The Advanced Paramedic Clinical Activity Study (APCAS): An insight into the Work of Advanced Paramedics in the Mid-West of Ireland

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Abstract

Background The Advanced Paramedic (AP) is a relatively recent role in Ireland and refers to a prehospital practitioner with Advanced Life Support (ALS) skills and training. The Advanced Paramedic Clinical Activity Study (APCAS) was initiated to provide an evaluation of the impact of the AP programme on patient care in Ireland.

Aim The aim of this study is to provide an insight into the clinical activity of APs over a six month period in the Mid-West region of Ireland.

Methods A prospective study was initiated whereby all ambulance calls dispatched by the regional Ambulance Control Centre were recorded by the attending AP, including calls received via the statutory 999/112 system. Participating APs were asked to complete a separate call log data sheet recording all demographic and clinical information for every call attended during the study period.

Results A total of 17 APs participated and 1,969 ambulance calls were recorded in APCAS. The Mid-Western Regional Hospital, Limerick was the busiest receiving facility. Activity peaked at weekends and was lowest on Tuesdays. Crew response, on-scene and transport times agree with previous reports. Most common emergencies include Medical (12%), Cardiovascular (10%) and Altered level of Consciousness & Seizures (10%). Least common calls include Airway & Ventilation and Environmental emergencies (<1%).

Conclusions This study provides an insight into the work of APs in the Mid-West region of Ireland. It would appear that despite the relative recency of the Irish AP programme the findings of this study are in line with previous international studies.

Keywords

Advanced Paramedics, Ambulances, Emergency Medical Services, Ireland, Prehospital care

Introduction

Prehospital care refers to the emergency and urgent care provided to a patient prior to and during transportation to a hospital or appropriate healthcare facility [1]. In Ireland prehospital care is provided by the National Ambulance Service (NAS) of the Health Service Executive (HSE) and additionally in parts of Dublin city by Dublin Fire Brigade under contract to NAS. In 2011 there were almost 1.2 million emergency medical presentations nationwide and the resulting hospital admissions amounted to 372,462 [2].

The Pre-Hospital Emergency Care Council (PHECC) is the Irish Emergency Medical Services (EMS) regulator [3]. Clinical care provided by prehospital practitioners is based on Clinical Practice Guidelines (CPG) developed by the PHECC Medical Advisory Group and approved by the Clinical Care Committee and Council. PHECC maintain a statutory register of prehospital emergency care practitioners which includes emergency medical technicians (EMT), paramedics and more recently, advanced paramedics (AP) [3].

The statutory ambulance response is primarily staffed by paramedic and AP grades. A paramedic in Ireland performs life-saving interventions and limited invasive therapies included pre-determined drug protocols [4]. APs undergo further advanced skills training and provide a wider range of pharmacological agents and more advanced invasive procedures [4]. International advanced life support (ALS) benchmark indicators [5] such as endotracheal intubation, intra-osseous infusion and autonomous referral pathways are reserved for AP practitioners only.

The AP training programme provided by the National Ambulance Service College and the Centre for Emergency Medical Science, University College Dublin graduated its first class of APs in 2005 [6] In order to undertake the graduate diploma course candidates must have a minimum of two years' experience as a PHECC registered paramedic. The Irish AP programme is modelled in some respects on the Intensive Care Paramedic of the Queensland Ambulance Service in Australia and also includes a supervised clinical internship as is the case with some paramedic training programmes in the United States

[6]. At present there are approximately 300 APs qualified in Ireland [7]. The rostering of APs is dictated by operational requirements and comprises response in both conventional ambulances as part of a two person crew or as a solo responder in rapid response vehicles (RRV).

The Advanced Paramedic Clinical Activity Study (APCAS) was initiated to provide an evaluation of the impact of the AP programme on patient care in Ireland. Therefore, the aim of this study is to provide an insight into the clinical activity of advanced paramedics in the Mid-West region of Ireland.

Figure 1 Map of the Mid-West region of Ireland

Methods

Setting and Participants

The APCAS was conducted prospectively over a six month period in the Mid-West region of Ireland i.e. County Clare, Limerick city and county, North Tipperary (Figure 1). The Mid-West has a catchment area of approximately 8,080 square kilometres [8] and a population of 379,327 [9] spread across urban and rural districts. It is served by the HSE NAS and all qualified APs in the region at the time (n=17) participated in APCAS.

Study Protocol

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Scientific Research Ethics Committee of the Mid-Western Regional Hospital. During the study period, patients were treated according to standard CPGs and no change in treatment or transportation occurred due to participation in APCAS. Data was recorded for all three primary call types handled by the Regional Ambulance Control Centre i.e. Allocation Status (AS) calls 1, 2 and 3. The AS1 code refers to emergency calls received via the 999/112 public call system which require an immediate response. The AS2 code includes calls received from general practitioners (GP) requiring an urgent response within a defined time-frame. The AS3 code refers to inter-hospital patient transfers. Participating APs were asked to complete a separate call data sheet for every call attended during the collection period. Demographic and clinical information was recorded for all calls as was the attendance of a GP on scene. AS1 cases were categorised using an adapted version of the PHECC Education and Training Standards [4].

Data Analysis

Data was entered into Excel and PASW v18 (Microsoft, San Diego, CA) for analysis and descriptive statistics included frequencies and percentages. Variables were tested for normality using the Kolmogorov-Smirnov test.

Results

Study Participation Rate

A total of 1,969 calls were recorded during the six month data collection period of APCAS. According to Regional Ambulance Control Centre records this represents 54% of total activity in the region during this time. The number of AS1 calls recorded in APCAS was 1,369 (70%). APs also responded to 245 AS2 calls (12%) and 355 AS3 calls (18%).

Call Location

The location of each call was recorded in order to provide information on call demand by county (Figure 2). Limerick city and county has the highest call demand with 871 calls (44%) followed by Clare with 716 calls (36%) and finally Tipperary with 101 calls (5%). The remainder of the calls were classified as "Other" which included the following; call cancelled, services not required, left scene, refused to travel, insufficient information). Limerick city and county also has the highest AS1 call demand with 554 calls (41%) followed by Clare with 512 calls (37%) and finally Tipperary with 61 calls (5%).

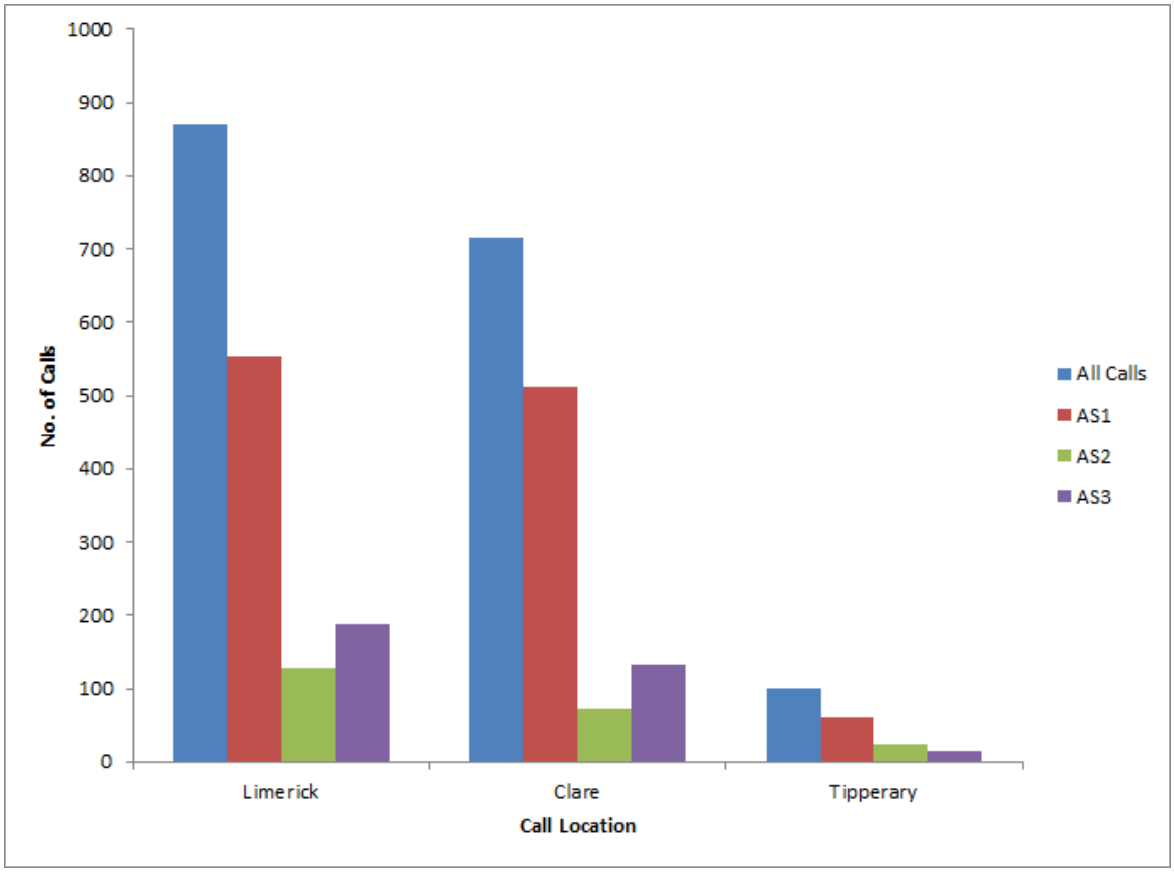

Figure 2 Geographical location of call demand (by AS category)

Weekday Call Occurrence

The majority of all calls in APCAS occurred on Mondays with 328 calls (17%) recorded on that day (Figure 3). Tuesdays recorded the lowest activity with 248 calls (13%). In terms of AS1 call activity Tuesday was also the least busy day (157 calls, 12%) but in terms of high activity the number of AS1 calls was consistent across Saturday (219 calls), Sunday (221 calls) and Monday (218 calls) recording 16% of activity respectively.

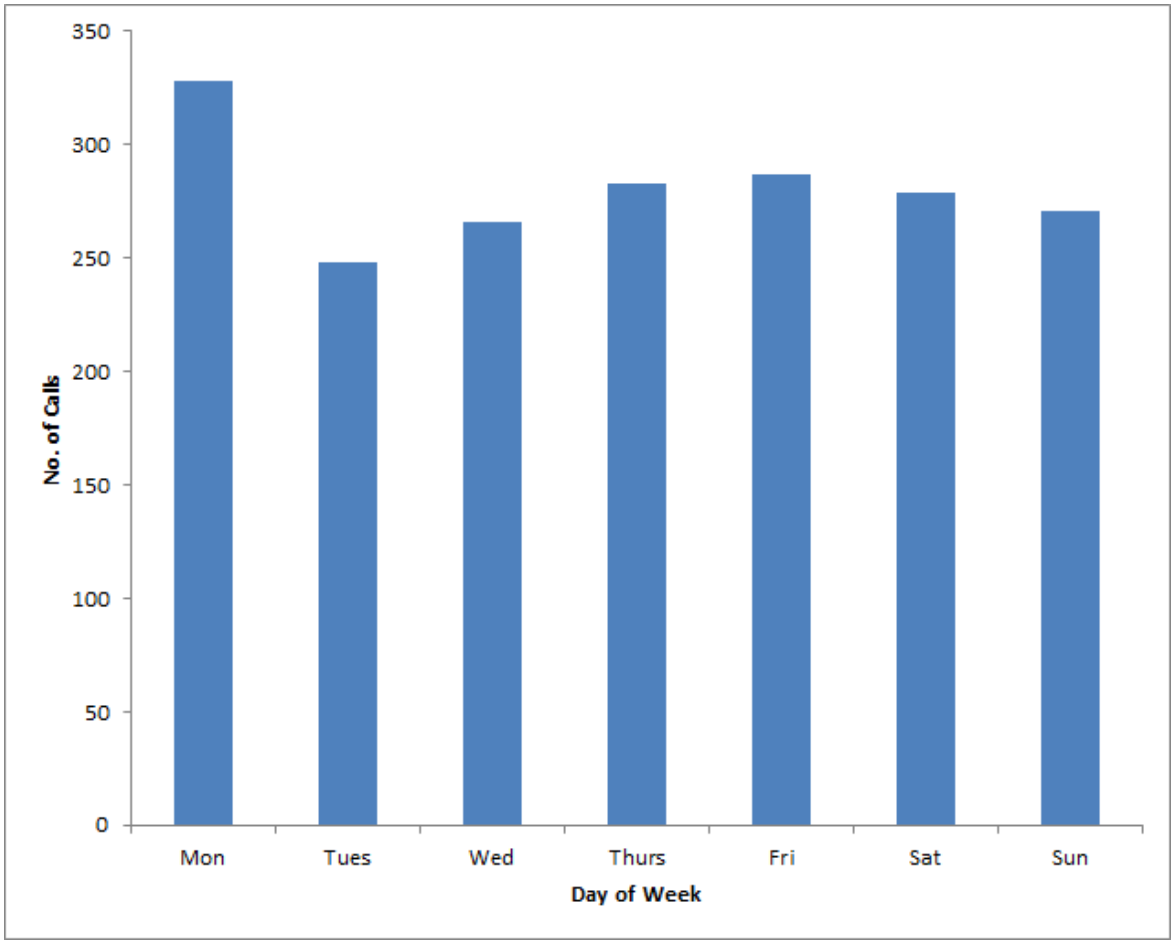

Figure 3 Call activity by day of the week for all Calls (AS1, AS2 and AS3)

GP Attendance at Calls

GP attendance at scene was recorded in APCAS. The total number of patients who were seen or attended to by a GP prior to the arrival of the ambulance was 451 (23%). GPs attended the scene in 197 AS1s (15%), 156 AS2s (64%) and 98 AS3 calls (28%).

Time Calculations

Crew response times, on-scene times and transport times to receiving medical facility are presented in Table 1. In APCAS it was found that 45% of AS1 calls had a response time within 8 minutes while 78% had a response within 19 minutes (Table 1).

Table 1 Response, on-scene and patient transport times in minutes (by AS category)

Time	AS1	AS2	AS3	All Calls
Response	10 (13)	19 (20)	5 (12)	10 (14)
On-Scene	16 (13)	15 (11)	13 (11)	15 (12)
Transport	15 (21)	23 (23)	22 (30)	17 (22)

*Data was non-normally distributed values presented are median (interquartile range)

Receiving Facility Information

The majority of all calls (50%) were transported to the Mid-West Regional Hospital in Limerick (Figure 4). There was no receiving facility for 237 calls (12%) and the reasons for this are listed below. In 140 calls (7%) the patient refused to travel with the ambulance crew and services were not required (stood down) in 63 calls (3%). In 19 calls (1%) the patient was deceased on scene and in 15 cases (1%) the caller or patient did not wait for the ambulance crew to arrive (left scene). The majority of these circumstances occurred on AS1 calls. In Figure 4 "Other Facility" mainly refers to AS3 calls and includes transport to hospitals outside the Mid-West Region, Nursing Homes and patient's residences.

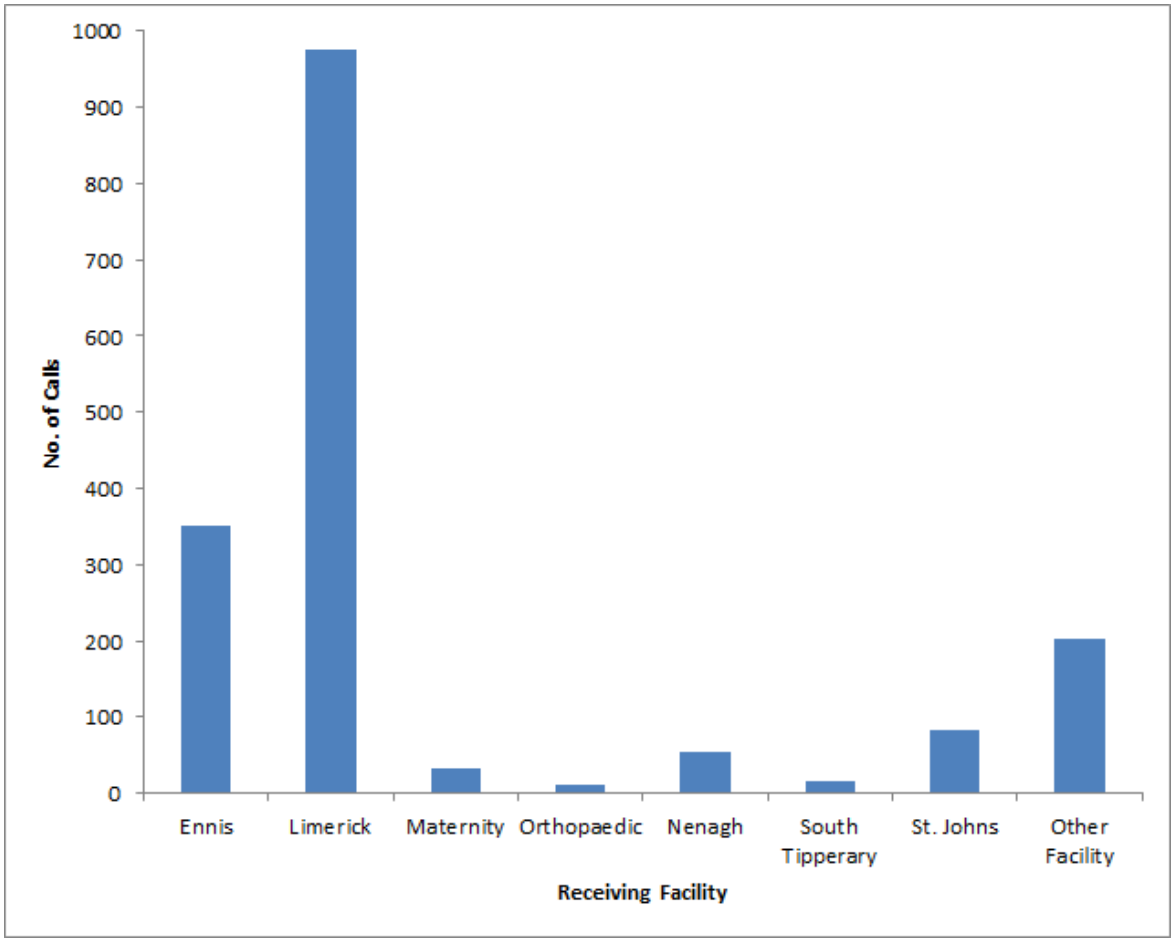

Figure 4 Information on Receiving Facility for all Calls (AS1, AS2 and AS3)

AS1 Call Case Type

APs were asked to record a clinical impression of the patient in AS1 calls which were then categorised by case type (Table 2). The categories were adapted from those outlined in the PHECC Education and Training Standards.

The most common AS1 case types encountered in APCAS were Medical emergencies (n=163, 12%), Cardiovascular emergencies (n=138, 10%) and Altered level of Consciousness & Seizures (n=137, 10%). The least common case types recorded in APCAS were Airway & Ventilation (n=2, <1%), Environmental emergencies (n=2, <1%) and Pregnancy & Pre-Delivery emergencies (n=3, <1%). A diagnosis was unavailable in 142 of the AS1 cases (10%).

The category of Allergies & Anaphylaxis includes medication reactions and Altered level of Consciousness & Seizures includes syncope, collapse and concussion. The category of Bleeding & Shock includes lacerations and the category of Burns includes cases of smoke inhalation. Diagnosis unavailable refers to cases that were stood down, services not required, patient left scene and clinical impression not recorded by AP. The most common Medical emergencies included cellulitis, epistaxis, gastroenteritis, influenza, meningitis, migraine, pancreatitis, pyrexia, respiratory tract infection, sepsis, shingles and urinary tract infection. The category of Mental Health & Behavioural emergencies included panic attacks and social issues. Neurological emergencies include cases of transient ischaemic attack and stroke. Musculoskeletal Injuries refers to dislocations and fractures only and all other muscular injuries were classified as Soft-tissue injuries. The most common case type in the Paediatric category was febrile seizures. The Trauma category refers to cases of assault, stab wounds, gun-shot wounds and road traffic collisions where no other specifics of the case were recorded.

Table 2 Clinical Impression of AP by Case Type in AS1 Calls (n=1369)

Case Categories	No.	%
Airway & Ventilation	2	<1%
Alcohol Related	69	5%
Allergies & Anaphylaxis	8	1%
Altered level of Consciousness & Seizures	137	10%
Bleeding & Shock	70	5%
Burns	7	1%
Cardiovascular Emergencies	138	10%
Childbirth & Neonatal Resuscitation	13	1%
Deceased	11	1%
Diabetic Emergencies	24	2%
Diagnosis Unavailable	142	10%
Environmental Emergencies	2	<1%
Head & Spinal Injuries	37	3%
Medical Emergencies	163	12%
Mental Health & Behavioural Emergencies	87	6%
Musculoskeletal Injuries	81	6%
Neurological Emergencies	59	4%
No Abnormality Detected	26	2%
Paediatrics	8	1%
Poisoning & Overdose	34	2%
Pregnancy & Pre-Delivery Emergencies	3	<1%
Respiratory Emergencies	109	8%
Soft-Tissue Injuries	123	9%
Trauma	16	1%

Discussion

The APCAS was initiated to evaluate the impact of the AP programme on patient care in Ireland. During the study 54% of total AP activity in the Mid-West was recorded therefore it can be assumed that this data is representative of activity in the region generally. AS1 calls comprised 70% of AP activity therefore 30% of calls responded to by APs were non-emergency calls (12% AS2 and 18% AS3). It may not be the most appropriate use of resources to have practitioners with ALS skills involved in routine inter-hospital patient transfers and this policy is currently under review by the NAS [10].

In terms of call location, Limerick had the highest call demand (44%) followed by Clare (36%) and North Tipperary (5%). This finding is probably related to the size of the population living in each county. In the Mid-West, Limerick city (57,106) and county (134,703) has the largest population (191,809) followed by Clare (117,196) and North Tipperary (70,322) [9]. The proportion of calls in North Tipperary was somewhat lower than expected based on population but this may be due to a lesser number of APs working in the area. In agreement with the general call demand Limerick also has the highest AS1 rate at 41%.

The majority of all calls in APCAS occurred on Mondays with 17% of activity recorded on that day. This can be attributed to the closure of primary care facilities over the weekend leading to a build-up of demand on Mondays and also perhaps to "spill-over" of weekend activities into the early hours of Monday mornings. In a 2006 PHECC analysis, the busiest day of the week for NAS in the Mid-West was Thursday, however it was reported that demand for services on this day was only marginally higher than other weekdays [11]. In APCAS Tuesdays recorded the lowest call activity at 13%. This is in agreement with findings from the London Ambulance Service [12]. AS1 call activity in APCAS was highest across Saturday, Sunday and Mondays (16%). The PHECC report also found a significant increase in AS1 activity on Saturdays and Sundays [11]. Román et al previously reported higher activity of the Spanish EMS over weekends, and particularly on Saturdays [13]. The APCAS data demonstrates peaks and troughs of call demand and highlights the need for a potential review of rostering arrangements. Current roster patterns may not reflect optimal levels for

response cover. Other jurisdictions have implemented staggered manning levels based on call demand [14].

In APCAS the presence of a GP on scene prior to the arrival of the ambulance was recorded in 23% of calls. As previously mentioned the AS2 code refers to calls received from GPs, however just 64% of AS2 calls in APCAS recorded the presence of a GP on scene. This is most likely due to patients being attended by an out-of-hours GP co-op practitioner with the patient then awaiting transportation following consultation. In APCAS it was found that GPs attended the scene in 15% of AS1 calls. In the Mid-West the ShannonDoc cooperative responds on an ad hoc basis to requests for support from the emergency services [7]. In contrast, in the United Kingdom out-of-hours emergency response is provided by GPs who are members of the British Association for Immediate Care (BASICS) which are directly linked to Ambulance Service Dispatch Centres [15].

The median response time for all call types in APCAS was found to be 10 minutes. Traditionally AS1 response times were measured using Operational Research Consultancy (ORCON) standards. First developed in 1975 these originally had been for a 14 minute (urban) or 19 minute (rural) response to emergency 999 calls in 95% of cases, and within eight minutes in 50% of cases, irrespective of the critical nature of the incident [16]. In Ireland the Health Information and Quality Authority (HIQA) use an updated version of these response time key performance indicators (KPI) which factors in the clinical status of the call. Life threatening incidents should be responded to by a **first responder** within 7 minutes 59 seconds in 75% of cases and should have a patient-carrying vehicle at the scene within 18 minutes 59 seconds [17]. However, at present there is no formal first responder deployment model in the Mid-West of Ireland other than the statutory emergency services. In APCAS it was found that 45% of AS1 calls had a response time within 8 minutes while 78% had a response within 19 minutes. In December 2011 it was reported that 49% of ECHO (life-threatening cardiac or respiratory arrest) calls were responded to within 8 minutes with over 72% having a patient carrying vehicle at the scene within 19 minutes [2]. In 2000 it was reported that just 38% of emergency calls received a response within 9 minutes [18]. Therefore, while there is certainly room for improvement in terms of response times advances have been made since the health reform programme resulted in the

establishment of the NAS. Internationally many jurisdictions are moving away from using KPIs based solely on response-times in favour of clinical outcome indicators [17] and plans are now in place to introduce this in Ireland over the coming years [10].

In the prehospital literature the debate continues on whether it is better to rely on the speed of response and transport ("hurry to hospital") or to take the time on-scene to initiate primary interventions and treat the patient before transport ("stay and stabilise") [19]. On site ALS increases the time that is spent on the scene and delays definitive in-hospital care [5]. Therefore, with the introduction of APs there had been some concern that on-scene times would increase due to their extended range of skills which may lead to unnecessary delays on-scene without any additional benefit to the patient. In APCAS the median on-scene time for all calls was 15 minutes, which does not seem unreasonable. One of the only previous Irish studies in this area reported ambulances having a median 14 minute period of care (arrival on scene to arrival in hospital) [18] but unfortunately transport times were not recorded in that study so direct comparisons to APCAS are difficult. In an Australian study it was found that mixed crews demonstrated shorter on-scene times than all AP crews, however the authors concluded that this was unlikely to be clinically significant [20]. Therefore it would appear that APs provide advanced management and decision-making without a negative effect on on-scene time, even when performing complex procedures.

The median patient transport time for all calls in APCAS was 17 minutes. AS1 calls had the shortest median transport time at 15 minutes which is most likely due to the critical nature of the cases resulting in lights and sirens transport. On the other hand AS2 calls and AS3 calls had median transport times of 23 and 22 minutes respectively. This may also be due to greater distances travelled, for example some AS3 calls recorded in APCAS resulted in transport to hospitals outside of the Mid-West region (Cork, Dublin etc.). With the closure of overnight services at local satellite hospitals the Mid-West Regional Hospital in Limerick is now the only hospital in the region with a 24 hour Emergency Department (ED) [7]. This means increased patient transport times, particularly at night time, in the Mid-West which presents greater challenges relating to en-route patient treatment for APs in the region.

The 24 hour ED service is also one of the reasons that the Regional Hospital in Limerick was the busiest receiving facility (50% of calls) in APCAS. This also relates to the higher population in Limerick city and the range of services there which may not be available in smaller hospitals, including the location of the Mid-West Cancer Centre on site [7]. In APCAS there was no receiving facility for 12% of calls and the majority of these (7%) relate to patients refusal to travel with the ambulance service. This is in agreement with a UK study which reported that 8% of patients refused to travel against the advice of the ambulance crew [21]. Abuse of the ambulance service can result in fewer resources being available to respond to life-threatening incidents, but it should be noted that not all of these cases in APCAS may be inappropriate 9-9-9 calls and the reasons for refusal to travel can be complex and diverse.

The most prevalent AS1 calls in APCAS related to Medical emergencies (12%) which is mainly due to the wide range of case types included in this category (including gastroenteritis, influenza, meningitis, sepsis etc.) Cardiovascular emergencies (10%) and Altered level of Consciousness & Seizures (10%) were also common. The least prevalent case types recorded in APCAS were Airway & Ventilation, Environmental emergencies and Pregnancy & Pre-Delivery emergencies (all <1% respectively). Due to the low exposure to these emergencies and consequent risk of skill deterioration, regular training in identification and treatment of these case types should be provided to APs in order to improve skill retention.

The limitations of the APCAS study include the involvement of a relatively small number of APs in one region which means that findings may not be applicable to all communities. However the findings are probably relevant for most of the Republic of Ireland and in countries where ALS paramedics have similar training and experience. Future APCAS analysis will examine if APs as currently trained can diagnose patients in the field and predict the requirement for hospital admission.

Conclusions

This study provides an insight into the work of advanced paramedics in the Mid-West region of Ireland. It would appear that despite the relative recency of the Irish AP programme the findings of this study are similar to other EMS systems and are in line with previous international studies.

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Conflict of Interest None.

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