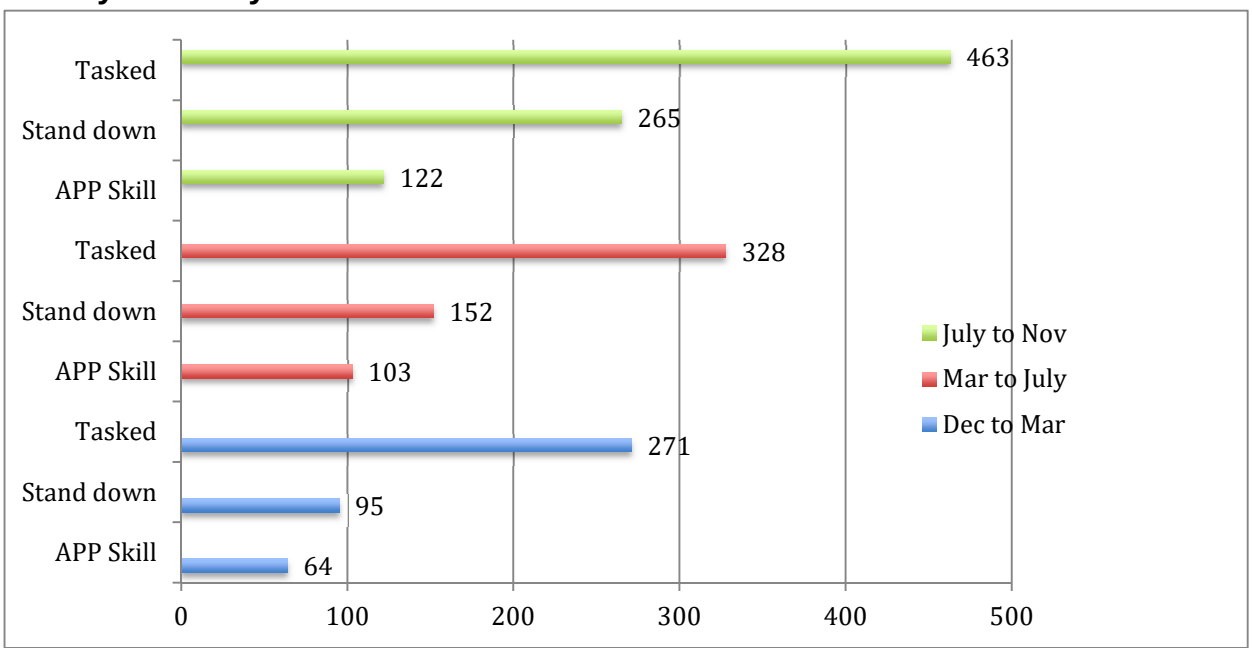


Figure 4: Activity comparison Dec 2017 to Nov 2018.

Appendix 1A

Interventions: December 2017 to March 2018

Skill/Intervention	Total	Individual AP	Team (EMRS)	Prior to AP arrival
Intubation	14	4	1	9
Inotropes	5	4	0	1
Advanced Analgesia	4	4	0	0
Pelvic Splint	2	1	0	1
NG/OG	3	3	0	0
Procedural Sedation	3	3	0	0
KTD	2	2	0	0
Thoracostomies	0	0	0	0
Ultrasound	24	24	0	0
Nasal ETCO2	0	0	0	0
Traumatic Cardiac Arrest Care Bundle	0	0	0	0
DC Cardioversion	0	0	0	0
AP led PLE	4	4	0	0
ROSC Care Bundle	5	5	0	0
Mechanical CPR	28	17	0	11

Interventions: March to July 2018

Skill/Intervention	Total	Individual AP	Team (EMRS)	Prior to AP arrival
Intubation	33	16	4	13
Inotropes	12	12	0	0
Advanced Analgesia	7	7	0	0
Pelvic Splint	7	2	3	2
NG/OG	1	1	0	0
Procedural Sedation	3	3	0	0
KTD	2	2	0	0
Thoracostomies	0	0	0	0
Ultrasound	42	42	0	0
Nasal ETCO2	25	25	0	0
Traumatic Cardiac Arrest Care Bundle	2	2	0	0
DC Cardioversion	0	0	0	0
AP led PLE	11	11	0	0
ROSC Care Bundle	8	8	0	0
Mechanical CPR	33	17	0	16

Interventions: July to November 2018

Skill/Intervention	Total	Individual AP	Team (EMRS)	Prior to AP arrival
Intubation	18	1	4	13
Inotropes	13	13	0	0
Advanced Analgesia	7	7	0	0
Pelvic Splint	11	9	1	1
NG/OG	1	1	0	0
Procedural Sedation	8	8	0	0
KTD	4	3	0	1
Thoracostomies	5	3	2	0
Ultrasound	33	33	0	0
Nasal ETCO2	34	34	0	0
Traumatic Cardiac Arrest Care Bundle	3	2	1	0
DC Cardioversion	2	2	0	0
AP led PLE	14	14	0	0
ROSC Care Bundle	17	17	0	0
Mechanical CPR	58	22	0	36

Appendix 2: Staff feedback & comment:

Ongoing Staff Survey: 104 responses since project began. Staff feedback has been sought through a short 4 question, online survey, designed by the project team. A link to the survey was made available to all SAS staff who have interacted with the APP at an incident.

A total of 104 responses have been received to date.

In response to **Question 1- What type of incident did you attend with the Advanced Practitioner?**

- Cardiac arrest 64 64%
- Trauma 27 27%
- Medical collapse 4 4%
- Agitated pt 3 3%
- Paed trauma 2 2%
- Paed arrest 3 2%
- Other 1 1%

In response to **Question 2- Did the Advanced Practitioner add to your patients care?**

- Definitely 91 91**%**
- Some benefit 10 7%
- Not sure 3 2%
- No benefit 0
- Definitely not 0

In response to **Question 3- Did the Advanced Practitioner make your job easier?**

- Definitely 91 91**%**
- Some benefit 10 7%

- Not sure 3 2%
- No benefit 0
- Definitely not 0

In response to **Question 4- Should the Advanced Practice (Critical Care) role be rolled out nationally?**

- Definitely 79 78**%**
- Probably yes 22 20%
- Not sure 3 2%
- Probably not 0
- Definitely not 0

Below are some excerpts from the free text areas of our survey. Respondents are invited to leave any comments they wish relating to their experience working with the APP.

- We had a particularly difficult job and having a PRU and an advanced para definitely made things easier. Dealing with run of the mill cases for the majority of our time, it's difficult to jump straight into the trauma mind set. We know what we are doing but having extra direction definitely helps the flow in these time critical situations.
- Excellent couldn't have got patient out without this help.
- Excellent pre hospital care of a paediatric head injury with clear handover at hospital. Added value.
- The child who the APP attended with a double paramedic crew received some of the best pre- hospital care I have ever experienced. The team worked very well together and it benefited the patient care delivered.
- As a paramedic of 25yrs I can see the work of our advanced paramedics being of great benefit to our patients. Their extended skills knowledge and experience could be invaluable in a number of scenarios. I have always known my own limitations and called on ScotSTAR/ EMRS when needed and would welcome the opportunity to work alongside at any time.

- Jeff was excellent to work with - he acted as a team leader at the cardiac arrest, keeping everyone on track and intervening where necessary. He asked for feedback and opinions during the arrest and I felt he valued my input as vq3 student. I hope to work with him, and other advanced paramedics, in the future.

- Found the input of the advanced paramedic very beneficial especially the debrief after the job was completed. During my 7 years as a technician I have never been involved in a structured debrief of the job.

- Effective management of cardiac arrest scenario provided a better structured platform to deliver the best clinical care. The PEA algorithm with ultrasound allowed unnecessarily moving the patient to accident and emergency which was best for the patients family also.

- I found Alistair critical care paramedic very professional. He took the lead whilst continuing to involve crew in scene. He was thorough and worked extremely well with patient, SFRS, and ourselves. He was very reassuring and clearly very competent in his role. What a breath of fresh air in a dusty dark loft space

- Having the advanced paramedic (critical care) attend a cardiac arrest not only brings extra hands but their experience and skills can only be beneficial for the patient first and foremost but also their colleagues as new skills can be learned to take forward to similar jobs.

- CP assistance requested by crew at scene via ACC for additional pain relief. Patient in 10/10 pain with a hip injury. Paramedics at scene had already administered 30mg morphine under direction of emergency consultant via telephone. The patient was still complaining of severe pain. The patient’s pain was more manageable with the help of advanced skills from CCP. Extrication from house and conveyance to ED was more manageable/safe with the patient comfortable. Also, assistance by CCP helped contribute to a better patient experience/outcome. Completed debrief after incident and received a patient follow up. Keep up the good work and thank you for your assistance.

- Really appreciated the time spent by the critical care paramedic to come to myself and VQ4 student following the incident, giving a chance for feedback and reflection along with welfare check.

- The advanced paramedic was beneficial on scene and during an informal debrief after the patient had been airlifted to hospital.

- Feel that working along side paramedics with extra training and skills can only be a positive thing. Providing the patient with the best possible care is our goal - advanced paramedics/critical care paramedics have

experience and ability to provide this care. It is also great for all other staff members to be able to learn from them. I work constantly with students, I feel that seeing people in these roles is inspirational for them.

- The whole job seemed to run a lot smoother. The added pair of hands was excellent plus the Advanced Paramedic was able to coordinate the rest of us while still applying their advanced skills. These skills and the additional equipment used by the AP were incredibly helpful and made our decision making process a lot easier.

- On several occasions, I have had the pleasure of working with the specialist Paramedic, and every time this has provided additional critical care to the patient. I have always been made very welcome and involved, and would hope the SAS make this post full time. Team Leader Paramedic Law Station.