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Information Systems Facilitate the UK Ambulance Service Transition towards an Omni-Channel Service

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ABSTRACT

This paper represents a description of those 'hidden' policies supported by information systems that currently influence the direction of change within the UK ambulance service. When an ambulance service displays poor response times it may have reached a situation where demand exceeds supply regularly, then using 'critical thinking' the management should reconstruct their approach and focus exclusively on patient needs and the sources of appropriate help. The UK ambulance service has developed three strategic approaches; firstly, a single-channel strategy employing ambulance service staff only ('hear and treat, or 'see and treat'); secondly, a multi-channel strategy involving other NHS services (from call to on–scene then accident and emergency or direct to a hospital ward); and thirdly, a new omni-channel strategy where the patient is directed on a pathway from the ambulance service to a combination of other NHS or voluntary services. The key element in developing an omni-channel strategy is a secondary triage system, supported by a new database, which ensures patients are directed to a specialist service that could provide them with the most immediate help to meet their needs. Some of these services to patients (for example, the Falls team) are provided by the ambulance service directly. Patients are directed to alternative services, identified in the database, this system allows the ambulance service to bypass accident and emergency and monitor the patient's pathway from the initial call to the outcome. Initial small projects indicate that the omni-channel system reduces duplication of effort, improves system productivity, reduces cost and shortens patients call to outcome time.

Keywords: Ambulance Service; Information systems; Omni-Channel; Critical Thinking; Restructuring

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1. Introduction

A recent House of Lords [1] report highlighted two specific complaints of ambulance response times and accident and emergency (A&E) waiting times which currently represent a fundamental weakness in the state of emergency care in the UK. The reasons Bramwell [2] indicates are that the service faces substantial increases in demand due to an aging population with both acute and critically ill patients living in the community with long-term illnesses.

The House of Lords [1] and the Audit Commission [3] reported that "the emergency health care services are gridlocked and overwhelmed and unable to provide safe care". Hussain [4] indicated that response times for ambulances in England have consistently missed their targets since the summer of 2021 with the biggest bottlenecks being in hospital handovers. Bagot [5] reports that patients have been advised to find their way to A&E rather than incur a long wait for an ambulance. Thomas and Devlin [6] and Lord Carter [7] reported that all the members of the Association of Ambulance Chief Executives (AACE) confirmed that ambulance delays were causing 'severe harm' to patients each month.

In addition, Lakhani et al [8] indicate that patients (and their carers) have difficulty knowing how to approach the vast array of NHS services and, therefore, as a last resort, contact the ambulance service. Management in the ambulance service also recognise that demand is high, one reason being that the public may call the ambulance service as a last resort when they have difficulty contacting their general practice (GP), the 111 services, the nearest Urgent Care Centre (UCC) or their out-of-hours primary care service.

Under such situations, the NHS needs to re-educate the public in the knowledge that the 999 ambulance service is primarily the gateway for life-threatening and emergency cases and although they provide other services these may need to be accessed through a further secondary triage system and directed to either other NHS or voluntary services. To support such a secondary triage system the ambulance service must create and maintain a comprehensive database of local NHS and voluntary services.

Ambulance service management has begun to tackle these problems through several separate structural and operational initiatives such as ambulance reception hubs co-located with accident and emergency (A&E) departments and secondary triage for non-life-threatening calls to direct patients to one or more NHS or voluntary services in preference to a visit to A&E. In some instances, the ambulance service may provide particular services themselves to speed the process of the call to an outcome where a patient only needs advice, equipment, or signposting to a voluntary service.

These initiatives, when combined, amount to the introduction of an omni-channel strategy which is particularly different from other operational models because patients are directed to the NHS or voluntary service which could help immediately without having to visit A&E for an onward referral.

2. Ambulance service support to patients

From its inception, the NHS ambulance service staff were employed as drivers who had limited knowledge of first-aid to attend emergencies and transport patients to hospital. If required, A&E doctors provided specialist on-site assistance. Subsequently, Chamberlain et al [9] reported that paramedic training leading to pre-hospital care was developed indicating that on-site treatment could save lives.

McCann [10] indicates that call-handlers employ a combination of pre-set questions, experience, clinical knowledge and decision support systems to assess a patient's need, offer immediate first-aid advice and determine what form of response the ambulance service will employ. Inevitably, the call-handlers will employ caution to minimise risk to the patient.

Each 999 call, or referral, to a call-handler is categorised by patient need defining the resources selected including:

- **Life-threatening calls** of any nature may warrant the immediate dispatch of a critical care

team or one or more double-manned front-line Ambulance (DMFLA) or Rapid Response Vehicles (RRV) manned by critical care paramedics (CCP)

- **Emergency calls** where a patient needs first-aid and medical attention before transportation to A&E may warrant urgent dispatch of a DMFLA
- **Urgent calls or special issues** requiring first-aid, medical, or welfare advice to a patient could warrant either a telephone response or a visit from a paramedic depending upon the nature of the call.
- **Non-urgent calls** for advice could be subject to telephone advice or minor on-site treatment and concluded upon the initial call.
- **Transport**-only requests could be pre-booked with Non-Emergency Patient Transport Services (NEPTS) by a health care professional only
- **Specialist and High Dependency teams** and other 'blue light services' could be deployed by call-centre supervisors or managers as required – see **Figure 1**.

The actual resource employed for each call may depend upon a combination of patient requirements, patient location and staff skills availability.

Following public pressure, the NHS imposed mandatory ambulance response times as a key performance measure and this turn forced the service to establish ambulance stations, previously generally co-located with hospitals in urban areas into stand-alone semi-rural locations.

Currently, the majority of 999 calls follow the population density data and are from urban areas and in recent cost-cutting measures a number of the rural ambulance stations have closed. However, resources must cover the whole country with the same response time targets which implies various types of ambulance resources may be required in different geographic areas, for example:

Urban Areas — resourced with DMFLAs, RRVs and NEPTS located at hospitals (including those with ambulance triage teams), stand-by points and inner-city paramedic urgent care centres. Further support may be obtained from the Voluntary Ambulance Services (VAS), Commercial Ambulance Services (CAS) and Community First Responders (CFR).

POTENTIAL RESOURCE ALLOCATION BY PATIENT CATEGORY

PATIENT CATEGORY	RESPONSE OPTIONS	SUPPORT OPTIONS	OTHER CALL-CENTRE OPTIONS
IMMEDIATELY LIFE THREATENING	CRITICAL CARE TEAM FLA (FULLY EQUIPED) HEMS/HART TRI-LIGHT TEAM	RRV (ADVANCEC PARAMEDIC) 'BASICS' TEAMS 'MERIT' TEAMS SPECIALIST VOLUNTARY SERVICES (MR) (RNLI)	PUBLIC + ADVICE PUBLIC + DEFIBRILATOR PUBLIC + BLEED CONTROL PACK DOCTOR ON-CALL
POTENTIALLY LIFE THREATENING	FLA (FULLY EQUIPED) HART RRV (ADVANCED PARAMEDIC)	CFR OR FSCFR STAFF ON-CALL SPECIALIST VOLUNTARY SERVICES (MR) (RNLI)	DOCTOR ON-CALL PUBLIC + ADVICE LOCAL PHARMACIST
EMERGENCY	FLA RRV (COMMUNITY PARAMEDIC)	CFR or FSCFR STAFF ON-CALL VAS WITH DMFLA	PUBLIC + ADVICE DIRECT TO UTC/UCS TAXI TO A&E
URGENT	FLA TAXI VAS	NEPTS CAS	PUBLIC + ADVICE DIRECT TO UTC/UCS LOCAL PHARMACSIST
NON-URGENT	NEPTS SELF-HELP TAXI	NEPTS CALL-CENTRE CALL-BACK SIGNPOST TO NHS SERVICES	HEAR AND TREAT DIRECT TO UTC/UCS SIGNPOST TO VOLUNTARY SUPPORT

ABBREVIATIONS

A&E ACCIDENT & EMERGENCY
BASIC BRITISH ASSOCIATION FOR INTERMEDIATE CARE SYSTEMS
CAS COMMERCIAL AMBULANCE SERVICES
CFR COMMUNITY FIRST RESPONDER
FLA FRONT LINE AMBULANCE
FSCFR FIRE SERVICE CFR
HART HADZOUS AREA RESPONSE TEAM
HEMS HELICOPTER EMERGENCY MEDICAL SERVICE
MR MOUNTAIN RESCUE
MERIT MEDICAL EMERGENCY RESPONSE INCIDENT TEAM
NEPTS NON -EMERGENCY PATIENT TRANSPORT SERVICES
RNLI ROYAL NATIONAL LIFEBOAT INSTITUTE
RRV RAPID RESPONSE VEHICLE
UCS URGENT CARE SERVICES
UTC URGENT TREATMENT CENTRE
VAS VOLUNTARY AMBULANCE SERVICE

Figure 1. Potential resource allocation by patient category.

Sub-Urban Areas — resourced with DMFLAs, RRVs and NEPTS located at hospitals, hub ambulance stations, stand-alone ambulance stations, co-located with other tri-light services (ambulance, fire and police) or out-of-hours stand-by points (OHSP). Further support may be available from the specialist teams, other blue-light services (all emergency services) and VAS, CAS and CFRs.

Semi-Rural Areas — resourced by DMFLAs located at out-of-hours stand-by points, community paramedics in RRVs located at GP clinics and Volunteer Double Manned Front-Line Ambulances (VDMFLA) potentially located with other blue-light services or in a suitable location. Further support may be available from CFRs.

Rural Areas — resourced by local primary care doctors on-call, RRVs with volunteer crews located at GP clinics and CFRs.

In the event of a life-threatening emergency, the ambulance service dispatchers may choose to divert any crew traveling in an unoccupied vehicle between calls. There are also opportunities for the ambulance service to call upon the British Association for Intermediate Care Systems (BASIC), Medical Emergency Response Incident Team (MERIT) or Helicopter Emergency Medical Service (HEMS) doctors, other specialist voluntary services and pharmacists (Ph) if required and dependent upon the patient category. If required, the dispatchers may advise any willing member of the public on scene where there is a public access defibrillator, first aid kit or bleed-pack.

3. Alternative Approaches

The ambulance service in the UK has undertaken a substantial change in the last decade; this has been recorded by Brewis and Godfrey [11], Granter et al. [12], Heath et al. [13] and Wankhade et al. [14] and [15]. These changes were operational concentrating on targets, methods, performance and training. However, the real need may be a strategic rethink which Paul and Elder [16] call 'critical thinking' to enable restructuring allowing focus on customer needs by the most appropriate resource in the most appropriate location.

There are currently two 'generic' approaches (or channel strategies) to service patients' needs; single channel and multi-channel with a third omni-channel currently in its initial stages — see **Figure 2**.

Firstly, a single-channel strategy, in which the ambulance service is the only contact with the pa-

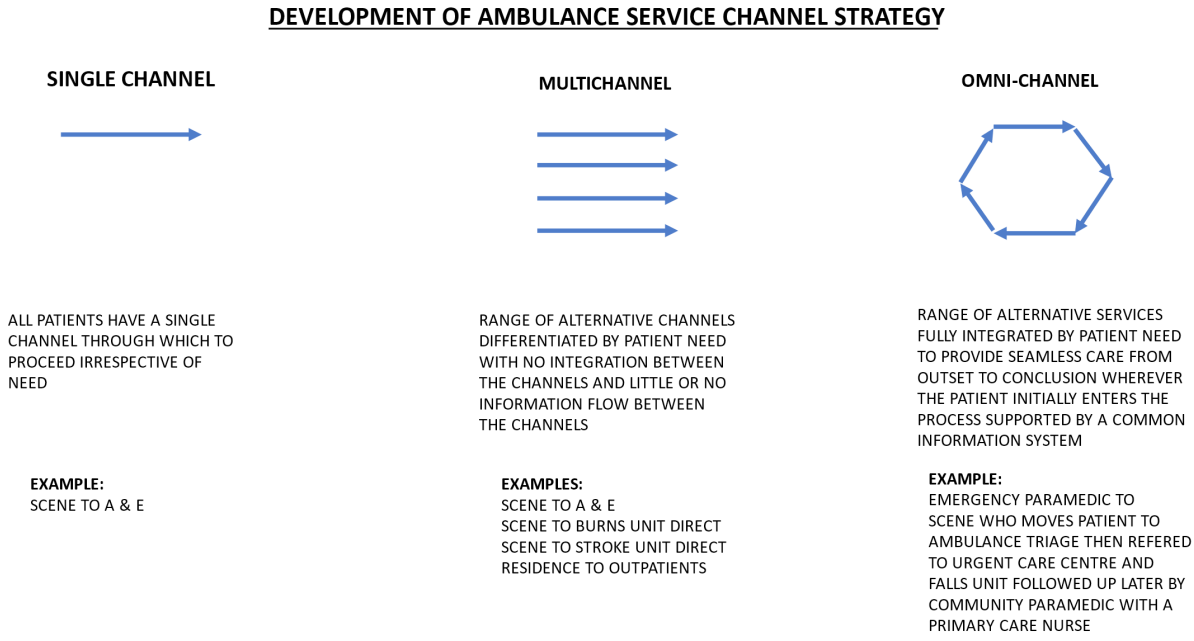

Figure 2. Development of ambulance service channel strategy

tient from the initial call to resolution. All 999 calls are initially triaged by a call-handler. Those calls not thought to be life-threatening or related to seriously injured patients may be passed to a paramedic or nurse under a secondary triage procedure. If the patient could be given a self-help solution by those undertaking the initial or secondary triage the call is terminated (known as a 'hear and treat' (H&T) resolution). Dale et al. [17] indicate that some non-serious calls may be concluded by employing a telephone consultation. An alternative single channel employing only the ambulance service would be if an ambulance is despatched and through discussions between the patient and the paramedics or 'on-scene' treatment an immediate solution is found for the patient who is discharged (known as a 'see and treat' (S&T) resolution).

Secondly, a multi-channel strategy, where a patient's destination is differentiated by the patient's needs and where each patient's pathway involves more than the ambulance service. There may be multiple different pathways; for example, from scene to A&E, or from scene direct to a specialist hospital department (burns, heart, or stroke) or scene to a mental health hospital.

Thirdly, an omni-channel strategy, where a patient moves through several separate health- care facilities some of which may be provided or signposted by the ambulance service. For example, an elderly patient who has fallen may be moved from the scene to an ambulance reception hub (co-located with A&E at a trauma hospital) undertake some tests while at the ambulance hub, and then be discharged home on the condition they are referred to an ambulance service Falls unit and the community paramedic for regular checks. Each of these services may be accessed separately, but in an omni-channel strategy are linked together often driven by the ambulance service response team desk as a catalyst providing a direct and integrated patient pathway.

4. Secondary Telephone Triage

The significant development driving an omni-channel strategy is the application of secondary telephone triage within the ambulance service. Call-handlers recognise that calls indicating either life-threatening situations or serious injuries (approximately 20% or less of the calls) require immediate attention although Dale et al [17] indicated that some non-serious calls may be concluded by employing telephone consultations only (hear and treat). Secondary triage is not new, it used to occur when call-handlers were not sure how to classify patients' needs but the omni channel process uses secondary triage to direct patients down the appropriate pathway.

Urgent but non-life-threatening calls not declaring serious injury may according to Blodgett et al. [18], be separated and undergo a secondary telephone triage by call-centre paramedics or nurses who may also refer patients directly to hospital-based clinical staff. Information collected during a secondary telephone triage may lead staff to recommend to patients that they select an alternative pathway to an ambulance call-out to access specialist services and obtain a quicker and more appropriate outcome. In some cases, secondary triage may also be conducted over a video link with the patient.

With an in-depth analysis by clinical staff the focus of secondary triage is upon appropriate outcomes from specialist services and may refer patients directly to another NHS service or an appropriate voluntary service, for example:

- Patient referred to Out-of-Hours GP service
- Patient to contact their specialist nurse (for example, a palliative care nurse)
- Patient referred to the paediatric department and an appointment secured
- Patient referred to a mental health crisis team (MHCT)
- Patient should attend the local Minor Injuries Unit (MIU), or Same Day Emergency Care Unit (SDECU) and an appointment secured
- Patient referred to the Falls team
- Patient referred to a local medical health team or GP practice
- Patient referred to Rapid Response Nursing Team (RRNT) or District Nurse (DN)

- Patient referred to an eye hospital and an appointment secured
- Patient referred to their midwife, and case notes forwarded
- Patient referred to an appropriate community provider or voluntary service
- Patient referred to social services and case notes forwarded
- Patient to contact home care provider
- Patient to contact a local pharmacy (Ph)
- Patient to contact their dentist
- Patient referred to a dental hospital appointment secured
- Patient to contact local optometrist
- Patient to contact local authority homeless services (to be followed up by the homeless team or duty social services team)
- Patient to contact substance abuse services
- Patient to contact Samaritans support service
- Patient to manage their condition with over-the-counter medication
- Patient to manage their condition using on-line support

Before secondary triage was extended to include referral to NHS and voluntary services the ambulance service would take patients to A&E for onward referral. For example, a mentally ill patient would in the past be taken by ambulance to A&E which would normally refer them to the Mental Health Crisis Team (MHCT) but in the new structure after secondary triage (by a specialist mental health nurse working in the ambulance service) the patient may be referred directly to the MHCT without attending A&E. In the omni-channel situation, the ambulance service represents the gateway to either refer directly or signpost patients to other NHS or voluntary services as required.

To offer a patient an immediate referral to an alternative service the ambulance service must have an up-to-date database of both alternative local NHS services and voluntary services. Such a database should contain a minimum of such information as:

- Organisation name, and list of services provided
- Addresses and contact telephone numbers, web-site and e-mail addresses by service provided.

Such a database is particularly significant and should be created, verified and updated regularly by a separate team within the ambulance service and should in addition identify NHS or voluntary services. In addition, this team could identify service or geographic gaps which could be addressed. This database should be available, not only to the triage teams but also to 111 and emergency call handlers, front-line paramedics, A&E staff, primary care staff and the out-of-hours doctors' service.

Ambulance service management recognises that secondary triage by a single paramedic or nurse may take considerable time to resolve the next stage in a patient's recovery process. The trade-off between extended telephone triage and alternative actions (such as 'see and treat (S&T) or transportation to A&E) is beneficial to both the patient and the ambulance service. The most significant benefit from secondary triage is that patients are referred directly, and appointments are made to contact (or are told to contact themselves) other NHS or voluntary services which would be able to satisfy their needs. This implies action is taken at the earliest opportunity.

The risk to a patient is that the secondary triage process (similar to the initial triage process) does not detect a patient with hidden symptoms whose condition is rapidly deteriorating. The ambulance service also recognises that at present both other NHS and voluntary services have difficulties providing care for all in need and must, therefore, recommend 'self-help' or direct patient contact with an appropriate service where appropriate.

5. Restructuring

For the ambulance service to concentrate resources on life-threatening situations and injured patients, and if secondary triage is to be successful, then the ambulance service must restructure. Individual ambulance services in the UK have piloted several separate initiatives to tackle this issue but these are generally small in scale and not evaluated, written up or published. The key to success may lie in an omni-

channel strategy that combines many past and new initiatives linked together through an information system and common access to a range of patient services offered by the NHS and voluntary services—see **Figure 3**.

This implies the restructuring of the profile of combined services in terms of the response to selecting alternative patient pathways, focusing on training and utilising all staff resources. This also implies multiple inbound pathways to patient services — see **Figure 4**.

An alternative restructured organisational profile may be driven by a generic 'patient category' including:

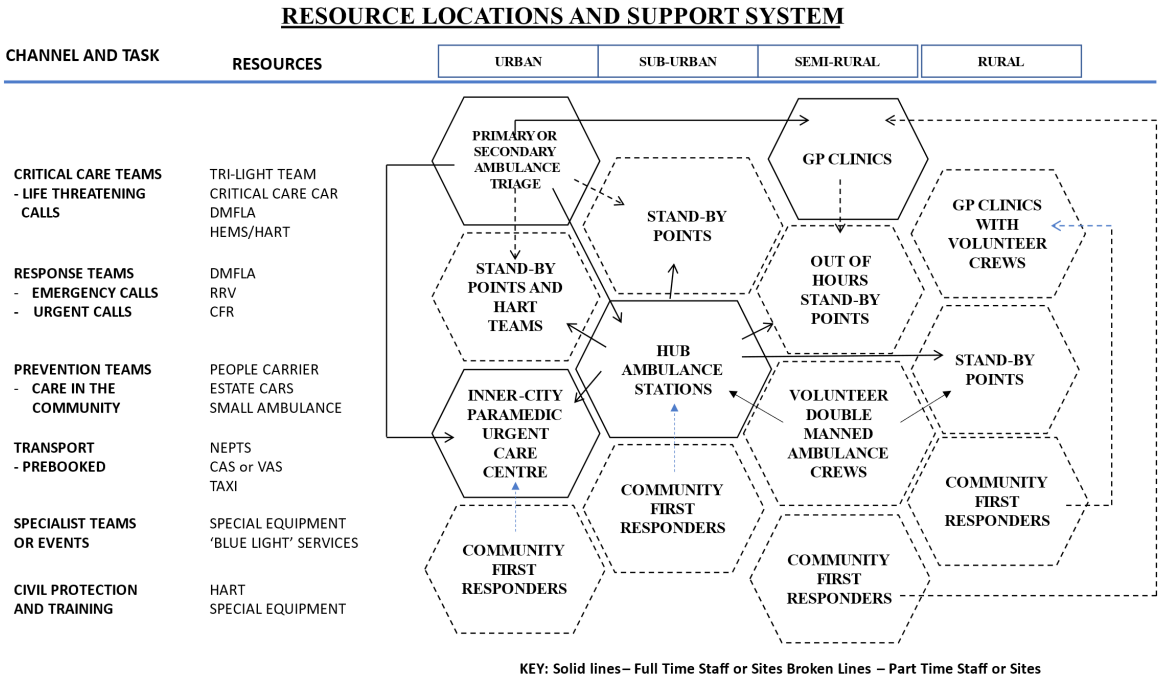

Figure 3. Resource location and support system.

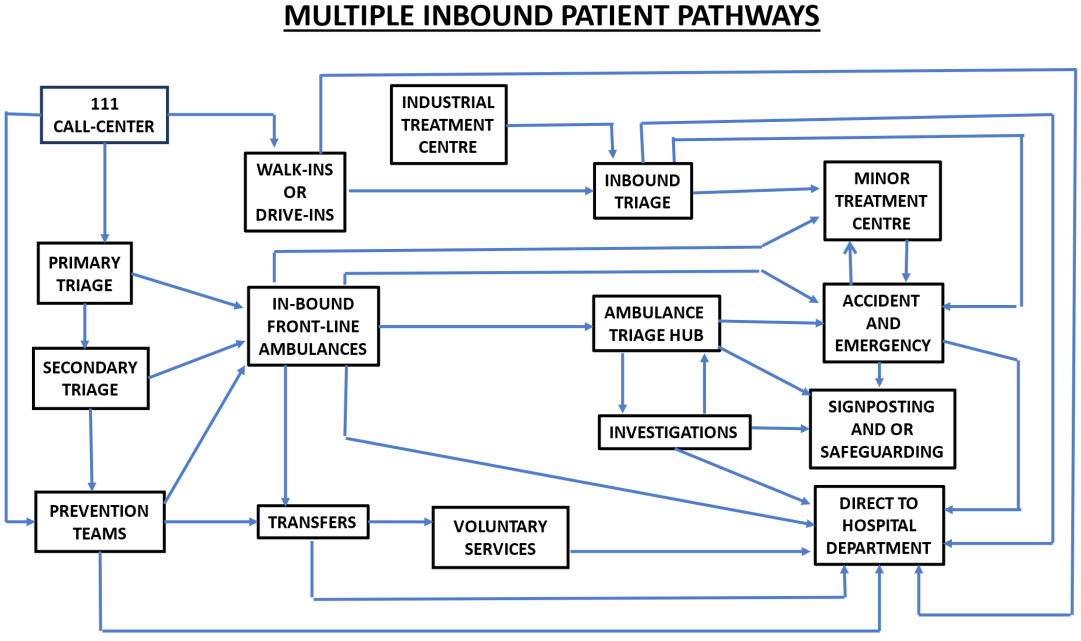

Figure 4. Multiple inbound patient pathways.

A **critical care team** located at sub-urban ambulance 'hubs' (or co-located with a Fire Service hub) to cover life-threatening calls including DMFLAs, a 'tri-light team' consisting of either advanced paramedics or trauma doctors for multiple patients and the most serious cases, Helicopter Emergency Medical Services (HEMS) for time-critical patient transport and the Hazardous Area Response Team (HART) to respond to mass casualty and difficult environmental situations. Supported by 'BASIC' or 'MERIT' teams, in Rapid Response Vehicles (RRVs) with solo paramedics, specialist voluntary services such as Mountain Rescue (MR) or Cave Rescue (CR) staff on-call or Community First Responders (CFRs) to provide either further specialist skills or the closest immediate first-aid response.

Critical care teams (CCTs) and Urgent Care Services (UCS) are a combination of elements from 'blue-light services' who respond and work together and are deployed using a common radio frequency where the most senior commander takes charge. The ambulance service element may include a DMFLA and an RRV with paramedics who carry the most up-to-date life-saving equipment and advanced medication.

These teams train and work together and would typically be employed on life-threatening emergencies, road traffic collisions (RTC), incidents on industrial premises, or mass-casualty incidents (MCI). They would not generally be called to attend urgent or non-urgent calls.

Ambulance Reception Hub Triage Teams operate in small multi-bedded fixed units but are co-located with A&E and staffed by advanced paramedics and nurses whose task is to accept patients from critical care and response teams to release the ambulance crews to attend further calls. The reception hub triage team would provide a patient holding area and would reduce patient waiting time in A&E by undertaking preliminary assessment, including such activities as first-aid or blood tests and despatching patients for investigations such as x-rays or scans. After preliminary assessments, patients could be referred to one of the following options A&E, the urgent care centre or signposted and transported to other NHS facilities – see Giles [19].

Similarly based on mobile teams Burns [20] reports that community paramedics could extend their activities into triaging patients under the Acute Home Visiting Service (AHVS). This essentially implies that the ambulance service takes over an element of the primary care home service offered by GPs employed in primary care. This reduces the demand on GPs and extends the remit of community paramedics by allowing visiting paramedics to refer patients to other NHS services.

Response teams located at ambulance stations, hospitals and stand-by points to cover emergency calls including DMFLAs and community paramedics in RRVs. Supported by staff on-call, CFRs, or a Voluntary Ambulance Service (VAS) with DMFLAs. Call-centre and ambulance staff would also direct patients (and have them transported) to 'minor or urgent care centres' (UCC) to reduce the demand upon A&E. Ambulance staff should, when 'on-scene', be able to obtain advice from triage nurses and trauma doctors at call centres or hospitals to refer or signpost patients to other NHS services, appropriate third-party services or to initiate referrals to safeguarding services.

Response teams could be directed to cover non-emergency but urgent calls including frequent callers, issues resulting from drink and drugs, or issues relating to rough sleepers and the homeless. A key feature is that a substantial number of these calls conclude as 'see and treat' but a minority need to be directed or transported to A&E for further investigation and treatment.

Prevention Teams (sometimes called 'outreach teams') consisting of specialist paramedics and nurses located at a sub-urban ambulance hub and community paramedics located at significant Primary Care (GP) clinics tasked to investigate specific issues related to community care (CC) where the patients either do not need a DMFLA and could use a smaller vehicle.

Both community paramedics and specialist prevention teams are tasked to use information gathered from primary care, urgent (or minor) treatment centres, secondary care, other parts of the ambulance service or signposting from voluntary services –

all of which is collated and issued by a 'prevention desk' at the call-centre. The principle is to allocate staff based on the 'Right Care Right Person' (RCRP) where staff are trained as paramedics first and one or more medical care specialties second. Specific issues which may be tackled in this manner include:

- Self-care for the elderly
- Self-care for those recently discharged from hospital
- Mental health issues
- How to avoid falls
- Palliative care including 'end of life' transport (last journey)
- Home-birth team

The key to the successful use of prevention teams is a combination of relevant and timely information flows to trigger an action or a proactive approach often in conjunction with an external organisation. Referrals from other NHS services, other public services and voluntary services operating in the community are a significant source of information.

Such information leads to actions that are a trade-off between planned early 'care in the community' and immediate emergency care when the patient's condition has deteriorated. Ambulance services have experimented with focused care and have used either single or double-manned mini-buses, people carriers, or estate cars which proved to be cheaper to buy, equip and operate than a DMFLA. The NHS has encouraged ambulance service chief executives to generate specific targeted services in situations where patients are known to undertake frequent calls to the ambulance service in a short period.

Scourfield [21] reported most ambulance services now have a Falls team to discharge patients on-scene with only minor injuries and some sub-contract this task to the Voluntary Ambulance Services (VAS) or Commercial Ambulance Services (CAS). The NHS [22] also announced they would fund an expansion in the numbers of mental health professionals working in both control centres and with paramedics to advise and treat (by phone and on-scene) mental health patients to avoid visits to A&E.

Other trials have included on-scene attention for those recently discharged from hospital, the welfare of patients with drug-related issues and self-care at home for the elderly and infirm. Mercer and Sheridan [23] reported a mobile team comprising a doctor and paramedic in a Physical Response Unit (PRU) from the Royal London Hospital visited the elderly, frail, or those known to have a medical history where a visit to A&E may be difficult and time-consuming. The PRUs offer tests, medical advice, medication and timed appointments including transportation for further investigations to patients at home to bypass A&E. A similar service may be offered at an inner-city paramedic urgent care centre.

Another example of a proactive approach is where a paramedic in a welfare team visits rough sleepers in the town centre at night with a voluntary organisation to ensure they are not ill and do not require food or medicine. The team offers advice on how best they might look after themselves in their current circumstances. Such actions may prevent rough sleepers from developing into a situation where they are in difficulties and their only option is to ring 999, leading to the deployment of a DMFLA.

Pilots of these (and similar pilots) practices had shown a 20% reduction in the need for ambulance services taking patients to A&E. The on-road crews used specially equipped unmarked vehicles manned by a paramedic and mental health nurse.

Transport Teams located at ambulance hubs or ambulance stations either single manned or double manned by ambulance technicians offer pre-booked non-emergency transport services between NHS facilities and patients' residences. These teams are a significant source of information for the prevention teams because they transport the same patients regularly and may recognise existing or potential outstanding issues.

An example of such action generated by information flow is when the community paramedic, located at a primary care facility, was informed by the Non-Emergency Patient Transport Service (NEPTS) that they had transported an elderly patient with dementia from hospital to home knowing the patient had a substantial number of tablets to take in the short

term to aid recovery. The NEPTS crew requested a visit from the community paramedic, to ensure the patient was rehabilitating and taking the correct tablets at the correct intervals to prevent the patient from making an error resulting in side effects that require an emergency call to the ambulance service and the deployment of a DMFLA.

Transport teams may also provide specialist facilities such as bariatric (BA), neo-natal (NN), isolation ambulances (IA) and children-friendly ambulances (CF) and tasking of resources available from Voluntary Ambulance Services (VAS), Commercial Ambulance Services (CAS), Marine Ambulances (MA) and those ambulance services provided by other NHS services (including specific hospital transport facilities).

Specialist Teams consisting of specifically trained crews with special equipment, often located with other tri-service organisations to provide a combined response service, such as water rescue services provided by the fire services. They also provide combined civil protection service through the Hazardous Area Response Team (HART) who assist patients and responders in nuclear, chemical, and biological situations and assist other public service organisations in the event of explosions, fire, flood, and air or ground contamination. Other specialist teams (potentially with NHS or volunteer staff in support) with particular equipment and medical training may respond if the Mountain Rescue (MR), Cave Rescue (CR) Mine Rescue or the Coastguard/(RNLI) are activated.

Volunteers are an important element of the ambulance service and include Volunteer Double Manned Front-Line Ambulance (VDMFLA) crews, doctors from the British Association for Intermediate Care Systems (BASIC) or Medical Emergency Response Incident Team (MERIT), or Community First Responders (CFRs). In addition, resources may be available from Volunteer Ambulance Services (VAS), Commercial Ambulance Services (CAS), or other blue-light emergency services. Call-centre dispatchers may also be able to call upon off-duty staff who are on-call.

A simple example of an omni-channel channel service is when an elderly patient, located in a rural area without transport, telephones 999 after suffering a cut and serious bleeding to their arm. The call centre initially requested that a local CFR attend to assess the situation and arrest the bleeding. Following an initial on-scene report from the CFR, the call centre dispatched a community paramedic to review the patient and dress the wound. The Community paramedic determined the wound was the result of a fall in the home and requested firstly, a medication review, and secondly, a repeat visit from the community paramedic in two days to redress the wound, and also a visit by the Falls team to determine whether any mobility equipment or household changes would provide opportunities to see whether the patient's memory was deteriorating, whether they were eating meals regularly and needed a local care package from social care. Subsequently, the Local Care Organisation (LCO) worked with the community paramedic to offer care in the community for the patient.

Types of Ambulances and Crews employed by each team could reflect the task being undertaken – see Table 1. Such specialization may reduce the requirement for DMFLA in favour of smaller vehicles with specialist crews reducing both overall capital and operating costs.

6. Information system support

This form of restructuring is both radical and daunting and cannot be undertaken without a significant amount of time and substantial expenditure upon staff training, capital expenditure and new information systems which are focused on patient needs. These constraints explain why ambulance services will only pilot one new approach at a time and be reluctant to monitor and record success or failure. However, compared with the use of paramedics in DMFLAs, specialisation improves patient services by direct referral to staff who are focused on that specific patient's needs.

The major catalyst in the success of an omni-channel service is an information system that both records previous and current issues and allows all NHS services to access a patient's data using either their NHS number or their name and postcode.

Table 1. Types of ambulance.

TYPE OF VEHICLE	TASK	CREW	FAVOURED LOCATION
All-terrain Ambulance (ATA) or All-terrain Vehicle (ATV)	Access to patients over rough terrain where other vehicles would not be able to travel	Specialist paramedics	Co-located with other emergency services
Bariatric Ambulance (BA)	Transportation of large patients weighing over 22 stone	Paramedics	Central ambulance hub
Bicycle Ambulance (BA)	Response in congested or restricted areas	Solo paramedic	City centre ambulance station
Cargo Vehicle (CV)	Storage and carriage of materials and equipment used by specialist prevention teams	Paramedics, ambulance technicians and specialist nurses	Ambulance hub
Critical Care Ambulance (CCA)	Complex on-scene care of patients with life-threatening conditions	Advanced or Senior Paramedics Trauma doctors and nurses	Ambulance hub or trauma hospital
Emergency Ambulance (DMFLA)	On-scene treatment and transportation of patients without life-threatening conditions.	Paramedics or Paramedic with Ambulance Technician	Ambulance hub, ambulance station or despatch points.
Fixed Wing Ambulance Aircraft (FWAA)	Transporting patients from remote locations with an airstrip to a city airport	Air paramedic and trauma doctor for life-threatening cases only	Remote or city airstrip
Helicopter Emergency Medical Service (HEMS)	Responding and transporting patients in a life-threatening situation	Trauma doctor and critical care paramedic	Regional airport
Isolation Ambulance (IA)	Transport of patients with infectious diseases	Paramedics and Specialists Nurses	Central ambulance hub
Marine Ambulance (MA)	Access to and transportation of patients by water	Marine paramedics and ambulance technicians	Suitable quay side
Mini-Bus Ambulance (MBA)	Transporting more than one non-emergency patients between residence and medical facility	Two ambulance technicians	Non-Emergency Patient Transport (NEPTS) ambulance station
Mobile Ambulance Triage Trailer (MATT)	Immediate triage on arrival at A & E by ambulance or on-scene at mass-casualty incidents or sporting/entertainment events	Paramedics and Nurses	Co-located with A & E
Motorcycle Ambulance (MCA)	Rapid response in congested or restricted areas	Solo paramedic	Ambulance hub
Multiple Victim Ambulance (MVA)	Mobile ambulance to provide first-aid to patients at sporting entertainment events.	Paramedics and nurses	Central ambulance hub
Neonatal Ambulance (NA)	Transportation of pregnant women about to give birth or immediately post birth	Paramedic and midwife	Maternity hospital/unit
Non-Emergency Patient Transport Service (NEPTS) Ambulance	Transport of non-emergency patients between either hospital to hospital or residence and medical facilities	Either single manned or double manned by ambulance technicians	Non-Emergency Patient Transport (NEPTS) ambulance station
Rapid Response Vehicle (RRV)	Small vehicle to arrive on-scene quickly to begin patient treatment as early as possible	Advanced Paramedic	Ambulance hub or trauma hospital
Special Ambulance (SA)	Vehicle constructed for use in a specific environment and transported by van or by trailer	Specialist paramedics	Co-located with other emergency services
Volunteer Response Car (VRC)	Small vehicle to arrive on-scene quickly to begin patient treatment as early as possible	Community First Responder	Co-located with other emergency services
Wheelchair Vehicle Access (WVA)	Transport of patients in a wheelchair	Two ambulance technicians	Co-located with other emergency services

Data access is particularly important to paramedics on-scene for observations and diagnosis, call-centre staff for triage and patient categorisation, and directing ambulances to alternative NHS facilities with capacity when local facilities are under pressure (under the Local Integrated Patient Care Plan (LIPCP). In addition to relevant data, the ambulance service would be able to offer a telemedicine service [24] where call-centre staff could seek direct advice from hospital doctors or pharmacists to secondary triage patients who may be either treated in the community rather than a hospital or moved directly to a hospital ward both of which reduce demand on A&E.

The call centre prevention desk could log and allocate all requests for non-urgent calls and ensure that follow-up calls and recommendations are progressed by suitable staff promptly.

This implies for each patient that information is sorted, analysed, and a forecast of potential issues is determined and acted upon by ambulance service staff to minimise further harm to the patient. The objective is to act for patients within a preventative and planned time limit rather than delay until an emergency call is received which requires a visit to A&E. This adds to the focus of the ambulance service from life-saving and emergency issues to one employing information to identify and the prevention of accident and illness which could lead to life-threatening or emergencies.

According to Newton [25] and Lord Carter [7], such actions indicate a significant shift in ambulance service operations to the areas covered by both A&E and primary care. In addition it is reported that information systems are the enablers to trigger care-in-the-community from various elements of the 'prevention team' to avoid both an initial visit to A & E with multiple subsequent visits to hospital departments and to initiate actions to avoid any further accidents.

7. Conclusion

The House of Lords [1] stated that in recent years many UK ambulance services suffered higher short-term demand than the capacity they have available leading to extended ambulance response times. The underlying issues were that paramedics were servicing a population increase which was getting older and in addition, they were called upon (as the patients' last resort) to cover services previously covered by other NHS functions. The range of patient issues above life-threatening, serious injuries and infectious diseases now covered by paramedics includes drugs (police), rough sleepers (social care), mental health crisis (mental health nurses), minor medical issues, and signposting (primary care) and childbirth (midwives).

It is a fundamental principle of public service suppliers defined by the National Audit Office [27] to target their operational concepts of customer service from an analysis of their customers' real needs rather than their perception of what they could supply. Paul and Elder [16] imply there is a need for the application of 'critical thinking' to design different customer service response packages using a combination of restructuring and new supportive information systems to meet different customer needs in different ways.

Such analysis will in turn expand paramedic roles through specialisation in particular areas of patient need. Over the last two years, a limited number of UK Ambulance Trusts have tackled individual issues in different ways (for example, ambulance reception hubs or Falls teams). Pilot projects have successfully tackled individual issues these only represent a direction of travel. Some Trusts have linked several projects together, but no Trust has yet covered the total available spectrum.

In many individual projects, there is real evidence that patient call to outcome time is significantly reduced. Although there is evidence that the few individual projects undertaken to completion offer improved patient care and overall cost reductions these projects are currently statistically insignificant in number and value when considering a whole NHS Ambulance Trust budget. The momentum for these projects is increasing and will allow concentration of focus to improve, ambulance response time, productivity and reduce operating costs. The real test will be long-term patient acceptance and approval and a

reduction in the patient call-to-outcome time.

There is currently an insufficient number of mature individual projects to identify any regional differences or the provision of specific measures for each completed element included in an omni-channel strategy. Although this may represent the next task for those ambulance services which aim to finance further developments.

The success of such a strategy could determine if in the longer-term larger specialist units (for example, mental health teams) may spin off to separate organisations within the NHS.

Author Contribution

This article has been researched and written by a single author

Conflict of Interest

There is no conflict of interest.

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Abbreviations and Acronyms

Throughout the reading and research for this paper, a large number of abbreviations and acronyms were encountered some of which were not fully explained when first used. For reference, the ones which appear in this paper are listed below:

111	Emergency Healthcare Call Centre
999	Ambulance Emergency Call Centre
A&E	Accident and Emergency
AACE	Association of Ambulance Chief Executives
AHVS	Acute Home Visiting Service
ARTT	Ambulance Reception Hub Triage Team
ATA	All-Terrain Ambulance
ATV	All-Terrain Vehicle
BA	Bariatric Ambulance
BA	Bicycle Ambulance
BASIC	British Association for Intermediate Care Systems
BMJ	British Medical Journal
CAS	Commercial Ambulance Services
CC	Community Care
CCA	Critical Care Ambulance
CCP	Critical Care Paramedic
CCT	Critical Care Teams
CFA	Child Friendly Ambulances
CFR	Community First Responder
CR	Cave Rescue
CV	Cargo Vehicle
DMFLA	Double Manned Front-Line Ambulance
DN	District Nurse
FLA	Front Line Ambulance
FSCFR	Fire Service Community First Responder
FWAA	Fixed Wing Air Ambulance
GP	General Practice
H&T	Hear and Treat
HART	Hazardous Area Response Team
HEMS	Helicopter Emergency Service
IA	Isolation Ambulance
LCO	Local Care Organisation
LIPCP	Local Integrated Patient Care Plan
MA	Marine Ambulance
MA	Motorcycle Ambulance
MATT	Mobile Ambulance Triage Trailer
MBA	Mini-Bus Ambulance
MCI	Mass Casualty Incident
MERIT	Medical Emergency Response Incident Team
MHCT	Mental Health Crisis Team
MIU	Minor Injuries Unit
MPA	Multiple Patient Ambulance
MR	Mountain Rescue
NA	Neonatal Ambulance
NEPTS	Non-Emergency Patient Transport Services
NHS	National Health Service
OHSP	Out-of-Hours Stand-by Points
Ph	Pharmacist
PRU	Physical Response Unit
RCRP	Right Care Right Person
RNLI	Royal National Lifeboat Institute
RRNT	Rapid Response Nursing Team
RRV	Rapid Response Vehicle
RTC	Road Traffic Collision
S&T	See and Treat
SA	Special Ambulance (converted for a particular use)
SDECU	Same Day Emergency Care Unit
UCC	Urgent Care Centre
UCS	Urgent Care Services
VAS	Voluntary Ambulance Service
VDMFLA	Volunteer Double Manned Front-Line Ambulance
VRC	Volunteer Response Car
WVA	Wheelchair Vehicle Access