

Pwyllgor Gwasanaethau Ambiwlans Brys Emergency Ambulance Services Committee

# Amber Review

A REVIEW OF CALLS TO THE WELSH AMBULANCE SERVICE CATEGORISED AS AMBER

SHANE MILLS & ROSS WHITEHEAD • OCTOBER 2018

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THE AMBER REVIEW HAS BEEN COMMISSIONED BY MR STEPHEN HARRHY, CHIEF AMBULANCE SERVICES COMMISSIONER AND DIRECTOR OF THE UNSCHEDULED CARE PROGRAMME FOR NHS WALES

# Foreword

I am pleased to present this report as the culmination of a rapid and extensive review of the Amber response category. The ambulance service in Wales is a highly visible part of the NHS landscape and the move away from time based targets to focus on quality of care was an historic shift in ambulance service measurement. This shift has undoubtedly resulted in some questions being raised about the impact of these changes on the quality and safety of care that is delivered to the citizens of Wales.

As a result of this and as part of the recommendations of an independent review, the Emergency Ambulance Services Committee and I were committed to undertaking a clinically led review of the Amber category.

The Review is broad and covers every aspect of the ambulance service response to Amber patients and has identified a number of findings and recommendations that can be incorporated into the commissioning plan as we continue to develop and improve ambulance service delivery in Wales.

The Review provides me with assurance that ambulance services in Wales are getting to the sickest patients first and therefore I see no reason to recommenced wholesale changes to the Clinical Response Model.



In this review we have been presented with information which follows a patient's journey from their call to the ambulance service to their discharge from hospital. I am assured from this information that the majority of patient outcomes are not affected by ambulance response times. This is not to say that a small number have been affected or had poor experiences and I am determined to address these.

As both the Chief Ambulance Services Commissioner and the Director of the Unscheduled Care Programme I am pleased that the findings of the review support the direction of travel in NHS Wales to focus on whole system measurement and quality.

There are opportunities for health services, staff and the public to work together to ensure we have an ambulance service that is used and delivered effectively.

I would like to take this opportunity to thank Shane, Ross, other members of the review team and contributors to this Review. Without the support and dedication of each individual and organisation we would have been unable to deliver such a comprehensive review in such a short space of time.

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# **Executive summary**

This report sets out the findings from the Amber Review launched in May 2018. There are two main areas that are addressed in the Review, based on the issues raised by the health service, the public, media and other stakeholders.

Firstly, is there a systemic problem with the Amber category that is resulting in worsening outcomes for patients. Secondly, are those patients, whose condition places them within the in the Amber category waiting too long for an ambulance response and if so what is the impact on their health and experience.

Qualitative and quantitative methodologies were used in this Review in order to deliver the depth and breadth of understanding needed to address these areas. The timespan of the Review was 1 April 2016 – 31 March 2018 in order to ensure access to all the relevant information.

The Review is set out in four sections, Explaining, Exploring, Delivering and Improving Amber. These sections aim to provide a comprehensive

narrative to address the two main areas. Staff and patient feedback is embedded within each section.

The Welsh Ambulance Service is an essential component for delivering care in a complex adaptive system. Models, measurement and targets for Ambulance service delivery across the UK are becoming increasingly disparate, although there is a general trend towards reducing the emphasis on response targets as the primary outcome measure.

When asked, ambulance staff and the public support the principle of the Welsh model 'to get the best response even if this is not the quickest response'.

Calls to the Welsh Ambulance Service are increasing and more work needs to be done to understand this. The Public support ambulance services doing as much as possible to avoid the need for them to go to hospital and staff feel they require more information on accessing alternative services.

Sickness levels remain high, reinforcing the n to ensure the emotional and physical wellbein of staff is supported, especially call takers due periods of increased activity.

The Welsh Ambulance Service is taking less people to hospital despite an increase in calls although there is agreement that more can be done by both the service and the wider NHS.

The public agreed that the continued focus for the Welsh Ambulance Services must be qualit of care. To support this the current ambulance quality indicators will be reviewed.

A pioneering way of following a patient journe from call to discharge was developed and used. This has provided assurance that the majority of patient outcomes have not been effected by ambulance response times although a small number have been effected and some patients will have had poor experiences.

need	The majority of patients categorised as Amber
ng	receive a prompt response and Ambulance
ring	services in Wales are getting to the sickest
	patients first although there are opportunities to
	enhance and improve the system. We found that
	increasing delays in ambulance response is due
	to the availability of resources not the clinical
e	response model.
	There is a compelling need for NHS Wales to work
or	collaboratively and focus on providing a safe,
y	timely and effective ambulance service.
e	
ey	
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# **Summary** of Findings

# **Explaining Amber**

- The prioritisation of calls is complex.
- There is a range of different responses depending on the patient's condition.
- Ambulance staff felt frustrated by the restrictive nature of the prioritisation system.
- The public felt that it was important to get the best response for their condition even if this was not the quickest.

# **Exploring Amber**

- There was increased demand in the • Amber category.
- Ambulance staff felt that expanding the numbers and roles of clinicians in the control room was essential.
- Receiving a quick ambulance response but ensuring this is the right response for your condition is important to the public.
- Further work is required to explore the relationship between cancellations and re-categorisations and ambulance response.
- Further work is required to explore the relationship between hoax calls, refusals and ambulance response.
- The Public support ambulance services doing as much as possible to avoid the need for them to go to hospital.
- Staff require more information on alternative services.
- Measures of quality is as important as response times.
- Measurement of the ambulance service should be refined to reflect the whole patient journey.

- Measures should be developed in partnership with patients.
- Members of the public wish to be supported and be better informed when making a 999 call.
- More patients in the Amber category are having their incident resolved or closed over the phone.

# **Delivering Amber**

- Funding for ambulance services has increased.
- The ambulance service does not always deliver sufficient resources to meet demand.
- The time ambulances are waiting outside hospitals has increased.
- Sickness levels remain high. ٠
- Emotional and psychological wellbeing of • staff is important.
- Call handlers should be supported, especially • during periods of increased activity.
- Resource availability is the foremost factor in providing an appropriate response.
- A lack of resource availability can result in longer waits for some patients.
- There has been an increase in the number of ٠ Serious Adverse Incidents reported.
- The clinical response model is a valid and safe way of delivering ambulance services.
- Members of the public support the principles of the clinical model.
- The length of time you wait for an ambulance response in the Amber category, does not appear to correlate with worse outcomes.
- There are further opportunities to use the ٠ Integrated Information Environment.

# Summary of Recommendations

- Measures of quality and response time should continue to be published although they need to reflect the patient's whole episode of care.
- Measures should be developed in collaboration with patients.
- There should be a programme of engagem to ensure clarity on the role of emergency ambulance services and how calls are prioritised and categorised.
- There must be sufficient numbers of clinicians in the contact centres to ensure patients receive the most appropriate level of care.



	•	The ambulance service must ensure that
		planned resources are sufficient to meet
		expected demand.
	•	The ambulance service must deliver against
		its planned resource.
	•	Health Boards must take appropriate actions
nent		to ensure that lost hours for ambulances
		outside hospitals reduce.
	•	The longest waits for patients in the
		community must reduce.

# **Summary of Further work**

- Understand the change in activity and explore opportunities for improvement in:
  - number of calls

٠

- patient cancellations
- re-categorisation
- refusals of treatment and transportation
- The role of the clinical support desk within the wider unscheduled care system should be reviewed.
- ٠ Health boards and the Welsh Ambulance Service should work together to ensure the current alternative services to hospital admission are being effectively used.
- A review should be undertaken by the ٠ Chief Ambulance Services Commissioner to support the Welsh Ambulance Service to maximise front line staff availability.

- A review should be undertaken by the Chief Ambulance Services Commissioner to support Health Boards to minimise lost hours to handover delay.
- The Chief Ambulance Services Commissioner ٠ will develop and implement a long wait reduction programme.
- There should be a review of the Serious • Adverse Incidents reported and Regulation 28 notices received over the most recent winter to ensure lessons are learnt and shared.
- The Integrated Information Environment should be used to identify opportunities for improvement within the unscheduled care services.

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## NOTE

Please note that through this report we make reference to the opinions or reflections of ambulance operational staff or managers. These statements have been taken as part of focus groups (total 20 staff) or during individual interviews with 5 operational managers and whilst those opinions or reflections may be valid for those individuals or groups, they are not necessarily representative of the whole Welsh Ambulance Service workforce. These staff are referred to as operational managers or operational staff within the report.

Also note that any reference to 'the public' or 'public opinion' in this report, unless otherwise stated, are from YouGov Plc. Total sample size was 1000 Welsh adults. Fieldwork was undertaken between 31st August - 3rd September 2018. The survey was carried out online. The figures have been weighted and are representative of all Welsh adults (aged 18+).

There is a significant amount of data and information regarding emergency ambulances services currently available and whilst every effort has been made to validate all the data and information within this Report and align it to publicly available data there is the possibility of discrepancy.

# Preface

and limitations of this report.

# In this section we explain the background to the Amber Review and the structure, methodology



## **1** Background

The emergency ambulance services in Wales are operated by the Welsh Ambulance Services NHS Trust which is commissioned, on a collaborative basis, by the seven health boards through the Emergency Ambulance Services Committee and the Chief Ambulance Services Commissioner who acts on the Committees behalf. Commissioning in this context means the needs of the citizens of Wales are identified and the ambulance services planned and secured to meet those needs.1

Every time a call is made to the official emergency 999 telephone line, the staff in one of Wales's three ambulance clinical contact centres use information about the nature of the patient's illness or injury to ensure they are provided with the right assistance. Contact centre staff are supported to gather this information through sophisticated software and a coding system which helps them to send an emergency ambulance, when needed, to the most urgent cases first. Since October 2015, in order to identify which cases are the most urgent, each call is placed in one of three categories. There categories are 'Red' (immediately life-threatening), 'Amber' (serious but not immediately life-threatening) or 'Green' (not serious or life-threatening). This way of categorising calls and sending the right medical help is termed as the 'clinical response model'.

An independent review<sup>2</sup> undertaken in 2017 supported the introduction of the new clinical response model and found it was delivering benefits for ambulance service patients. The review made a number of recommendations for further improvement to the model, including:

"Review the call categories outside Red, in particular the Amber category. There is concern that this group is too large and not sufficiently discriminatory in terms of prioritising patients with high acuity illness, and that for some calls this is resulting in unacceptably long waits."

The significant interest across the political and public spectrum in the quality and safety of the ambulance response, particularly for patients whose condition places them within the 'Amber' category has been recognised by Emergency Ambulance Services Committee and the Chief Ambulance Services Commissioner. The commitment to undertake a review was included in the Committees 2018/19 'Integrated Medium Term Plan'.3

The Welsh Government and the Cabinet Secretary for Health and Social Services also recognised the public interest and supported the Chief Ambulance Services Commissioner in requesting a clinically led review of the ambulance service response to patients categorised as 'Amber'. This Report is the outcome of that review.

# 2 Structure of the Report

The Report is presented in four sections:

### Part A – Exploring Amber

In this section we explain the Welsh Ambulance Service clinical response model, how ambulance calls are prioritised and the public and staff understanding of the Amber category.

### Part B – Exploring Amber

In this section we follow the CAREMORE®4 'five step pathway' used by Welsh Ambulance Services, starting from a patient making a 999 call for ambulance services to being taken to hospital. It demonstrates the changes that have occurred with calls and incidents in the Amber category over time.

### Part C – Delivering Amber

This section considers how Welsh Ambulance Services are using their resources to meet the demands placed on it. It will also explore what happens when the daily demand cannot be met and some patients end up waiting a long time for an ambulance and what effect that may have on their health and experience.

### Part D – Improving Amber

This section considers the findings of the Amber Review and highlights opportunities for improvement.

The full terms of Reference for the Amber Review are available in Appendix I.

Any discussion on ambulance services inevitably involves specialist terms, explanations, charts and statistics. We did not want to interrupt the flow of the report with exhaustive or technical explanations or to overwhelm the reader with detailed analysis, tables or charts. Therefore the main body of the Report is written, wherever possible, in non-technical language. The Technical Appendices expands on specific elements from the main body, providing supplementary detail and/or supporting data. Any cross reference from the main body of the Amber Review to the Technical Appendices is denoted by a small () just above the line of text with an accompanying technical appendix section, for example: 02

# 3 Limitations of the Amber Review

The Amber Review has been concluded within 6 months and we have attempted to engage with a representative range of stakeholders. We recognise that there is a need for wider engagement and a broader range of stakeholders will be included in the further work recommended by this Report.

The time period granted for the Amber Review has defined the depth and breadth of research and analysis. We have received assurance from members of the Expert Reference Group that the research underpinning the Review is of a high level and sufficient for the purposes of the production of this report. There is a significant amount of data and information regarding emergency ambulances services currently available in the public domain and whilst every effort has been made to validate all the data and information within this Report and align it with that which is publicly available, there is the possibility of discrepancy.

Although both of the authors are employed by NHS Wales they have endeavoured to be as objective as possible whilst undertaking the Review.

## 4 Methodology

We have delivered a Report underpinned by a robust evidence base supported by staff experies and patient opinions. We have used public information sources, supplemented by specific requested information from Welsh Ambulance Services to analyse and appraise the activity and operations of the Service over the last two years

We established an Integrated Information Environment of for the Review to enable data across the emergency care journey to be expertly analysed alongside clinical inquiry an discussion. We agreed on a two year time period to enable longitudinal and seasonal comparise agreeing on 1st April 2016 to 31st March 2018 to utilise the most recent validated information.

To assist us in developing the Amber Review methodology and validating the findings, we convened an Expert Reference Group consisti

	of a range of individuals with expertise and
ences	experience in academic research, operational
	management, unscheduled care and emergency
!	ambulance services. The Expert Reference Group
	invitees are listed in Appendix III.
d	
s.	We commissioned the Picker Institute to support
	us to collect Welsh Ambulance staff views
	through one to one interviews and focus groups
	and public opinion through an online survey.
nd	We have provided summarised findings
iod	throughout this Report and delivered pragmatic,
sons,	focused recommendations for future areas
to	of health service delivery, health policy and
	academic enquiry.
	The methodology for each element of the Review
	is shown in <b>Appendix II.</b> •
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# Explaining Amber

In this section we explain what the Welsh Ambulance Service clinical response model is in Wales, how ambulance calls are prioritised and the public and staff understanding of the Amber category.



## 5 The Clinical Response Model for Ambulance Services in Wales

In 2001, after a comprehensive UK wide review,<sup>5</sup> ambulances services moved away from a historical system where vehicles were dispatched on a 'first come first served' basis to one where calls were prioritised and categorised into 'A' (immediately life-threatening), 'B' (serious but not immediately life-threatening) and 'C' (neither serious nor life-threatening).

Although the priority was changed, the success or failure of the ambulance services continued to be measured by the time taken for the ambulance service to reach the scene of an incident.<sup>6</sup>

In Wales the 2013 McClelland Review of Welsh Ambulance Service<sup>7</sup> recommended that the Welsh Government move from the exclusive eight minute response time target, to a more 'intelligent' set of indicators that put a greater emphasis on patient outcomes and experience. The McClelland review also recommended a different approach to the commissioning of ambulance services which resulted in the establishment of the Emergency Ambulance Services Committee and the appointment of a Chief Ambulance Services Commissioner. <sup>(D2)</sup> Following the McClelland Review and after due consideration, the Welsh Government <sup>8</sup> in 2015 approved of a new approach for measuring the response to 999 calls.

This new approach, termed the 'clinical response model' moved away from categorising calls by 'A', 'B' and 'C' and introduced three new categories:<sup>9</sup>

### Red

The 'Red' category of call is for immediate life-threatening conditions where a person is in imminent danger of death.

### Amber

The 'Amber' category of call is for those patients with serious conditions that are not immediately life-threatening, but which are urgent and may need treatment and care at the scene or rapid transport to a healthcare facility.

### Green

The 'Green' category of call is for non-serious conditions which can often be managed by other health services, including healthcare advice or through self-care.



### 92% of responders felt that

## "getting the best response for my condition even if this is not the quickest response"

was an important element of the

The clinical response model gave the ambulance service the ability to fully assess and prioritise patients before sending an ambulance.

The clinical response model was evaluated in 2017 and, although there were recommendations for improvement, the evaluation found that

### "The principles used to develop clinical model...are sound" and "the right direction of travel." 10 02

One of the principles of the clinical response model is getting "the best response for my condition even if this is not the quickest" and during the Amber Review public survey 92% of citizens stated that this was an important element of the ambulance service.

Welsh Ambulance Services managers interviewed for the Amber Review believed that the introduction of the clinical response model prompted staff to think more about the individual patient rather than "meeting a target" and that ambulance services were now more "patient centric and quality focused".

[The Introduction of the clinical response model made services] "patient centric and quality focused". Operational manager

# 6 Clinical Response Models in other health systems

There is variation in how health services in different countries respond to emergency ambulances calls. Ambulance services in England have an Ambulance Response Programme which sets out national ambulance service standards. These standards are designed to improve ambulance services by 'targeting the right resource to the right patient'. The Ambulance Response Programme has four categories: Lifethreatening calls, Emergency Calls, Urgent Calls and Less Urgent Calls.11

In Scotland a new clinical response model was introduced for the Ambulance Service in November 2016. The model focuses on improving patient survival and treatment rather than measuring the time it takes to respond. The principle of the model being to 'send the right response to meet need'. Under the model call handlers spend more time with patients to better understand their health needs and ensure they send the appropriate response for their condition. The new model has five categories: Immediately Life-threatening, Serious not Life-threatening, See, Treat and Refer, Hear, Treat and Refer and Non-Emergency.12

During the facilitated focus groups undertaken for this Review, staff stated that it didn't really matter what "colour the call was" (with the exception of red), the issue was making sure calls were "sorted and prioritised correctly and accurately".

"If you've got a thousand calls coming in, it doesn't matter what colour coding they are, they have to be triaged, but you've still got the same poorly patients, whether they are a red call or whether they are an amber call." **Operational Manager** 

Given the variation across the UK of category names, we feel that there should be consultation with the public to ensure the colour designations given to the call categories in Wales, and now used widely in the media and official publications, are the most appropriate descriptors or whether clinical categories (Immediately Life-threatening etc.) or other terms would give greater clarity to the public.



# 7 Measures and targets

The justification for using response time as a service measure is based on research on the relationship between time and clinical outcome for specific clinical conditions like cardiac arrest. For patients experiencing a cardiac arrest there is evidence of a relationship between delay in resuscitation and survival.13

A UK study of response time and outcomes in patients considered to have life-threatening emergencies found no difference in mortality rates with response time longer than 8 minutes after adjusting for a range of patient and service characteristic.<sup>14</sup> None of the available evidence demonstrates a direct relationship between ambulance response times and patient outcome in terms of mortality when it comes to other conditions, life-threatening or not.15,16,17

The value of a response time as a measure of the impact and quality of ambulance service care is therefore questionable18 but, not just in the UK but internationally, the organisation and operational design of ambulance services have been dominated by the need to meet these standards. This does not mean that time is not important and the relationship between time and care has been established for a number of conditions such as acute myocardial infraction and stroke.<sup>19,20</sup> Ambulance services have a

vital role to play in the overall journey of the patient with these conditions, but it is providing treatment at scene and delivering patients to an appropriate facility that has an impact on outcome.

Ambulance services in England have three response targets for categories below 'Red', which are similar, but with important differences to the Welsh Ambulance Service categories of 'Amber' and 'Green'.

Although some studies have shown that imposed targets can improve aspects of NHS performance,<sup>21</sup> ambulance services in Scotland have, like those in Wales, moved away from response targets. In these countries targets, for the categories outside of Red, have been replaced by the measurement of response times, outcomes, care quality and patient experience. It has been stated that if health services are preoccupied with hitting targets then the actual journey an individual patient experiences becomes secondary; performance is determined against crude indicators, not the expectations and experience of those using the service.<sup>22</sup>

As part of a study paramedics described the role of response time targets in ambulance service culture as "an obsession" and "ludicrous". They felt targets dominated service delivery and took priority over factors which they saw as more important such as the quality of care provided or patient outcomes.<sup>23</sup>

Using targets instead of measures has been rejected by some as they give no incentive to achieve more than the target so in fact the "minimum becomes the maximum".<sup>24</sup>

Benchmarking, a process by which a health service can measure and compare its own processes with those of others, and ideally with those that are leaders in a particular area, is useful in improving understanding and quality.<sup>25</sup>

We recognise the usefulness of benchmarking against other ambulance services, but believe the introduction of time based targets may create a distraction from understanding the patient's journey from call to treatment. Later in this Report we explore how Clinical Indicators that span a patient's whole episode of care codeveloped with patient representative groups should be considered.



# 8 Prioritising calls

When you call 999 a telephone operator will ask you which emergency service you need. In a medical emergency in Wales you will be connected to the local ambulance service clin contact centre unless all the call handlers in centre are already busy, then calls are directed any available 999 call handler in Wales.

Once the call is connected to the ambulance service they are asked questions such as "is t patient breathing" to identify immediately li threatening emergencies that may require a 'Red' categorisation.<sup>26</sup>

After ruling out a 'Red' categorisation, the cathandler will ask some additional questions to determine the priority for dealing with the incident and to help provide the right advice. The Welsh Ambulance Service, as with many other emergency services in the United Kingo and across the world, use a set of "protocols" These protocols contain key questions and instructions for the call handler to provide a standardised way of classifying the type and medical urgency of the call. The set of protocol used in Wales is called the Medical Priority Dispatch System and is the same system used by thousands of ambulance services acro the world.<sup>27</sup>

# -

	The Medical Priority Dispatch System generates
	a specific set of letters and numbers, called
	a 'dispatch code', that is made up of three or
nical	four pieces of information, each of which is
that	explained below:
ed to	
	• 1st piece is a number that indicates the
	specific condition that may be present after
	initial questions to the caller, for example
he	Abdominal Pain/Problems, or Animal
ife	Bites/Attacks.
	• 2nd piece is either E, D, C, B, A or $\Omega$ , and
	indicates how many crews are needed, their
all	"expertise" and "how rapidly they are
	needed" for that patient's condition. For
5	example 'E' means "closest vehicle with
	lifesaving equipment" and $\Omega$ means "refer
,	to alternative care." <sup>28</sup>
dom	
".	• 3rd piece is a number relating to further
	specific information about an individual
	patient's condition, for example "not alert"
	or "clammy." <sup>29</sup>
ols	,
	• 4th piece, only present with certain codes,
	provides very specific details that may be
OSS	required in some situations, for example,
	whether it is a stabbing or shooting situation
	This is important as a safe distance for
	knives is different than that for guns
	Surgeren and that for Surge

The Medical Priority Dispatch System has approximately 1,900 codes that can be generated in response the caller's answers. These codes are added to and amended by the International Academy of Medical Priority Dispatch in response to the information and evidence provided to them by the services that use the system.

Of these 1,900 codes 62% fall in the Amber category. Amber 1 codes account for around 14% of the codes and covers such things as recent strokes (within 4 hours) and chest pain. Amber 2 codes account for around 48% of the codes and covers such things as falls and less-recent strokes (over 4 hours).

What this does not mean is that all the people contacting ambulance services who believe they, or someone with them, is experiencing a stroke will be prioritised in the stroke protocol or as Amber, as other symptoms such as unconsciousness may mean that the call is categorised as another condition with a higher priority code, such as Red.

The system prioritises the urgency of a call comparative to others, but does not determine what type of vehicle to send or whether to send that vehicle under blue lights. This is left to each individual ambulance service as they are configured differently and have different resources, demographics and geography.<sup>30</sup>

In Wales the group who determines how the ambulance service responds to a particular code is called the Clinical Prioritisation Assessment Software Group. This group allocates codes to one of the Red, Amber, Green classifications. It also uses sub-categories for a total of five classifications (Red, Amber 1, Amber 2, Green 2 and Green 3).31

This group also determines the best response, (called "the ideal response") or next best response, (called "suitable response") for each individual code. These ideal or suitable responses could be a clinical telephone assessment, rapid response vehicle, emergency ambulance or a specialist resource. It should be noted that where

an ambulance resource is available it should be dispatched without delay.

As an example - most codes related to stroke have Emergency Ambulance as the 'ideal' response. This is because, in order for these patients to receive the best level of care in a timely manner, they need to be transported to a hospital, therefore they need a vehicle with the capability of transport them safely.

Conversely a Rapid Response Vehicle is considered a 'suitable' response to stroke calls, as, although the staff member is able to assess and reassure the patient, the vehicle has very limited transportation capabilities.

Continuing to use stroke as an example: staff in the contact centre may send an emergency ambulance, as it's the ideal response, to a call related to stroke even though a Rapid Response Vehicle, a suitable response, is closer.

Which ONE, if any, of the following would you expect to happen when contacting the emergency ambulance service via 999?



An ambulance to be sent to me, only if an assessment showed I required an ambulance



An ambulance to be sent to me immediately, after my needs were assessed but regardless of what those needs are

An ambulance to be sent to me



6%

immediately, with no assessment of my needs



Welsh Ambulance operational staff taking part in focus groups for the Amber Review (shortened 'operational staff') The majority of the Welsh Ambulance operational staff agreed that the Medical Priority Dispatch System "worked well" as an initial starting point to sort calls, although some felt that the inability for call handlers to deviate from the system was "restrictive".

The operational staff acknowledged that once the code had been generated then they had "some flexibility" to ask questions but many lacked confidence to do this and were worried about the "consequences".

Some Welsh Ambulance Service managers felt there was a lack of public understanding of the need to prioritise resources in some way and this can "cause friction with the public". However, in contrast some operational staff felt that in general when calling 999 the public were "beginning to accept" being asked some other information and being told that the condition they are calling about "doesn't warrant an ambulance straight away".

The majority (73%) of the public understand that they will be assessed before an ambulance is sent. (see box) although 6% think there should be no assessment at all.

We found during the Amber Review that prioritisation of calls is complex and even where calls are in the same category, such as Amber, there is a range of different responses depending on the patient's condition. We acknowledge the need for further public education on how calls are prioritised.

## 9. FINDINGS FOR EXPLAINING AMBER

- The prioritisation of calls is complex
- There is a range of different responses depending on the patient's condition
- Ambulance staff felt frustrated by the restrictive nature of the prioritisation system
- The public felt that it was important to get the best response for their condition even if this was not the quickest
- Restrictive nature of the prioritisation system

28



# **Amber in numbers**



THE DATA DISPLAYED IS REPRESENTATIVE ONLY, AND BASED ON AVERAGE VALUES OVER THE 2 YEARS OF THE REVIEW

# PART B Exploring Amber

over time.



# In this section we follow the CAREMORE®<sup>32</sup> 'five step pathway' used by Welsh Ambulance Services, starting from a patient making a 999 call for ambulance services to being taken to hospital. It demonstrates the changes that have occurred with calls and incidents in the Amber category



### **CAREMORE® FIVE STEP PATHWAY**



# Step 1 Help me choose

## 10 Public calls to ambulance services

The number of 999 calls to Welsh Ambulance Services has increased from April 2016 to March 2018 as shown in Figure 1. In 2016/17 the total

number of 999 calls to WAST was 486,085 and in 2017/18 it was 540,891, an increase of 11.3%. 07



The reasons for this increase in the number of calls to ambulance services experienced in ma countries<sup>33</sup> is multifaceted but could include: 34, 35, 36, 37, 38, 39

- Wales has an ageing population which can mean more frailty, more dependency, more people with chronic conditions and more people with multiple conditions that require multiple treatments or interventions.
- Complex social issues such as poverty, a lack of personal social support, increased separation from close family, diminished access to transport and increasing alcohol related problems.
- There may be some **cultural issues** with some people's desire for a convenient 'easy access' solution to their health concerns that allow them to bypass perceived or actual complex community pathways and access to primary care services.
- There may be issues with local care provision - people may not understand how to directly access the range of primary care services available. They may be directed to urgent care services by other services such as NHS Direct or Out-of-Hours/In-hours GP services.
- Daily, weekly or **seasonal peaks** in demand.
- There could be people who are **calling** ambulances services back to find out

34

### "When patients don't know what to do they'll ring 999" Operational staff

f	
any	

when the ambulance will arrive, to tell the ambulance service that the situation has changed or to cancel the ambulance.

• Multiple people calling ambulance services about the **same incident**.

Effectively managing the number of calls to ambulance services will improve performance throughout unscheduled care services and potentially deliver better health outcomes for patients.40

Operational staff felt that a "large volume of calls" to the service could be "prevented" through better public education.

Operational staff said that they believed 'the public' viewed the emergency 999 number as a 'fall back system', saying; "When patients don't know what to do they'll ring 999, so some education learning there would be good".

Operational staff mentioned that the public had "a lack of knowledge" of alternative services, in particular Minor Injury Units. One staff member stated that Minor Injury Units were "the best kept secret of the health service".

We feel that there should be a clearer understanding of demographic, socio-economic, health related and other factors behind in the rise in the number of people calling the Welsh ambulance service as it is crucial to improving the management of future demand.

# 11 Other callers to the ambulance service

The majority of calls to the Welsh Ambulance Service are made by the general public, however a substantial number are made by the police or other healthcare services like GPs and nursing homes.

Welsh Ambulance Services see primary care health services as a key partner in delivering sustainable patient care,<sup>41</sup> although some operational staff felt the ambulance service was used as a "safety net" by some GPs. The 2013 McClelland Review found that call handlers did not feel empowered to challenge GP calls. We support the work of the Chief Ambulance Services Commissioner in promoting effective collaboration between primary care and emergency ambulance services.

Nursing homes for older persons are another service that frequently call the ambulance service. Operational staff believed that there was a significant number of calls from nursing homes for patients that had fallen. Operational staff felt it would be beneficial for all nursing homes to have a defibrillator, lifting cushions and be trained in resuscitation. The Welsh Ambulance Service is already working closely with some nursing homes in specific areas of Wales to try and reduce calls, usually by providing lifting equipment and training and the expansion of this work should be explored. The Police force is also a substantial user of ambulance services, not surprisingly as they are typically dealing face to face with the public or are called to incidents and accidents. Operational staff felt that some police officers do not fully understand how the prioritisation process works although ambulance clinicians are increasingly present in some police control rooms to provide advice and support .

Operational staff were frustrated with persons calling ambulance services because of alcohol intoxication as the "paramedics go out and end up just putting that person in a taxi to get them home".

Operational staff felt they had "a lack of training" to be able to deal with calls from persons experiencing mental distress. They suggested a trained mental health professional working in the contact centre would "help alleviate a lot of pressure".

We recognise that Welsh Ambulance Services have recently appointed a mental health lead to explore opportunities to improve staff confidence in dealing with callers with mental distress. We believe part of this role should be to better understand the demand from those with substance misuse, drug or alcohol issues and transient mental distress, often combined as 'mental health' as they require different responses from health and social care services.



# Step 2 Answer my call

## 12 Answering a 999 ambulance call

When someone calls the ambulance service through the emergency 999 number call handlers make every effort to answer the call as quickly as possible. The Welsh Ambulance Service track the number of calls that take less than 6 seconds to answer as an internal measure.

Figure 2 shows performance against this measure for two years from April 2016 to March 2018 and demonstrates a downward trend over that period.

# **13** Ambulance **Verified Incidents**

Figure 3 shows that verified incidents have risen at a reduced rate compared to calls. Overall there has been 2.2% increase in verified incidents when comparing 2016/17 and 2017/18.





Answering ambulance calls promptly is a difficult task, especially given the 11% increase in number of calls. Operational staff talked about how they regularly go "off shift worrying about a patient" and about needing more support for their own emotional and mental health when dealing with "extreme pressures" day to day.

Operational managers felt that contact centre staff were "undervalued" and that call handler duties are "extremely stressful and anxiety inducing". We support the need to safeguard the emotional and physical wellbeing of staff, particularly after distressing calls, and understand that Welsh Ambulance Services already have several initiatives in this area which should be sustained and developed.



The reason there has been an 11% increase in calls answered but only a 2.2% increase in incidents needs to be understood. Reasons could include: multiple people ringing to report the same incident, calls passed to other ambulances

services, calls abandoned prior to assessment, cancelation requests and people re-contacting ambulances services to get an update on a previous call.

**14 Incidents** 

by category

The overall 2.2% rise in incidents discussed in

all categories. Those incidents categorised as

Red have seen a rise of 14.6%, Amber has seen a

the previous section, has not been uniform across

rise of 7.6%, and there has been drop of 9.7% in

incidents categorised as Green. These variations

are illustrated in the Figure 4.

# Step 3 Come to see me

# 15 Ambulances being sent to Incidents

The number of Amber incidents requiring an ambulance to be sent\* has risen 1.2% between 2016/17 and 2017/18 as shown in Figure 5.



Understanding why there has been a rise across the Red and Amber categories and a reduction in Green can support planning and delivery of ambulance and wider unscheduled care services.





\* In this review for simplicity we refer to 'ambulances attending or ambulances being sent' as an Emergency Ambulance as it is the most common vehicle. Note that there are other ambulance resources (E.G. Rapid Response Vehicles, Air Ambulances)

The overall increase in incidents that have required an emergency ambulance to attend obscures a divergence within the Amber category

between those incidents categorised as Amber 1 (increase of 11.4%) and Amber 2 (decrease of 16.5%) as shown in Figure 6.





One of the reasons the 2.2% rise in the number of verified incidents has not resulted in an equivalent rise in the number of emergency ambulance being sent to patients is the expansion of the 'clinical support desk' within the ambulance contact centres. 05

Introduced after the McClelland review of ambulance services in Wales in 2015,<sup>42</sup> and funded by Welsh Government, this clinical support desk team of nurses and paramedics provide clinical triage and advice to callers.43

Operational staff suggested that there are opportunities to use the clinical support desl as part of an extension of the clinical response model. An example given by staff was that a identifying a code as not immediately lifethreatening calls would be "taken by a traine clinician who can ask relevant questions" an provide the right support.

Operational staff felt that having more clinic in the contact centre would be "extremely useful" as they can use "clinical judgement" ensure the appropriate prioritisation of incidents. Contact centre clinicians could also "give callers an honest estimation of how likely they are going to wait" and "recommend alternative pathways".



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ontact centre staff also felt that in future dvanced Paramedic Practitioners (a new nitiative where paramedics with advanced skills ttend incidents) could "help teams within the ontact centres" although some staff felt that is initiative needed "more clarity".

he Amber Review survey found that 88% of the ublic thought it was important that ambulance ervices provide medical advice on the phone nat avoids the need for an ambulance to attend n incident.

Another possible reason for the variation between the number of verified incidents and the number of ambulances being sent is callers cancelling the ambulance prior to its arrival. There has been a 129.5% increase in these cancellations between 2017/18 and 2016/17. There is a need to explore the relationship between these cancellations and long waits for emergency ambulances.



### 

# Step 4 Give me treatment

# 16 When the Ambulance arrives

When an ambulance arrives at an incident the patient's clinical condition will be assessed and treated, if possible, at the scene. If the patient's condition requires it, they will be taken to either the nearest hospital emergency department or to a specialist centre.44



of the public think it is important that ambulance services do as much as possible to avoid the need for me to go to hospital

The majority of the public think it is important that ambulance services do as much as possible to avoid the need for them to go to hospital. We propose that Welsh Ambulance staff be supported to recognise the significant contribution they deliver to a patient's health and wellbeing. The time they spend with a patient should bring value and deliver the best outcomes possible whether treatment at the scene or when taken directly to a health facility.

There may be opportunities to work in partnership with the public about how they can help ambulance staff before and when they arrive at the scene of the incident.

Ambulance staff normally treat patients with no prior knowledge of their conditions or medical history. It would support ambulance staff to treat more people at the scene of the incident if they had access to patient information such as medication, allergies and medical history.45

Sometimes when an ambulance arrives at an incident the patient cannot be found, they may have decided they no longer required help or it could have been a hoax call. Between 2016/17 and 2017/18 there was a 17.5% increase in the number of times a patient wasn't present when the ambulance arrived.

Sometimes when an ambulance arrives the patient 'refuses to be treated', or taken to the hospital by the ambulance crew. We recognise that further work is required to understanding the reasons for refusal and guide the development of better services to meet patient needs.



# Step 5 Take me to hospital

# 18 When the Ambulance leaves the incident

Not all patients attended by ambulance crews are taken to hospital. Following assessment and treatment by the crew they may be left at home with advice or referred to a community health service.





We recognise the important of the ambulance service reducing the number of patients being transported to hospital and all opportunities improved this should be explored.

Another factor which may impact on the number of patients taken to hospital is to It has been found that making sure staff have access to an easily navigable up to date electronic register of services<sup>48</sup> helps them to access alternative community or health services. Welsh Ambulance Services staff stated they had a partial register in place but there was "a need to be able to know more" about them so staff can access them and direct callers "to the right service". We recognise that NHS Wales is currently adopting a national directory of services.

ensure operational staff are led by competent and empowering clinical managers.<sup>47</sup> Over the last three years Welsh Ambulance Services have developed a 'clinical leadership model' to improve staff clinical support. We would want to measure the impact of this model on patient outcomes. An additional factor in reducing the number of patients being taken to hospital is the availability

# 17 Measuring quality

There are a broad range of conditions categorised as Amber and, alongside response times, Welsh Ambulance Service and its Commissioner measure interventions being provided through a set of 'Ambulance Quality Indicators'.46

97% of patients told us it is important to measure the quality of the treatment provided to them. We need to ensure that as many patients as possible in the Amber category are covered by clinical indicators.

We also recognise these indicators need to reflect the whole patient journey and be developed in partnership with patient representative groups.



its important to measure the quality of treatment

There has been a reduction in the number of patients taken to hospital for the Amber category of 0.1% from 2016/17 and 2017/18 as shown in Figure 7.

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of other health and social care services to support the patient.

Operational staff admitted that they "do not always know what pathways are available" and "how to help them access them".



# 19 Arriving at the Hospital

Once they arrive at hospital, normally at the emergency department, ambulance staff will pass on medical information to hospital staff and transfer the patient and therefore the responsibility for their ongoing care, to the department.<sup>49</sup>

Such transfers of care from one set of clinical staff to another are normally labelled as 'handovers of care' or colloquially as just 'handover'. There can be a delay in handing over patients between ambulance services and the emergency department and this is discussed in the 'Delivering Amber' section.

# **20 FINDINGS FOR EXPLORING AMBER**

- There was increased demand in the Amber category.
- Ambulance staff felt that expanding numbers and roles of clinicians in th control room was essential.
- Receiving a quick ambulance responent
  but ensuring this is the right responent
  your condition is important to the p
- Further work is required to explore relationship between cancellations and re-categorisations and ambular response.
- Further work is required to explore relationship between hoax calls, ref and ambulance response.
- The Public support ambulance serv doing at much as possible to avoid need for them to go to hospital.

l over 52% of patients thought they would be seen quicker in the Emergency Department if they arrived by ambulance. Work should be undertaken to ensure the public understands that assessment at the emergency department is based on clinical need and not by the mode of arrival.

We recommend that there should be a programme of public education, consultation and engagement on the role of emergency ambulance services as well as how calls are prioritised and categorised.

	Staff require more information on
	alternative services.
	Measures of quality is as important as
	response times.
	Measurement of the ambulance servic
	should be refined to reflect the whole
or	patient journey.
ic.	Measures should be developed in
	partnership with patients.
	Members of the public wish to be
	supported and be better informed whe
	making a 999 call.
	More patients in the Amber category
als	are having their incident resolved or
	closed over the phone. ●

PART C

# Delivering Amber

This section considers how Welsh Ambulance Services are using their resources to meet the demands placed on it. It will also explore what happens when the daily demand cannot be met and some patients end up waiting a long time for an ambulance and what effect that may have on their health and experience.



# 21 Demand and Capacity – overview

In the previous section we discussed the number of people calling ambulances, the number of incidents, the incidents being closed over the phone and ambulances being sent to patients This collection of activities can be termed the 'demand' placed on the Ambulance Service.

In order to give the best possible response to patients the Welsh Ambulance Service needs to meet this demand which, at various degrees, is present every hour of every day. The service needs to have the right number of people in the clinical contact centres answering calls ar managing incidents and the right number of emergency ambulances and other vehicles on road at the right time. These staff and vehicle the ambulance service's 'capacity'.

Matching demand and capacity is a fundamer requirement for delivery of first-class modern health and social care services.<sup>50</sup>

Welsh Ambulance Services should have the right capacity available to match the daily demand. Sometimes events occur (for example road traffic

ber	accident with multiple vehicles) which cannot
	be foreseen and produce a brief spike in demand
	but otherwise demand follows a generally
-	predictable pattern.
!	
	When Welsh Ambulance Services do not have
	enough capacity to meet the demand this can
	create a 'gap' and sometimes this gap can
to	be closed, by bringing in extra capacity or by
	changes in process, but sometimes it cannot.
e	When this demand /capacity gap cannot be closed
	it results in problems delivering the required
nd	response to patients and therefore some patients
	wait longer.
the	
es are	There are two main reasons why a 'gap' between
	demand and capacity can occur. The first is not
	having the necessary capacity in the first place,
ntal	either through lack of investment or having
n	issues with organisation planning and the second
	is by losing capacity through ambulances waiting
	too long outside hospitals, preparing ambulances
ght	for the next incident and staff sickness. Each
•	of these reasons will be discussed further in
affic	this report.

# 22 Having enough capacity – Investment

As with all parts of the NHS in Wales, every year the ambulance service receives funding to run their services<sup>51</sup> and this funding needs to match their aims and objectives<sup>52</sup> which in the ambulance services case is set by the commissioners.

The clinical response model also provides a mechanism for enabling ambulance services to better use the resources they have for the benefit of patients,<sup>53</sup> which the Welsh Ambulance Service has started to do, for example by becoming more efficient at sending the right type of vehicle and reducing the number of vehicles sent to incidents.

As well as the normal annual funds and uplifts for inflation, over the last few years the Welsh Ambulance Services has received additional funds from the Welsh Government and commissioners to support initiatives such as avoiding taking patients to hospital, ensuring more patients are cared for at home and expanding the clinical support desk.

This increase in funding is shown by comparing Welsh Ambulance Services revenue for patient care activities in 2017/18, which was £167 million compared to 2016/17 when it stood at £156 million. Comparing staff working for Welsh Ambulance Services across the two years also shows an increase from 2,982 in 2016/17 to 3,059 in 2017/18.<sup>54</sup>

Commissioners should continue to provide the Welsh Ambulance Services with the level of funding to deliver the right level and quality of patient care and that the funding received is dedicated to front line service.

# 23 Having enough capacity – Staff availability

A challenge for any ambulance service is ensuring the right number of staff with the right skills are available at the right time to match the demand for services.

Scheduling of staff to ensure there are sufficient crews to meet daily demand is a complex task due to regulations relating to various aspects of staff management. These regulations include limits on the number of consecutive work hours, the number of shifts worked by each employee and restrictions on the type of shifts assigned.<sup>55</sup>





Figure 8 shows that on average actual staff availability was 3.3% below the planned staff availability.

Welsh Ambulance Services funding £156 million in 2016/17 £167 million in 2017/18



The number of staff hours that Welsh Ambulance Services plan to be made available per day once factors such as sickness levels, holiday allowance, training time and other anticipated non-availability has been taken into account is called the 'planned' staff availability.<sup>56</sup> It would be challenging for an ambulance service to always get a precise match between planned staff and the actual staff availability but any sizable or continuous variation may be a problematic.

**Figure 8** shows that the total planned and the actual staff availability for every month between April 2016 and March 2018.

### • FIGURE 8: NUMBER OF STAFF HOURS PLANNED TO BE AVAILABLE AND NUMBER

We need to understand the impact of this difference between planned and actual staff availability , particularly with emergency ambulances and reflect that staff spoke about how many ambulances were deployed at any one time and how this "seems to be fewer than it used to be even with an aging population and an increase in emergency calls".

The Welsh Ambulance Service acknowledge that there are issues in planning for staff availability and they commissioned a 'Demand and Capacity Review' in 2016 and have begun to implement the findings from this review which includes improving rostering.57

The Welsh Ambulance Service can reduce these operational shortfalls by offering employees paid extra shifts. Although this is a normal way for ambulance service to operate it does depend on the willingness of staff to work additional hours, and can increase staff stress and lead to exhaustion.58

We were keen to understand the association, if any, of staff availability and the waits that can be experienced for patients whose conditions have been categorised as Amber. Figure 9 shows the results of comparing the variation in staff availability in hours and the 'Amber 95th percentile'.\*





Figure 9 shows that the comparison is indistinct except for the three months of 2018.

143,677 hours lost to planned/actual gap

\* The '95th Percentile" is calculated as the value below which a certain percentage of patients fall. For example if the 95th percentile for a response time was 20 minutes then 95% of calls would be answered within that time and 5% would wait longer.

# • FIGURE 9: THE VARIATION BETWEEN EA AND RRV PLANNED AND ACTUAL STAFF





# 24 Losing capacity – Ambulances waiting too long outside Hospitals

Handovers of care are sometimes governed by measures of time, set locally or nationally,<sup>59</sup> and when the time taken to handover care exceeds this agreed time period it is classed a 'handover delay'. The underlying reasons beh handover delays are multifactorial<sup>60</sup> and may include:61, 62, 63, 64

- Major incidents making emergency departments and hospitals busy.
- Disrupted management of patient move ٠ within and out of hospitals, including transferring patients from Emergency Departments into wards.
- Patient flow through the hospital. •
- Seasonal pressures such as winter ٠ flu outbreak.

у	• Behaviour of professionals in primary care (volume of healthcare professional referrals).
as a hind 7	• Reduced staff resources, equipment and capacity in Emergency Departments.
	• Physical environment of hospital sites and Emergency Departments.
ment	When we try to calculate handover delays we normally convert the time waiting outside of hospital to 'lost hours', this means that for that period of waiting the ambulance cannot go to
	another incident. Calling it a 'lost hour' is an operational term and it does not mean that the time the crew spend with the patient is not valued and an important contribution to clinical care.

When we examine the data from April 2016 – March 2018, shown in **Figure 10**, we can see that the number of hours (over 15 minutes) that have been 'lost' due to waiting outside of a hospital has risen over both winters of 2017 and 2018 with January and February 2018 being particularly high.

• FIGURE 10: THE NUMBER OF LOST HOURS DUE TO DELAYS IN HANDOVER OF PATIENT FROM AMBULANCE TO HOSPITAL





In Wales there is a standard that requires 95% of patients to be handed over in 15 minutes.<sup>65</sup> **Figure 11** shows the percentage of patients har over within 15 minutes, and therefore those th



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take longer than this. It demonstrates that the target has not been met for two years with 54% of patients being handed over to hospital staff within 15 minutes in April 2016 to 45% in March 2018.

### • FIGURE 11: PERCENTAGE OF PATIENTS HANDED OVER TO HOSPITAL STAFF

The 15 minutes target does clearly represent how long some patient may wait in an ambulance

outside of a hospital. Figure 12 shows the number of patients waiting in time bands.



The consequences of the patient remaining on the ambulance outside of a hospital is that they are being cared for in an environment which is designed and equipped to deal with emergency incidents not for the provision of prolonged periods of care. This means the vehicle lacks toileting and food and water facilities as well as appropriate mattresses and seating supports.

Patients waiting in ambulances outside of hospitals may have a poor experience of care<sup>66</sup> although some have said they were reassured by the continued presence of ambulance staff.<sup>67</sup> We recognise more work needs to be done to understand patient experience although we presume it is not dignified and progressive care if patients are waiting in an ambulance for several hours.

Patients have said they would like to be kept informed during their wait<sup>68</sup> and we support the Welsh Government advice to keep patients and their carers fully informed of the reason for any handover delay and the progress in resolving it.69

Handover delays have been associated with high levels of stress for all staff groups, and in particular frustration for ambulance crews waiting with patients outside the hospital.<sup>70</sup>



60

We recognise that the principal issue with handover delays is that they prevent emergency ambulances from responding to other calls and this is discussed in later in this report.71

We recognise the pressure the wider unscheduled care services, especially emergency departments are under, however we need to urgently collaborate as a whole healthcare system to address the issue of handover delays.

# 25 Losing capacity -Ambulances getting ready for the next incident

After transferring the patient to hospital staff the ambulance crew get the vehicle ready before making themselves available to respond to the next incident (called being 'clear'). It is important to note it is not always possible to be ready for a new case quickly as staff should be allowed time to emotionally recover after dealing with a stressful incident.<sup>72</sup> They may also need time to restock the ambulance with medication and equipment.

There is an expectation that the ambulance crew take no more than 15 minutes for this activity.

Figure 13 shows that the number of hours that have been lost from 'handover to clear' (above 15 minutes) as reported by Welsh Ambulance Services has risen by 45% and over the two years.

### • FIGURE 13: LOST HOURS FROM HANDOVER TO CLEAR (AVAILABLE FOR THE NEXT CALL) 1,200 1,000 800 Hours 600 400 200 0 Jul-17 Aug-17 Sep-17 Oct-17 Nov-17 Apr-16 Aay-16 Jun-16 Jul-16 Aug-16 Sep-16 Oct-16 Nov-16 Dec-16 Jan-17 Feb-17 Mar-17 Apr-17 May-17 Jan-18 eb-18 Jun-17 Dec-17 18 Mar-

16,624 hours from handover to clear over two years

We need to explore the reasons why there should be such a rise in the hours lost to handover, it could be a change of process, or that restocking is taking longer or it could be that staff require longer to recuperate given that they may have cared for patients for a longer period than usual.

# 26 Losing capacity – Sickness

As in any large organisation there are alwa number of staff who have illnesses/acciden which prevent them for working. These rat of staff absence due to sickness are closely monitored in the NHS.

In England it is known that ambulance service have the highest sickness rate in the NHS73 Welsh Ambulance Services have the highest sickness rates of any NHS Wales organisation.74



iys a	Figure 14 shows the sickness level for all staff
nts	and demonstrates the higher levels through
tes	the winter periods. Welsh Ambulance Services
,	acknowledge that through the winter of 2017/18
	sickness was the "highest we have experienced
	for a number of years".75
vices	
<sup>3</sup> and	
st	

### • FIGURE 14: WELSH AMBULANCE SERVICES SICKNESS RATE

It is essential to reduce sickness rates as high sickness absence rates contribute to 'poor resource utilisation',<sup>76</sup> meaning less capacity. Figure 15 the number of hours that have been lost from 'front line' staff sickness (excluding management or administrative staff) from April 2016 to March 2018.



We recognise that Welsh Ambulance Services have taken a number of actions to support staff emotional and physical health and reduc sickness rates although some staff felt there was a "lack of support" for their own "menta health". Staff also discussed the "abuse" they "day to day".

Operational staff talked about how their jobs impacted their health and life outside of work The staff explored the improved focus on rest breaks and shift finishing times recognising this benefits staff welfare. Although they also acknowledged that this may have a 'knock on effect with response times', by reducing available capacity.

We recognise that some patients will become frustrated with long waits, but abuse cannot be tolerated and we support Welsh Ambulance



88,095 hours lost to front line staff sickness 🕷

3	Services in ensuring that action is taken against
	every act of harassment.
ce	
	Welsh Ambulance Managers also state they
al	have reviewed rosters in order to better fulfil
y get	the principles of the clinical response model,
	although they also said that these changes in
	shift patterns could affect staff work-life pattern.
k.	We acknowledge that the Welsh Ambulance
t	Service recognises that the health and wellbeing
that	of their staff is "crucial to delivering and
)	maintaining safe, high quality healthcare" and
1	are working with trade union partners to help
	staff to be as "healthy, well and resilient as
	possible"77 although we also recognise the impact
	of this work is still to be seen in reported staff
!	sickness rates.

# 27 Demand and **Capacity – impact**

We have attempted to discuss the various elements of demand and capacity separately in order to fully explore the contributory factors for each. However, this does pose challenges for understanding how each of these elements

interacts with others to ultimately impact on the response provided to patients.

Figure 16 endeavours to compare lost hours, resource availability and the Amber 95th percentile.

• FIGURE 16: COMPARISON BETWEEN LOST HOURS (HANDOVER DELAYS/HANDOVER TO CLEAR/STAFF SICKNESS), EA AND RRV PLANNED AND ACTUAL STAFF AVAILABILITY AND THE AMBER 95TH PERCENTILE



Hours lost	Hours lost	Hours lost
to staff	to Handover	to Handover
sickness	to clear	delay
(hours)	(hours)	(hours)

Variation between planned and actual staff availability EA & RRV only

Amber 95th percentile response time (mins)

In the winter of 2017/18 we see a combination of circumstances of shortfalls in staff availability and a significant amount of lost hours which resulted in a increase in the length of time some patients are waiting.

Operational staff felt that "resourcing issues" were a major issue and that the response model is not designed for such "restricted resources"

and this issues was exacerbated by "hospital delays". One staff member summed this issue up by saying:

"If we had the ideal crews, no hospital delays, we would get to our patients a lot quicker." **Operational staff** 

66



# 28 Waiting times for ambulances

As stated previously handover delays are a significant contributory factor is the loss of ambulance resources. This loss can manifest in longer ambulance response times. Figure 17 shows the relationship between hours lost to handover delay and Amber 95th percentile.

There were 536,260 incidents categorised as Amber between April 2016 and March 2018. 59% of patient waited less than 20 minutes for





an ambulance and 87% waited less than 60 minutes as shown in Figure 18.

### • FIGURE 18: RESPONSE TIME (IN TIME BANDS) FOR PATIENTS CATEGORISED AS AMBER

Number of patients in time bands to maximum wait

Within the overall Amber category there is a variance in response time between incidents categorised as Amber 1 or Amber 2. The majority, 65% of Amber incidents, were categorised as

Amber 1 and in this category 66% waited less than 20 minutes for an ambulance response and 92% waited less than 60 minutes as shown in Figure 19.





Number of patients in time bands to maximum wait

The remaining 35% of the total number of Amber ambulance response and 77% waited less than incidents were categorised as Amber 2 and in this 60 minutes as shown in **Figure 20**. category 45% waited less than 20 minutes for an




Waiting for an ambulance, even for a short time can cause anxiety and frustration, especially if the patient is on their own, and information provided by the call handler, such as ambulance arrival time and what to do while waiting could reduce uncertainty in a stressful situation.78

The Welsh Ambulance Services should consider actions to reduce anxiety whilst patients were waiting with 97% of the public saying they would like to be told the approximate ambulance arrival time.

Contact centre staff may call waiting patients back to ensure their condition has not deteriorated. If during these 'call backs' the patient gives new information the call may be re-prioritised. This may re-prioritisation may also occur if the patient calls back. 88% of the public thought that receiving regular 'call backs' from the ambulance service whilst they wait for a response was important. Sometimes when the volume of calls gets very high, these 'calls backs' get suspended. The reason for this is to ensure new calls get answered promptly. We believe that patient welfare checks are a vital part of the continuity of care that should be offered by Welsh Ambulance Services and that their suspension during periods of escalation should be reviewed.

The Amber Review has demonstrated that the majority of patients are receiving a timely response, however there is a compelling need for NHS Wales to work collaboratively to ensure a safe, timely and effective ambulance service.

### **29 Serious Adverse** Incidents

Serious Adverse Incidents are events where the consequences to patients, families and carers, staff or organisations are so significant or the potential for learning is so great, that a height level of response is justified.79

There are policies and guidance in place for all NHS Wales organisations to describe the circumstances in which a Serious Adverse Incidents response may be required to ensure that they are investigated thoroughly and,







of the public said they would like to be told the approximate ambulance arrival time

e	most importantly, learned from to prevent the
	likelihood of similar incidents happening again. <sup>80</sup>
ened	From April 2016 to March 2018 Welsh Ambulance
	Services reported 90 Serious Adverse Incidents
	in their 'Monthly Integrated Quality and
	Performance reports'. <sup>81</sup> Figure 21 displays the
	reported incidents by months over the two year
	period, there were 28 incidents in 2016/17 and
	63 in 2017/18 with a clear rise in the winter
	2017 period.



The reason for any rise in Serious Adverse Incidents can be multifaceted and difficult to identify. One of the simpler explanations is that the rise in the number of Serious Adverse Incidents shown in Figure 21 relates to a rise in the number of verified incidents, the logic being that as demand increases, if the probability of a Serious Adverse Incident remains fixed, then the quantity would rise.

### THE NUMBER OF VERIFIED INCIDENT



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As Figure 22 shows there does not appear a clear correlation between the number of verified incidents and the number of Serious Adverse Incidents as the number of incidents dropped in November 2016 and November 2017 compared to the previous months, however there was a rise in Serious Adverse Incidents in both months.

### • FIGURE 22: NUMBER OF SERIOUS ADVERSE INCIDENTS REPORTED COMPARED WITH

Incidents reported by Welsh Ambulance Services

Another proposition is that the number of Serious Adverse Incidents can be linked to longer waits for ambulances. Figure 23 correlates the number of Serious Adverse Incidents against the Amber 95th percentile.

• FIGURE 23 COMPARISON BETWEEN NUMBER OF SERIOUS INCIDENTS AND AMBER **95TH PERCENTILE** 



Figure 23 shows a rise in the number of Serious Adverse Incidents alongside a rise in the Amber 95th percentile response time. However it is important to note, not all Serious Adverse Incidents are related to patients within the Amber category.

We are also aware that Welsh Ambulance Services have been issued a number of 'Regulation 28 notices' between April 2016 and March 2017. A Regulation 28 notices applies where a coroner is under a duty under to make a report to prevent other deaths.<sup>82</sup> Although these notices often state that a single cause cannot be said to have caused a death they have stated that delays could have been a 'contributory factor'.

The independent board members of Welsh Ambulance Services, concerned at the rise in the number of Serious Adverse Incidents, have undertaken an 'assurance review' and found that there was "not just one root cause for each concern". They found the significant issues to be:

- Hand over delays and availability
- Availability of Staff and Welfare
- Call Centre categorisation and investigation process
- Escalation levels and protected resource

The independent board members are keen to ensure rapid learning from these incidents.

Whilst straightforward correlations may be difficult to detect we are aware that behind every Serious Adverse Incident is either harm, concern or a poor experience of care.

We are eager to ensure that any lessons from Serious Adverse Incidents are learnt and shared, especially around the amber category. We therefore advocate that a further review is undertaken jointly by Welsh Ambulance Services and commissioners into the Serious Adverse Incidents reported and Regulation 28 notices received from December 2017 to February 2018.

### 30 Do long waits cause harm? -**Overview**

Some patients will have a poor experience wh waiting a long time for an ambulance and we have discussed in previous sections how this experience can be improved.

We should note that the statement 'a long tim is subjective and will have different value to different people. There is no definition that ca be used so in this review we use various meas depending on context.

Nevertheless accepting poor experience and the subjectivity of 'long waits' one of the purpose the Review is to understand if the categorisat of Amber is causing harm to patients. It should

### • FIGURE 24: THE INTEGRATED INFORMATION ENVIRONMENT



The Integrated Information Environment contains millions of data points and to our knowledge this is the first time in Wales that this has been achieved on this scale or depth. Whilst the analysis within this report focuses on patients presenting to the ambulance service in the Amber category, there are significant opportunities to work in this environment to support developments within the wider health system

ilst	be acknowledged that the relationship between waiting a long time and attributable harm is
poor	complex and uncertain.
	To generate this understanding of correlation
ne'	between potential harm and 'long waits' we have
	worked with a range of organisations across NHS
an	Wales to develop an 'Integrated Information
ures	Environment' which allows us to digitally trace
	a patient's journey across their episode of care
	and to use clinical and analytical expertise to
he	scrutinise this journey and track interventions and
es of	outcomes. The data used to develop the Integrated
ion	Information Environment is shown in Figure 24.
d	

as currently there is a clear lack of integrated data across the patient journey.83 The Clinical Prioritisation Assessment Software Group, mentioned earlier in this report, currently uses ambulance service data and clinical expertise to regularly review codes to ensure they are in most appropriate response category. The Integrated Information Environment should now be used by this group to augment this process.

### 31 Do long waits cause harm? -Outcomes

We have developed a range of indicators that can be used as a proxy measure of harm. We have grouped these to create a cluster of outcome indicators that we have used to explore the following issues:

### Waiting for an ambulance

There is a perception that longer waits in the community for an ambulance response has a higher propensity to cause harm.

### Waiting in an ambulance

There is a perception that long handover delays outside of hospitals are causing harm to patients.

For each of the areas there is a logical hypothesis that harm is linearly associated with an increase in volume or time. We aim to explore this hypothesis and understand its validity and applicability to the Amber category.



### 31.1 Waiting for an ambulance

When studying the relationship between response times and patient outcomes, it is important to take into account the influence the clinical response model has on these time based outcomes. As the clinical response mod is designed to reach those sickest individuals first, then we would expect to see the poorest outcomes for patients responded to the quick Therefore, in order to analyse the relationship between response and outcomes in a more pu way, we need to first adjust out the effects of clinical response model, and this can be done through the use of the codes from the Medica Prioritisation Dispatch System mentioned previously in this report.

As also mentioned earlier, Medical Prioritisat Dispatch System codes are placed in either the Red, Amber 1, Amber 2 or Green category a consequence of which is that some codes are more likely to be clustered within incidents

frequencies of those MPDS codes.

	hav	ing the quickest response times. Taking
	ave	rage outcomes for each code, we can calculate
that	exp	ected average outcomes for each response
5-	tim	e,* and then calculate outcome ratios by
lel	divi	iding the actual average outcomes with their
	asso	ociated expected average outcomes, at each
t	resp	ponse time point. Figures 26-28 are expressed
æst.	as t	hese adjusted ratios, with the 100% line
p	representing an outcome which is in line with	
ıre	what would have been expected given the mix	
the	of codes.	
<u>!</u>		
ıl	The	e proxy outcomes we used for patients waiting
	for	an ambulance in the community.
	a.	First presenting National Early Warning
tion		Score Ratio
	b.	Conveyance Ratio
	c.	Admission Ratio
e	d.	Cardiac Arrest Report Form (CARF)
	e.	Recognition of Life Extinct (ROLE)

\*The expected average is a weighted average of the individual MPDS code outcomes, with weights based on the relative

### 31.1.1

### **Total incidents by Response Time**

For context Figure 25 shows the distribution of response times for all Amber calls, and it is clear that the majority of these calls are attended to within an hour, and care therefore needs to

be taken when assessing the significance of outcomes beyond this time which are likely to subjected to a large degree of statistical error.



### 31.1.2

### **First presenting National Early** Warning Score Ratio

National Early Warning Score is used across t Ambulance Service and secondary care in Wal It enables clinicians to calculate and articulat the level of risk of a patient's physical condition deteriorating in a standardised way.

Figure 26 demonstrates that those responded to within 20 minutes seem to have a higher National Early Warning Score on average that

### • FIGURE 26: FIRST NATIONAL EARLY WARNING SCORE RATIO BY RESPONSE TIME



- First National Early Warning Score Ratio

he	would have been expected, given the mix of
les.	Medical Prioritisation Dispatch System codes,
e	but after 20 minutes, it is generally lower. This
ion	effect might be down to a combination of factors;
	contact centre clinicians may be applying clinical
	discretion over the deployment of the next
đ	ambulance, or it could be that for a significant
	number of patients, their condition improves
n	while they wait for an ambulance.

100% Reference Line (average National Early Warning Score in line with that expected)

### 31.1.3 **Conveyance Ratio**

Understanding the relationship between conveyance and length of response time may provide an insight into the appropriateness of ambulance prioritisation.

The conveyance ratios shown (Figure 27) are broadly in line with what would have been

expected for response times up to around 80 minutes, but there is a noticeable drop-off beyond that point. However, care needs to be taken with regards to the interpretation of data points beyond this response time, due to the relatively small numbers involved.

### 31.1.4 **Admission Ratio**

Understanding the relationship between response times and the rate of admission from Emergency Departments is a useful indicator of the clinical needs of a patient. Note that the ratio expressed is based on all incidents where an ambulance arrived at the scene, not just those where there was a conveyance to the Emergency Department.







First National Early Warning

in line with that expected)

Figure 28 shows that the ratio of patients admitted into hospital is in line with that expected based on the mix of Medical Prioritisation Dispatch System codes, and there seems to be no evidence to show that longer response times have an effect on overall admission rates. However, this is not to say that there might have been individual instances in which a delayed response led to a poorer outcome, as stated earlier in this report.

### • FIGURE 28: ADMISSION RATIO BY RESPONSE TIME CARDIAC ARREST REPORT FORM

100% Reference Line (average Admission rate in line with that expected)

### 31.1.5 **Cardiac Arrest Report Form**

Understanding the link between response times and the need for cardiac arrest interventions is an important proxy measure of harm and accuracy of ambulance services prioritisation systems.

One of the ways we can measure this is to look at the number of patients in the Amber category where the ambulance crew document that they undertook an intervention as a result of the patient having a cardiac arrest. We looked at the time taken to respond to these patients compared to other patients.

Although it should be noted that the numbers are small in relation to the overall number of patients in the Amber category.

It is important to note that the cardiac arrest may occur at any point in time whilst the patient is with the ambulance crew.

Due to the very small numbers involved (0.3% of total Amber) it was not appropriate to calculate the adjusted ratios, and therefore, in Figure 29 we compared the response time distributions for Amber patients having had a Cardiac Arrest intervention documented on the 'Cardiac Arrest Report Form' against those who did not.

Figure 29 shows that those patients with an element of the Cardiac Arrest Report Form completed were attended to quicker than those without.

• FIGURE 29: COMPARISON OF RESPONSE TIME DISTRIBUTIONS FOR CARF V NOT CARF

	CARF	NOT CARF
Avg. response time (mins)	28.3	33.9
25th percentile response (mins)	7	8
Median response (mins)	13	16
75th percentile response (mins)	24.5	33
90th percentile response (mins)	51	74

### 31.1.6 **Recognition of Life Extinct**

Understanding the link between response times and the Recognition of Life Extinct is an important proxy measure of harm and accuracy of ambulance services prioritisation systems.

### • FIGURE 30: COMPARISON OF RESPONSE TIME DISTRIBUTIONS FOR RECOGNITION OF LIFE EXTINCT VERSES NON RECOGNITION OF LIFE EXTINCT

	CARF	NOT CARF
Avg. response time (mins)	33	33.9
25th percentile response (mins)	8	8
Median response (mins)	14	16
75th percentile response (mins)	27	33
90th percentile response (mins)	65	74

### 31.1.7

Summary of Outcome Cluster for Waiting for an Ambulance

• FIGURE 31: WAITING FOR AN AMBULANCE OUTCOME SUMMARY

### INDICATOR

First presenting National Early Warning **Score Ratio** 

**Conveyance Ratio** 

**Admission Ratio** 

**Cardiac Arrest Report Form** 

**Recognition of Life Extinct** 

Figure 30, due to the very small numbers (0.2% of total Amber), compares the response time distributions for Amber patients who are recognised as life extinct versus those who are not, and shows that the response times were slightly shorter in the Recognition of Life Extinct group.

FINDING
Those responded to within 20 minutes have a higher National Early Warning Score than those responded to after 20 minutes
Conveyance ratios are in line with what would have been expected
No evidence that longer response times have an effect on admission ratios
Those patients with an element of the Cardiac Arrest Report Form completed were attended to quicker than those without
Response times for Recognition of Life Extinct patients were not dissimilar to non- Recognition of Life Extinct patients

### 31.2 Waiting in an ambulance

It is difficult to gain a true understanding of the relationship between handover delays and patient outcomes, due to the fact that patients who wait in an ambulance are not representative of all patients conveyed to Emergency Departments.

The fact that these patients need to stay in an ambulance with crew members could indicate that their condition is such that they are not well enough to wait in the Emergency Department waiting room.

We focused on the observations taken during the patient's time within the ambulance such:

- National Early Warning Score
- Pain scores

It should be noted that the numbers involved for this analysis are quite small, due to the current difficulties in identifying and analysing multiple observation records.

### 31.2.1

Difference between the average First and Last National Early Warning Score during hospital handover delay

Measuring how a patient's National Early Warning Score is affected during the wait out a hospital prior to being handed over is impor for understanding the impact of waiting on a patient's clinical condition.

Figure 32 shows the differences between the average first and last National Early Warning

### • FIGURE 32: DIFFERENCE BETWEEN AVERAGE FIRST AND LAST NATIONAL EARLY WARNING SCORE DURING HOSPITAL HANDOVER DELAY

### By Handover Wait



	Score recorded by the ambulance crew during
side	the handover delay, and for each of the handover
rtant	wait time bands, the differences were less
	than zero, denoting that, on average, patients'
	scores reduced slightly during their time in
	the ambulance, as we may expect when being
	cared for by skilled ambulance and emergency
5	department staff.

### 31.2.2

Difference between the average First and Last Pain score during hospital handover delay

Measuring how a patient's pain trend is affected during the wait outside a hospital prior to being handed over is important for understanding the impact of waiting on a patient's clinical condition. Figure 33 shows that the average pain scores reduced between the first set of observations outside the hospital and the last set of observations before the handover.

### • FIGURE 33: DIFFERENCE BETWEEN FIRST AND LAST PAIN SCORES DURING HOSPITAL HANDOVER DELAY





31.2.3

Summary of Outcome Cluster for Waiting in an Ambulance

• FIGURE 34: WAITING IN AN AMBULANCE OUTCOME SUMMARY

INDICATOR	FINDING
Difference between the average First and Last National Early Warning Score during hospital handover delay	On average patients' National Early Warning Score reduced during their time in the ambulance, as we may expect when being cared for by skilled ambulance staff and ED
Difference between the average First and Last Pain score during hospital handover delay	On average pain scores reduced between the first set of observations outside the hospital and the last set of observations before the handover as we may expect when being cared for by skilled ambulance and ED staff

### 32 Do long waits cause harm? -Summary

It is possible that some patients may in the longer term exhibit poorer health outcomes due to their long wait for a response, however using the data available to us within the Integrated Information Environment there appears to be no direct relationship between long waits for an ambulance response and poorer outcomes for the majority of patients.



We believe that work should continue, in order to understand the relationship between harm and response times, especially for specific conditions, and that additional information is required to augment the Integrated Information Environment such as tissue viability assessments and emergency department interventions.

### **33 FINDINGS FOR DELIVERING AMBER**

### PART D

# Improving Amber

This section considers the findings of the Amber Review and highlights opportunities for improvement.





We have delivered in this Report a comprehensive assessment and narrative that describes the Amber category in detail. Overall we find that the principle of the clinical response model, of getting to the sickest patient first and getting the right response to the patient is supported by both the public and staff.

We have found instances of good practice as well as opportunities for improvement to the quality of care, public understanding or ambulance response for patients whose conditions have been categorised as amber.

The Welsh Ambulance Service is experiencing an increase in demand on its services, and the service is contributing in mitigating the impact of this demand on the wider health services.

There needs to be a better understanding of why demand is increasing, the role of other services in driving this demand and how the ambulance

service can further contribute to the management of this demand as part of the wider health system.

We have developed and used an innovative Integrated Information Environment to examine any possible correlation between response times, waiting outside a hospital and poorer outcome. We are reassured that this information demonstrated that the Welsh Ambulance Service is effectively prioritising patients and getting to the sickest patients first. We have shown that when patients are waiting outside of a hospital for admission they do not, on the whole, deteriorate or have worsening pain.

We believe that this Integrated Information Environment will provide stakeholders with a rich resource to enable a greater understanding of the key factors involved in pre-hospital unscheduled care and will enable more effective commissioning and delivery of services.

The link between Serious Adverse Incidents and Amber category is complex, and a clearer understanding of the root causes of these incidents need to be established.

We have found that there are a number of patients in the amber category that are waiting too long to receive a response. The overriding factor in improving this is the availability of ambulance resources and not the categorisation of these patients as Amber.

In order to avoid the combination of factors that were seen last winter, the ambulance service and the wider NHS must ensure that it takes every opportunity to maximise the availability and efficiency of resources in order that the patients of Wales receive the highest quality and timely ambulance response.



### FINDINGS

### The Review has found:

### Explaining Amber

### **Exploring Amber**

- Measures should be developed in
- supported and be better informed when
- having their incident resolved or closed

### Delivering Amber

- The length of time you wait for an

### RECOMMENDATIONS

### In light of these findings the Review recommended the following:

Measures of quality and response
time should continue to be published
although they need to reflect the
patient's whole episode of care

- - meet expected demand

### It also recommends that further work is required as follows:

- A review should be undertaken

- There should be a review of the most recent winter to ensure lessons
- by the Chief Ambulance Services handover delay

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# Appendix

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### Appendix I

### **Appendix I Introduction**

The 2016/17 independent review of the clinical response model pilot, undertaken by the Public and Corporate Economic Consultants (PACEC), made a number of recommendations for further improvement to the clinical response model, including a recommendation to review the call categories outside of 'Red'.

At the Emergency Ambulance Services Committee (EASC) of 28 March 2017, the committee members and Chief Ambulance Services Commissioner (CASC) endorsed the PACEC review and agreed to address the recommendations. A call category review was undertaken by the WAST Clinical Prioritisation Assessment Software Group in 2017/18 and ongoing review processes are in place.

However, it is recognised by the CASC, that the implementation of the clinical model is more nuanced than the allocation of clinical codes to response categories, and that there is significant interest across the political and public spectrum in the quality and safety of the ambulance response, particularly for patients whose clinical condition places them within the Amber category.

The 2018/19 EASC Integrated Medium Term Plan (IMTP) approved by the committee on the 27 March 2018, commits the CASC to undertake an 'Amber review' to consider these wider issues. The CASC has directed the EASC clinical team

to lead a review addressing the information, issues and concerns surrounding the Amber call category that will also consider patient expectation and experience, use of alternative responses and pathways, ambulance handover times and system risk.

### Accountability and governance

The Chief Ambulance Services Commissioner will function as the reviews sponsoring officer. The review will be led by experienced clinicians, Mr Shane Mills, Director of Quality and Patient Experience and Mr Ross Whitehead, Assistant Chief Ambulance Services Commissioner. The review team will:

- Report formally to the Emergency Ambulance Services Committee on a quarterly basis.
- Bring to the Chief Ambulance Services Commissioners attention any significant matters, and seek decisions/guidance where necessary.

### Scope

The review programme covers four general areas in respect of calls within the Amber category: In considering these questions the review team will ensure that the overarching aim of the clinical response model of ensuring that the sickest patients receive the quickest response and that the right response is sent the first time are used as the benchmark for assessing success.

### Context - What is the Amber Catego This question will explore:

- What conditions does it contain?
- How does it compare to similar categori elsewhere such as England, Scotland an internationally?
- How is this category prioritised?
- How is this category responded to?

### Activity – What has been the workloa this Category over the last 2 years? This question will explore:

- What has been the activity in this catego for the last 2 years?
- How does this compare with similar act elsewhere such as England, Scotland an internationally?

Performance/Outcomes - Is there a problem with the Amber Category? This question will explore:

- What performance/outcomes have been achieved over the last 2 years?
- How does this compare to similar catego elsewhere?
- What is the relationship between the ambulance service performance and wid system pressures such as hospital hande delays? (including SAIs, Winter etc)
- How does the achieved performance compare with extant clinical guidelines?

ry?	Improvement – What can be done differently for this category? This question will explore:
ies Id	• Are the right conditions/patients in this category?
	• Can we respond differently to parts or all of this category with existing or new services?
	• Are we commissioning services to respond to this category effectively?
ad in	
	Guiding principles
	In undertaking this review, the review team will
	be guided by the following principles.
ory	It will be guided by the principles of Prudent
	Healthcare and the 'quadruple aim':
ivity	
ıd	• Improve population health and wellbeing.
	• Improve the experience and quality of care of individuals and families.
	• Enrich the wellbeing, capability and
	engagement of the workforce.
	• Increase the value achieved from funding
	through improvement, innovation, use of
1	best practice and eliminating waste.
	• Encourage a whole system approach to
ories	the management of citizens in the Amber
	category, maintaining a focus on people,
	their outcomes and what matters to them.
der	• Ensure the clinical prioritisation of calls to
over	emergency ambulance service is continued.

### **Stakeholders**

The review will ensure wide engagement with relevant stakeholders, including:

- National Assembly Members •
- Welsh Government
- Health Boards Executives and Clinical Leaders
- WAST Executives and Clinical Leaders
- Relevant voluntary agencies/groups (e.g. Stroke Association)
- Professional colleges (College of Paramedics, Royal College of Emergency Medicine, Royal College of General Practitioners)
- Staff representatives
- Clinical Networks

The review team are engaged with the Picker Institute to undertake staff and citizen engagement activities.

### Support and dependencies

The Review team will be working at pace to address the Areas covered in section 3. The review team will in particular require dedicated support from:

- National Collaborative Commissioning Unit (for example Clinical Director of Unscheduled Care, administrative support)
- Subject area experts (for example WAST call takers, WAST clinicians, ED clinicians)
- Data and information specialists (for example NWIS, WAST, HBs)

The review team will be dependent on information providers for timely responses to information requests.

The review team will contact specific agencies outlining the required support week commencing 16 April 2018.

The review team will require access to funding, estimated at £72,000, to support research, engagement and communication activities.

### **Review**

The review team will establish an expert reference group to provide independent peer review and oversight of the programme. A broad membership of experts will be drawn from across NHS Wales, academic and other institutions.

### Appendix II

### Methodology followed by the **Amber Review**

### 1 Methodology

The broad nature of this review required a mixed methods approach. The relevant methodology for each distinct area that the review covered is outlined below.

### 1.1 Context

This was a desk review that traced the history of the implementation of the clinical model in WAST and the background to the commencement of the commissioning of WAST and the establishment of EASC.

**1.2** Comparisons with other countries

A desk review of library searches, public information searches and requested information to compare the model and activity in Wales with that of other countries.

### 1.3 Data sources and analysis

A two year time period for the 31 March 2016 to 1 April 2018 was agreed. The main data source for activity was provided by the Welsh Ambulance Services Informatics team based on the regular information provided to the Clinical Prioritisation Software Assessment Group. Performance information was derived from publicly available information from StatsWales, Ambulance Quality Indicators or Welsh Ambulance board reports. The Review Team also appointed a dedicated and experienced senior data analyst as the Amber Review data lead to ensure robust quantitative analysis.

### 1.3.1 Data Linking

A novel approach to using linked data across a patients unscheduled care journey was developed. The full methodology for the establishment of this data set is provided in Technical Appendix 1. A range of outcome cluster in dictators were developed to explore the impact of waiting on patients.

### 1.4 Management Engagement

Five individual interviews were undertaken by the Picker Institute with senior operational and clinical managers within the Welsh Ambulance Service. A topic guide was developed to frame the interview and a narrative summary of the discussions produced.

### 1.5 Staff engagement

Three focus groups were undertaken by the Picker Institute across Wales with a variety of operational staff. A topic guide was developed from the themes identified by the management interviews and a narrative summary of the discussions produced.

### 1.6 Public Engagement

A survey was developed by the Picker Institute to explore public perceptions and expectation of ambulance services for an urgent clinical condition. The survey was facilitated by YouGov and 1000 responses were received. Analysis of the findings and demographics of the respondents was then produced.

### **Appendix III**

### **Expert Reference Group Invitees**

### **Stephen Clinton**

Assistant Director of Operations (Clinical Contact Centers) Welsh Ambulance Services NHS Trust

### Shane Mills

Director of Quality and Patient Experience National Collaborative Commissioning Unit

**Ross Whitehead** Assistant Chief Ambulance Services Commissioner for The Emergency Ambulance Services Committee

### **Chris White**

Interim Chief Operating Officer ABM UHB

### Jonathan Whelan

Assistant Medical Director Welsh Ambulance Service NHS Trust

### Paresh Wankhade

Professor of Leadership and Management & Director of Research, Edge Hill University Business School

### **Grayham Mclean**

Unscheduled Care Lead, Executive Department, Welsh Ambulance Service NHS Trust

Jan Thomas Assistant Chief Operating Officer Corporate Services, ABM UHB

### Jo Mower

Clinical Director National Programme Unscheduled Care National Collaborative Commissioning Unit

### Andy Swinburn

Assistant Director of Paramedicine Welsh Ambulance Services NHS Trust

# TA Technical Appendix

Supplementary information or supporting detail



# **Technical Appendix: 1**

Methodology for linking Welsh **Ambulance Services Trust data to Emergency Department data** 

AUTHORED BY: Dr Gareth John NHS Wales Information Service

### Data Sharing

A data-sharing agreement was signed by WAST and the NHS Wales Informatics Service (NWIS), allowing NWIS to access the ambulance Computer Aided Dispatch (CAD) and Patient Clinical Record (PCR) data. This agreement applied to data collected during the period 1st April 2016 to 31st March 2018, coinciding with the study period.

### Computer Aided Dispatch (CAD) data

Each ambulance incident can result in a dispatch of any number of vehicles, with associated CAD records being generated for each of these vehicle journeys. These records contain an incident identifier plus information about the nature of the incident and the MPDS dispatch code allocated to that incident (see below for details of MPDS), the type of vehicle dispatched, the location of

the incident, the key date/time points along the ambulance call cycle (e.g. time of call, ti dispatch code established, time at scene, tir scene, time at hospital, time of handover), a the destination hospital.

In terms of person demographics, only the age and gender of the patient are recorded within the CAD record, although only one set of person demographics are provided pe incident, regardless of the number of patier conveyances involved in that incident. Ther within the record, it can appear that a 36 year old male was conveyed to hospital in a parti ambulance, whereas in fact it was a 30 year female who was involved as part of the sam incident, and the 36 year old male may have been separately conveyed to hospital in another vehicle, or may not have been conveyed at all.

5	Any vehicle can be "stood down" at any point in
me	the journey, and these manifest themselves as
ne left	"stop reasons" or "stood down" flags in the CAI
and	dataset. In many cases, the vehicle which arrives
	first at the scene of an incident is not the one that
	subsequently conveys the patient to hospital.
	For example, a Rapid Response Vehicle (RRV)
	will often be the first vehicle on scene, but an
	Emergency Ambulance may subsequently conve
r	the patient to hospital.
nts or	
efore,	For the study period, the CAD data contained
ar	information relating to 798,595 distinct
cular	incidents, 432,589 (54.2%) of which involved th
old	conveyance of at least one patient to one of the
e	major EDs in Wales.

### Patient Clinical Record (PCR)

The vehicle crew can complete any number of PCR forms for patients that they attend to, and these can be linked to the associated CAD records using unique PCR form identifiers. The PCR contains personally identifiable information (PII) such as forename, surname, date of birth, gender and postcode of residence, from which it is possible to derive NHS numbers using the standard NWIS/SAIL matching algorithm, which uses both exact and probabilistic matching. The derived NHS numbers can then be used facilitate the onward linkage of records to other health and mortality data, for both those sets of patients conveyed to hospital and for those treated at the scene or left at home.

The remainder of the PCR record is composed of detailed clinical information, including the six physiological findings and one observation that make up the National Early Warning Score (NEWS), which is used as a proxy measure for the level of acute illness. There are also pain scores and specific sections relating to the particular nature of that incident, e.g. Road Traffic Collisions and Cardiac Arrest. For the study period, PCRs were found for 526,048 incidents (67%), of which 454,258 were able to be traced to an NHS Number (86.3%). For those 432,589 incidents involving a conveyance to one of the major EDs in Wales, PCRs were found for 313,952 incidents (73%), and of these, NHS numbers were able to be traced for 271,976 (86.6%). A visual representation of the above numbers is shown in Figure 35 below.





### Emergency Department (ED) data

The ED dataset contains demographic, administrative and clinical information relating to each attendance at an emergency department in Wales. The demographic fields include PII fields such as NHS number, forename, surname, date of birth, gender and postcode of residence, and the administrative data items include the name/code of the hospital, the patient's mode of arrival, the ambulance incident number, key time points such as the administrative arrival date/time (the ED check-in time) and administrative end date/time, and the outcome of the attendance.

Due to considerations of data quality and availability, the scope of the linkage exercise was restricted to just the 13 major emergency departments in Wales (Minor Injury Units (MIU) excluded), and for the study period, there were 418,420 attendances reported at these EDs, where the reported mode of arrival was either ambulance or helicopter, or where an ambulance incident number was recorded.

### Linkage of conveyance ambulance incidents to **ED records**

The main focus for this work was the follow-up of those patients conveyed by ambulance to an ED, in order to determine a range of outcome information, based on events within the ED and beyond.

As previously mentioned, there were 432,589 distinct ambulance incidents in which at least one patient was conveyed to one of these major EDs, accounting for 450,462 ambulance journeys (and associated CAD records). However, with the ED datasets reporting a lower number of reported ED attendances (418,420), there was an immediate issue in terms of determining the true numbers of ambulance arrivals at the ED. One possible reason given for the higher numbers on the ambulance side was that certain patients might circumvent the ED, and be taken directly to specialist units (e.g. cardiac), although further work is required to fully understand these differences.

Generating pairs of possible matches

The first stage of the matching algorithm was to extract pairs of records from the CAD and ED datasets which might be a possible match. Pairs of records where the hospital name (or code) matched and where the Administrative Arrival Date/Time (ED) was within 1 hour (±) of the Hospital Arrival Date/Time (CAD) were extracted into a table "Possible Matches". This initial restriction placed on the number of pairs of records to consider for matching (known in matching parlance as "blocking rules"), would reduce the subsequent computational effort of the matching process. This first step generated 2,365,407 pairs of possibly matching records, with possible matches found for 449,303 (99.7%) of the CAD records and 416,535 (99.5%) of the ED records.

### Linking CAD to ED records (deterministic matching)

For 276,036 of the incidents where at least one patient was conveyed to a major ED, an NHS number was able to be derived (as previously described under the PCR section), and therefore we defined our exact (deterministic) matches to be those "Possible Matches" pairs where the NHS numbers from the PCR/CAD matched the associated NHS number in the ED dataset, and also where this match was unique. This resulted in 222,677 of pairs of exact match records, which were loaded into the table "Highly Likely", leaving 227,785 CAD and 195,743 ED records as still unmatched and needing to be run through a probabilistic matching algorithm.

### Linking CAD to ED records (probabilistic)

For the remaining unmatched CAD and ED pairs in the "Possible matches" table, probabilistic matching was attempted, with matching scores based on an application of Bayes Theorem, with the prior log odds of a match combined with a set of independent Log Likelihood Ratios (LLRs) to create an overall match score for each possible pair.1a

### POSTERIOR LOG ODDS OF A MATCH = PRIOR LOG ODDS<sub>0</sub> + Σ LLR<sub>1</sub> WHERE I **RELATES TO EACH OF THE INDEPENDENT** ATTRIBUTE COMPARISONS

For the prior log odds of a match in our case, we took into consideration the fact that arrival rates varied by hospital, the time of the day and the day of the week. Based on the previously mentioned blocking rules which were used to generate the "Possible matches" table, we would have expected to generate fewer pairs of "possibly matching" records for those patients arriving at an ED at 1am in a smaller ED, compared to 10am in a larger ED. Therefore, we based our prior log odds on the average number of pairs of records (from our "Possible Match" table) by hospital, the time of day of the arrival (2 hour periods) and the day of the week.\*

Figure 36 shows how the average numbers of ambulance arrivals at ED varies according to by the time of day & day of week (top table), and by individual ED (bottom table). The resulting prior log odds range from -2.28 for arrivals at the University Hospital of Wales between 14:00 and 15:59 on a Monday (the busiest period) to -0.41 for arrivals at Bronglais General Hospital between 06:00 and 07:59 on a Tuesday (the quietest period).\*\*

### \*e.g. if there were on average 20 attendances at Hospital A between 8am and 10am on a Thursday, there would likely to be (on average) 20 possible matching ED records for every CAD arrival (20 "Possible matches" pairs of records) at Hospital A between 8am-10am on a Thursday. However, only one (or possibly none) out of these possible pairs of records will be the correct matching pair and so the prior odds of us selecting the correct matching pair from the table (at random) would be 19:1.

\*\*This means that we would automatically be more confident that a pairs of records in our "possible matches" table would be a true match for the "Bronglais General Hospital between 06:00 and 07:59 on a Tuesday" pairing than the "University Hospital of Wales between 14:00 and 15:59 on a Monday" pairing.

	MON	TUE	WED	THU	FRI	SAT	SUN
00:00 - 01:59	36.1	35.5	35.7	36.4	36.4	38.7	41.6
02:00 - 03:59	34.4	33.1	32.3	33.4	33.2	37.0	40.0
04:00 - 05:59	30.0	29.1	29.2	30.0	29.6	31.7	34.1
06:00 - 07:59	27.4	25.9	26.3	25.8	26.5	27.1	27.9
08:00 - 09:59	38.7	38.2	37.7	36.8	37.8	36.5	36.7
10:00 - 11:59	44.8	43.8	43.5	43.7	44.0	43.3	43.0
12:00 - 13:59	46.1	44.7	44.3	44.9	44.2	43.9	44.8
14:00 - 15:59	49.4	48.2	48.2	48.3	47.8	47.8	48.7
16:00 - 17:59	48.2	47.4	46.9	47.6	47.6	48.0	47.3
18:00 - 19:59	43.0	42.2	40.7	41.8	42.7	42.2	42.1
20:00 - 21:59	44.6	44.2	44.4	44.6	44.6	44.8	44.8
22:00 - 23:59	40.8	41.5	40.9	41.8	42.6	44.2	41.6

### AVERAGE AMBULANCE ARRIVALS PER ED PER WEEK

Bronglais General Hospital Glangwili General Hospital Morriston Hospital Nevill Hall Hospital Prince Charles Hospital Princess of Wales Hospital Royal Gwent Hospital The Royal Glamorgan Hospital University Hospital of Wales Withybush General Hospital Wrexham Maelor Hospital Ysbyty Glan Clwyd Ysbyty Gwynedd

### • FIGURE 36: AVERAGE AMBULANCE ARRIVALS PER HOUR AT EDS IN WALES

1	58.1
2	235.1
3	541.1
2	218.1
2	257.3
2	214.6
3	09.0
2	244.0
3	67.5
1	88.9
2	.67.5
3	502.5
2	253.4

TECHNICAL APPENDIX: 1

In order to calculate the LLRs, comparisons were made between the CAD and ED records, with focus on those attributes that were either common to both records, or where attributes were in some way associated. The attributes compared were:

- Age of the patient (CAD vs ED)
- Gender of the patient (CAD vs ED)
- Incident location (CAD) vs patient's place of residence (ED)
- Ambulance arrival time at the hospital (CAD) vs the administrative arrival time (or checkin time) at ED
- Ambulance incident number (CAD vs ED)

Labels were assigned to describe the comparison of each of the CAD/ED attribute pairings compared, as shown below.

### a. Age of patient

Although age is a very obvious attribute to compare, as previously mentioned, only one set of demographics are assigned to an incident, regardless of the number of patients conveyed to hospital. This might be an issue in the case of a road traffic collision involving multiple casualties, but should be less of an issue in the case of medical emergencies. The labels use for age comparison are as follows:

- i. Same age
- ii. 1-year difference in age
- iii. 2-year difference in age
- iv. 3 or more year difference in age

### b. Gender of patient

Gender is another obvious and direct comparison, although note that the same issues covered above for the age of patient, also apply to gender. The labels used are as follows:

- i. Same Gender
- ii. Different gender

# c. Proximity of incident location to patient's place of residence

A large proportion of ambulance incidents take place at or near a patient's place of residence, and so for the matching process, different measures of proximity were defined. The first set were based on geographic area codes (e.g. postcodes, and census geographies), and the second set used the crow-fly distance between the two locations, which mitigated against some of the issues associated with geography-based measures, e.g. where the distance between two locations is less than 1km, but those two locations are on either side of a geographic border. The labels used are as follows:

- Geographic location of incident (CAD) compared to geographic area of residence of patient (ED)
- i. Postcode match
- ii. Census output area match
- iii. Lower super output area match
- iv. No match on geographic area

- Crow-fly difference between location of incident (CAD) and place of residence of patient (ED)
- i. Within 1km
- ii. 1 to 4km
- iii. 4 to 9km
- iv. 9 to 16km
- v. Over 16km

### d. Time difference between the ambulance arrival at the hospital and the ED check-in

The comparison between the time of arrival of the ambulance at the hospital (CAD) and the administrative arrival time or check-in time (ED) is already part of the blocking rule used to generate the list of possible matches, and as a result, the time of arrival contributes to the prior log odds of a match. However, this comparison is based on smaller time difference bands.

Note that although patients can wait in the back of an ambulance, this should not delay the time of check-in.

The labels used relate to the following time differences:

- Administrative arrival time (ED) between 1 and 4 minutes before Vehicle at Hospital time (CAD)
- Administrative arrival time (ED) = Vehicle at Hospital time (CAD)

**TECHNICAL APPENDIX: 1** 

- Administrative arrival time (ED) between 1 and 4 minutes after Vehicle at Hospital time (CAD)
- Administrative arrival time (ED) between 4 and 9 minutes after Vehicle at Hospital time (CAD)
- Administrative arrival time (ED) between
  9 and 16 minutes after Vehicle at Hospital time (CAD)
- Administrative arrival time (ED) between 16 and 25 minutes after Vehicle at Hospital time (CAD)
- Administrative arrival time (ED) between
  25 and 36 minutes after Vehicle at Hospital
  time (CAD)
- Administrative arrival time (ED) more than 4 minutes before or more than 36 minutes after Vehicle at Hospital time (CAD)

### e. Ambulance Incident Number

Ambulance incident numbers are recorded in both the CAD and ED data sets, and for most of the study period, they comprised of a one letter prefix (C, N or P), followed by 7 digits. Subsequent changes to ambulance dispatching system removed the need for these prefixes, at least from the point of view of creating unique incident numbers, although this was not obviously reflected in either the ambulance or ED datasets provided. In general, the ambulance data received was consistent, in that it retained the original one letter prefix and 7-digit format throughout, but there was huge variation in the formatting and completeness of the ambulance incident number in the ED dataset of the study period. Some of these formatting issues were easier to deal with than others, and these are reflected in the labels below, but there were other problems which were more difficult to overcome, for example where hospital systems started to truncate the rightmost 1 or 2 characters of the incident number.

The labelling of the different possible scenarios was as follows:

### i. Label A

Submitted Ambulance Incident Number (ED) formatted as Annnnnn AND Incident ID (CAD) = Ambulance Incident Number (ED)

### ii. Label B

Submitted Ambulance Incident Number (ED) formatted as nnnnnnn AND Incident ID (CAD) with prefix removed = Ambulance Incident Number (ED)

### iii. Label C

Submitted Ambulance Incident Number (ED) formatted as 00nnnnnn AND Rightmost 6 characters of Incident ID (CAD) = Rightmost 6 characters of Ambulance Incident Number (ED)

### iv. Label D

Submitted Ambulance Incident Number (ED) formatted as nnnnnnn

AND

Rightmost 7 characters of Incident ID (CAD) = Rightmost 7 characters of Ambulance Incident Number (ED)

### v. Label E

Submitted Ambulance Incident Number (ED) formatted as Annnnnn AND Rightmost 7 characters of Incident ID (CAD) = Rightmost 7 characters of Ambulance Incident Number (ED)

### vi. Label F

Submitted Ambulance Incident Number (ED) formatted as Annnnnn OR nnnnnn OR nnnnnnn AND None of the above matching combinations are satisfied

Having assigned labels to each of these attribute comparisons, the next task is to assign associated log likelihood ratios (LLRs) to these labels. The formula for the LLR is as follows:

### LOG LIKELIHOOD RATIO = LOG

### PROB (LABEL | RECORDS ARE A TRUE MATCH)

PROB (LABEL | RECORDS ARE NOT A TRUE MATCH)

In plain English, the numerator here repre the probability of a particular label, given the pair of records were a true match. Usin age of patient as an example, this could be probability of the label "same age", given the pair of records were a true match. We expect this probability to be very high (clo 1), but data is not always perfect, and so it be that in the high pressure and often cha environment within which ambulance cre operate, they occasionally get the age wro by one or two years (label = "1-year differ in age" or "2-year difference in age"). Th to probabilistic matching is that it does not necessarily rule out pairs of records with differences. Instead, it tries to quantify th relative likelihood of these labels existing true matches compared to non-matches. denominator represents the distribution in pairs of records deemed to be non-mat

We can elicit the numerator probabilities analysing pairs of records that we know to represent correct matches (from our "Hig Likely" table). We can also generate a tab containing non-matching pairs of records taking those pairs of records from the "po matches" table, which we subsequently k could not have been true matches because true matching pair was one of our "highly matches. We then elicited the denominate probabilities by analysing these pairs of re

Figures 37 to 41 shows the distribution of for "highly likely" pairs of matches compared to

esents	non-matching pairs, for age, gender, geography/
that	crow-fly distance, and the time from ambulance
ng	arrival to ED check-in.
e the	
n that	Due to the aforementioned complexities
would	associated with the comparison of ambulance
ose to	incident numbers, Figure 42 shows the
t could	distributions of labels split by each of the 6
otic	Health Boards (HBs) that have a major ED.
ews	These are Aneurin Bevan (AB), Abertawe Bro
ong	Morgannwg University (ABMU), Betsi Cadwaladr
rence	University (BCU), Cardiff & Vale (C&V), Cwm Taf
ie key	(CT) and Hywel Dda (HD).
ot	
these	All the associated LLRs across each attribute and
ie	label are shown in Figures 43 and 44, with the
; in	latter showing the ambulance incident number
The	labels by health board and hospital.
of labels	
ches.	For the comparison of patient age, Figure 37
	shows that the label "same age" is much more
by	prevalent in the "highly likely" pairs than the
0	non-matching pairs (74.8% v 1.3%) which is
ghly	reflected in a likelihood ratio of 55.4 and an
le	associated log likelihood ratio (LLR) of 4.0, as
s, by	shown in Figure 43. The "1-year age difference"
ossible	label also scores positively (LLRs = 1.7) and
now	even though the "2-year age difference" has a
e the	negative score (LLR = $-0.4$ ), the penalty is not as
y likely"	high as for the "3+ years age difference"
or	label (LLR = -2.8).
ecords.	
	In all cases, a positively-valued LLR increases
labels	our confidence in a match but a negatively-

valued LLR decreases our confidence in a match.

Figures 38 and 43 show distributions and associated LLRs for patient gender with and LLR of 2.0 for "same gender" and ~ 0.0 for "different gender", which is almost exactly as would be expected, given that we would only expect a very number of our "highly likely" matches to have a mismatch on gender, and we would expect our non-matches to be evenly split between males and females.

The distributions and associated LLRs for the comparison of the geographic areas are shown in Figures 39 and 43 respectively, with "same postcode" receiving an LLR of 6.6, and "census output area match" and "lower super output area match" also receiving high LLR scores of 4.3 and 2.8 respectively. Lower down the table, it can be seen that the label "no match on geographic area" earns a LLR of -1.35.

Figures 40 and 43 shows the information for crow-fly distances, and living within 1km of the incident location gains a LLR score of 3.5. However, all distances greater than 1km (including the 1-4km band) are more prevalent in the non-matches, which on first reading is surprising, but it should remembered that our earlier blocking rule stipulated that all possible pairs of CAD/ED matches had to have a match on the hospital, and therefore, it is more likely that the incident locations and places of resident are both relatively close to that hospital, thus reducing the expected range of our crow-fly distances.

Note that only one LLR should be used to cover both the proximity between the location of incident and the patient's place of residence (due to the previously mentioned constraint of having independent LLRs, where possible), and so we simply choose the highest LLR from the geographic area and crow-fly distances.

Figures 41 and 43 show that the time from ambulance arrival to ED check-in was most likely to be between 4 and 9 minutes for the "highly likely" matches (LLR = 2.4), with the time bands either side also scoring highly (LLR for 1-4 minutes = 2.1, LLR for 9-16 minutes = 1.5).

Finally, based on the information in Figures 42 and **44**, it is clear that different hospitals "favour" different formats of ambulance incident number, and LLRs vary significantly between labels and hospitals. Label A scores highly across the board, which we would expect, given that it is the only label which indicates a match on a pair of correctly formatted ambulance incident numbers. Label B (same as label A but with the character prefix missing from the ED ambulance incident number) also scores highly for most hospitals. It is also noticeable how the level of confidence in match varies by hospital, even for the same label. For example, label D in Royal Gwent Hospital has a LLR of 5.9, compared with 2.5 for Withybush General Hospital. In fact, the LLRs for hospitals in the Hywel Dda health board (HD HB) are generally lower than for other health boards, with the right hand truncation of the ambulance incident numbers in the ED systems being a particular problem.

MATCHES VERSUS NON-MATCHES



Sa gend



### 1 year age Unknown 3+ years age 2 year age difference difference difference age 33.557 4,117 11.817 6.682 24,804 24,619 846,318 31,051 90.1% Highly Likely Matches Non-matches 5.3% 3.0% 3.3% 1.8% 2.6% 2.6%

### FIGURE 37: DISTRIBUTION OF AGE OF PATIENT LABELS FOR "HIGHLY LIKELY"

### • FIGURE 38: DISTRIBUTION OF GENDER LABELS FOR "HIGHLY LIKELY" MATCHES VERSUS NON-MATCHES

ne ler		Different gender		Unknown gender
48 70		986 456,990		5,043 23,473
Hi	ighly Likely Matc	hes		
N	on-matches			
		48.6%		
	0.4%		2.3%	2.5%

### • FIGURE 39: DISTRIBUTION OF GEOGRAPHIC LABELS FOR "HIGHLY LIKELY" MATCHES VERSUS NON-MATCHES



### • FIGURE 41: DISTRIBUTION OF AMBULANCE ARRIVAL TO ED CHECK-IN TIME LABELS FOR "HIGHLY LIKELY" MATCHES VERSUS NON-MATCHES



### • FIGURE 40: DISTRIBUTION OF CROW-FLY DISTANCE LABELS FOR "HIGHLY LIKELY" MATCHES VERSUS NON-MATCHES



mins after	4-9	mins after	9-16	mins after	16-25	mins after	25-36	i mins after	Othe of a	r time arrival
,130 ,394	99 31	9,979 7,15,4	5 54	5,110 4,045	1 70	3,701 0,593	86	2,914 5,240	2 63	2,456 7,810
ely Ma hes	tches									%
	44.9%									67.9
%		2%	24.7%	8%	.2%	.5%	~	9.2%		
2.4		4.(		5.	9	7	1.3%		1.1%	

_	011	ININ		n	L .

C&V HB 9.3%

HD HB 26.4%

CT HB

72.9%

0.2%

0.0%

FIGURE 42: DISTRIBUTION OF AMBULANCE INCIDENT NUMBER LABELS FOR "HIGHLY LIKE	LY
MATCHES VERSUS NON-MATCHES (BY HEALTH BOARD OF MAJOR ED)	

			A	В	C	D	E	F	Number
	AB HB	Highly Likely Non-matches	23,110 349		254 29	15,081 186	103	2,441 171,527	53 350
A	BMU HB	Highly Likely Non-matches	16,314 252	7,096 76	2,264 328	35	65 1	2,224 134,860	1,924 14,546
1	вси нв	Highly Likely Non-matches	34,814 502	1,595 24	3,605 490	94	568 6	4,924 183,810	2,019 11,735
(	С&V НВ	Highly Likely Non-matches	2,609 27	19,941 231	1,823 329	226	20	1,486 159,605	2,089 22,436
	СТ НВ	Highly Likely Non-matches	29,704 505	1,237 35	6,643 908	105 3	132 4	2,062 143,332	887 4,486
	HD HB	Highly Likely Non-matches	9,262 201	3,314 66	4,471 411	52 4	357 3	12,141 75,561	5,533 12,215
tches			А	В	С	D	Е	F	Unknown Incident Number
y Matches	es	AB HB	A	В	С	D	E	F 99.5%	Unknown Incident Number
Likely Matches	atches	AB HB	A 56.3% 0.2%	B	C 0.6% 0.0%	D 36.7% 0.1%	E 0.3%	F 99.5% 5.9%	Unknown Incident Number 0.1% 0.2%
ghly Likely Matches	on-matches	AB HB ABMU HB	A 56.3% 0.2% 54.5%	B 23.7%	C 0.6% 0.0% 7.6%	D 36.7% 0.1%	E 0.3%	F 99.5% 5.9% 89.9% 7.4%	Unknown Incident Number 0.1% 0.2%
Highly Likely Matches	Non-matches	AB HB ABMU HB	A 56.3% 0.2% 54.5%	B 23.7% 0.1%	C 0.6% 0.0% 7.6% 0.2%	D 36.7% 0.1%	E 0.3% 0.2% 0.0%	F 5.9% 5.9% 7.4%	Unknown Incident Number 0.1% 0.2% 6.4% 9.7%
Highly Likely Matches	Non-matches	AB HB ABMU HB	A 56.3% 0.2% 54.5% 54.5% 73.1%	B 23.7% 0.1%	C 0.6% 0.0% 7.6% 0.2%	D 36.7% 0.1%	E 0.3% 0.2% 0.0%	F 99.5% 5.9% 89.9% 7.4% 93.5%	Unknown Incident Number 0.1% 0.2% 6.4% 9.7%
Highly Likely Matches	Non-matches	AB HB ABMU HB BCU HB	A 56.3% 0.2% 54.5% 73.1%	B 23.7% 0.1% 3.3%	C 0.6% 0.0% 7.6% 0.2%	D 36.7% 0.1%	E 0.3% 0.2% 0.0% 1.2%	F 99.5% 5.9% 89.9% 7.4% 93.5% 10.3%	Unknown Incident Number 0.1% 0.2% 6.4% 9.7% 4.2% 6.0%
Highly Likely Matches	Non-matches	AB HB ABMU HB BCU HB	A 56.3% 0.2% 54.5% 54.5% 73.1% 0.3%	B 23.7% 0.1% 3.3% 0.0%	C 0.6% 0.0% 7.6% 0.2% 7.6% 0.2%	D 36.7% 0.1% 0.1%	E 0.3% 0.2% 0.0% 1.2% 0.0%	F 99.5% 5.9% 89.9% 7.4% 93.5% 10.3%	Unknown Incident Number 0.1% 0.2% 6.4% 9.7% 4.2% 6.0%

6.5%

16.3%

12.7%

0.1%

0.1%

9.4%

0.2% 0.8%

0.3% 3.0% 0.0% 0.6% 0.3% 0.0% 0.3% 0.0%

CROW-FLY DISTANCE, AGE, GENDER AND ARRIVAL TO CHECK-IN TIME LABELS

ATTRIBUTE	LABEL NAME	LR	LLR
Age	Same age	55.4	4.0
	1 year age difference	5.7	1.7
	2 year age difference	0.7	-0.4
	3+ years age difference	0.1	-2.8
Gender	Different gender	0.0	-4.7
	Same gender	2.0	0.7
Geography	Postcode match	701.7	6.6
	Census output area match	73.6	4.3
	Lower super output area match	16.9	2.8
	No match on geographic area	0.3	-1.4
Distance	Within 1km	33.8	3.5
	1-4km	0.7	-0.3
	4-9km	0.2	-1.6
	9-16km	0.1	-2.2
	Over 16km	0.1	-2.1
Arrival time	1-4 mins before	0.2	-1.8
	Same time	1.3	0.3
	1-4 mins after	8.5	2.1
	4-9 mins after	11.4	2.4
	9-16 mins after	4.3	1.5
	16-25 mins after	0.8	-0.2
	25-36 mins after	0.1	-1.9
	Other arrival time	0.0	-4.1

5.3%

5.1%

96.0%

85.4%

34.6% 15.8% 13.8%

0.1%

0.5% 0.1% 0.0% 1.0% 0.0%

7.4% 12.3%

2.2% 3.0%

# • FIGURE 43: LIKELIHOOD RATIOS (LR) AND LOG LIKELIHOOD RATIOS (LLR) FOR GEOGRAPHY,

### • FIGURE 45: CALCULATION OF MATCH SCORE FOR PAIR 1

### • FIGURE 44: LIKELIHOOD RATIOS (LR) AND LOG LIKELIHOOD RATIOS (LLR) FOR AMBULANCE INCIDENT NUMBER LABELS, BY HOSPITAL

		1	4	E	3	(	2		2	E	Ξ	l l	F
HEALTH BOARD	HOSPITAL NAME	LR	LLR	LR	LLR	LR	LLR	LR	LLR	LR	LLR	LR	LLR
АВ НВ	Nevill Hall Hospital	217.7	5.4			26.6	3.3	307.4	5.7			0.1	-2.0
	Royal Gwent Hospital	293.2	5.7			42.4	3.7	374.8	5.9			0.1	-2.0
ABMU HB	Morriston Hospital	351.3	5.9	541.5	6.3	33.5	3.5			329.8	5.8	0.1	-2.0
	Prince of Wales Hospital	363.2	5.9	248.1	5.5	34.3	3.5					0.1	-2.0
BCU HB	Wrexham Maelor Hospital	209.4	5.3	229.4	5.4	28.4	3.3			267.7	5.6	0.1	-2.0
	Ysbyty Glan Clwyd	429.5	6.1	390.9	6.0	31.6	3.5					0.1	-2.0
	Ysbyty Gwynedd	260.3	5.6	230.5	5.4	31.6	3.5			164.4	5.1	0.1	-2.0
С&V НВ	University Hospital of Wales	593.0	6.4	529.7	6.3	34.0	3.5					0.1	-2.0
СТ НВ	Prince Charles Hospital	192.3	5.3	193.1	5.3	26.2	3.3			111.7	4.7	0.1	-2.0
	The Royal Glamorgan Hospital	238.3	5.5	81.4	4.4	26.8	3.3	56.7	4.0			0.1	-2.0
HD HB	Bronglais General Hospital	112.1	4.7			36.1	3.6					0.4	-1.0
	Glangwili General Hospital	122.7	4.8	123.1	4.8	28.2	3.3	91.1	4.5			0.5	-0.7
	Withybush General Hospital	106.8	4.7	130.1	4.9	18.8	2.9	12.3	2.5	239.6	5.5	0.3	-1.1

CALCULATING THE OVERALL MATCH SCORE (POSTERIOR LOG ODDS SCORE)

Shown in **Figures 45** and **46** are two worked examples of how match scores (or the posterior log odds) are calculated. Note how only one out of the geographic area comparison and distance scores (the highest) contributes to the overall score, with

the five independent LLRs added to the prior odds to arrive at the posterior log odds. In Figure 46, also note that where any of the information is unknown or missing (e.g. the ambulance incident number in the ED record), a LLR score of 0 is awarded.

ATTRIBUTE COMPARISON	AMBULANCE	ED	LABEL	LLR	LLR TO USE
Age comparison	73	73	Same age	4.0	4.0
Gender comparison	F	F	Same gender	0.7	0.7
Incident Location v Place of Residence					
Geographic area comparison					
Postcode	SA6 6NL	SA6 6RU			
Census Output Area	W00010084	W00004356		-1.4	
Lower Super Output Area	W01000816	W01000806			-0.3
Distance	1.3	km	1-4km	-0.3	
Time from ambulance arrival to ED check in	03	:57	1-4 minutes	2.1	2.1
Ambulance Incident Number	C1979447	1979447	Label B	6.3	6.3
<b>Prior Odds</b> for Arrivals at University Hospital of Wales at 02:24 on a Wednesday					-1.8
Match score (Posterior log odds)					11.0

### • FIGURE 46 CALCULATION OF MATCH SCORE FOR PAIR 2

ATTRIBUTE COMPARISON	AMBULANCE	ED	LABEL	LLR	LLR TO USE
Age comparison	51	52	1 year age difference	1.7	1.7
Gender comparison	F	F	Same gender	0.7	0.7
Incident Location v Place of Residence					
Geographic area comparison					
Postcode	NP14 3QA	NP14 3QA			
Census Output Area	W00010012	W00010012	Postcode match	6.6	
Lower Super Output Area	W01000900	W01000900			6.6
Distance	0.0	km	Within 1km	3.5	
Time from ambulance arrival to ED check in	05:12		4-9 minutes	2.1	2.4
Ambulance Incident Number	C1739173	Unknown	Unknown		0.0
<b>Prior Odds</b> for Arrivals at Royal Gwent Hospital at 16:30 on a Sunday					-2.1
Match score (Posterior log odds)					9.3
EXTRACTING THE "BEST" MATCHES					

From the "possible matches" table, we removed those pairs of records already deemed to be an exact match, plus all associated pairs known to be non-matches, and calculated match scores for all remaining pairs of records.

In order to reduce the chance of false matches, we only considered those pairs of matches where the log odds score was the highest for that CAD record and also the highest for that ED record. We labelled these pairs of records as "best matches".

### What constitutes a good posterior log odds score?

In order to quantify how good a posterior log odds score is, there is a need to need to convert these scores to match probabilities. In order to do this, we carried out an independent probabilistic matching exercise for all those CAD records which already had a known "highly likely" ED match, verified previously using the NHS number, and then independently extracted "best matches" for these. We then calculated the proportion of times that the "best match" agreed with the "highly likely" match, for different ranges of posterior log odds scores.

Figure 47 shows how the % sensitivity (or % of records accepted as a match) decrease as our posterior log odds threshold values increase.

However, as the posterior log odds increases, our % confidence that those are true matches also increases. In this case, a posterior log odds of 0 equates to a match probability of around 91.4%, and using this value as the minimum threshold for the acceptance of a match, we result in a match rate (% sensitivity) of 98.8%. Indeed, for this threshold value of 0, the overall true match rate would be 98.3% (% specificity), as most of the posterior log odds are actually well in excess of 0.

It should be noted that the sample of records used for this probability modelling are, by definition, a cleaner set than we would typically expect to deal with when carrying out probabilistic matching in practice; the fact that NHS numbers were able to be derived for these records would suggest that they were above average in terms of the completeness and accuracy of the fields contained within those records. In addition, the "highly likely" cohort deliberately excluded incidents where there were multiple patients conveyed, or where there were more than one ED attendances for the same patient in quick succession (possible duplicates). Therefore, when running the probabilistic matching in practice on less sanitised data, we would have expected to see significantly lower rates of sensitivity.

### 4 Match results for the study

Of the 432,589 ambulance incidents where there was at least one conveyance to a major ED, matches to associated ED records were found for 392,181 (a match rate of 90.7%). However, taken as a percentage of the slightly smaller number of ED records put forward for matching (418,420), a healthier match rate of 93.7% was achieved.



In terms of levels of confidence in the matches, 58.9% of the 392,181 were exact matches, 28.7% were probabilistic matches with match probabilities greater than 99%, 11.8% had match probabilities between 95% and 99% and 0.6% had match probabilities between 90% and 95%.

## **Technical Appendix: 2**

COMMISSIONING OF AMBULANCE SERVICES

### **Emergency Ambulance Services Commissioning**

The publication of the McClelland<sup>2a</sup> review of the Welsh Ambulance Service in April 2013, can be considered as a seminal point in the development of emergency ambulance services commissioning in Wales. Numerous<sup>3a</sup> other reviews had been conducted into the performance and quality of the ambulance service in Wales, in the six years prior to the publication of the review, however despite this level of scrutiny, ambulance response time performance was consistently the poorest in the UK.

The McClelland review made a series of recommendations on the future delivery of ambulance services in Wales, this included establishing the Emergency ambulance Services Committee (EASC) as a statutory body of health boards responsible for jointly planning and securing emergency ambulance services. Within the first year of being established EASC delivered a number of significant milestones, including the provision of additional £7.5m funding for 119 members of staff, a further recurrent £8m<sup>4a</sup>, and a commissioning quality and delivery framework that clearly set out the arrangements and expectations for the emergency ambulance service.

This progress acted as the catalyst to enable the delivery of the McClelland recommendation around the need to review ambulance service response targets and support the ambulance service to become a clinical service fully embedded in the wider unscheduled care system.

### Collaborative **Commissioning Quality** and Delivery Framework

Prior to the formation of EASC there were inadequate arrangements in place for the commissioning of emergency ambulance services between Health Boards and the Welsh Ambulance Services NHS Trust (WAST).

The EASC at its inaugural meeting in April 2014 sponsored the use of CAREMORE® for the creation of a Commissioning, Quality & Delivery Framework Agreement ('Framework Agreement') for Emergency Ambulance Services.

A Collaborative Commissioning Project Group was established to lead the production of the Framework Agreement, which consisted of representation, at executive director level, from all Health Boards and WAST, together with Welsh Government and Public Health Wales.

Collaborative Commissioning was the favoured methodology as it endorses the national 'once for Wales' approach to share and develop ideas in a non-competitive environment. This is the situation in which CAREMORE<sup>®</sup> has been successfully applied to develop the 'Framework Agreement'.

CAREMORE<sup>®</sup> is a commissioning method, focusing on Care standards, Activity, Resources Envelope, Model of care, Operational arrangements, Review of performance and Evaluation. It is a registered trademark belonging to Cwm Taf University Health Board UK2630477.

The Framework Agreement covers WAST's provision of emergency ambulance services, which includes:

- Responses to emergencies following '999' telephone calls;
- Urgent hospital admission requests from General Practitioners (and other Health Care Professionals);
- High dependency and inter-hospital transfers;
- Patient triage by telephone;
- NHS Direct Wales Services; and
- Major incident responses.

### FIGURE 48



The Ambulance Care Pathway is designed to ensure that ambulances are dispatched to calls where there is an immediate need to save life or provide treatment which requires an ambulance. For other less serious cases, alternative

In addition, an innovative citizen centred perspective has been adopted in the creation of the Framework Agreement which is called the Ambulance Patient Care Pathway. This pathway describes a 5-step process for the supporting the delivery of emergency ambulance services within NHS Wales. The 5-steps are:

treatments such as referrals to other parts of the NHS or telephone advice will be provided. The pathway is intended to ensure the ambulance service is providing the right response for a patient dependent on their clinical need.

# **Technical Appendix: 3**

### **Call Categories**

Call categories provide the ambulance service with a means to cohort the large number of MPDS codes into a manageable number of categories that require a similar response. Within Wales and indeed across the UK there have been a number of iterations of call categories since the establishment of NHS ambulance services. The tables below provide an over view of the development of call categories in Wales over recent years.

### FIGURE 49 PRE-2011

CATEGORY	DESCRIPTION	TARGET / MEASURE
Category A	Immediately life-threatening condition/injury	65% of all Category A incidents across Wales must be responded to by a suitable responder within eight minutes of the chief complaint being verified by the call taker and a minimum level of 60% must be achieved in every LHB area
		95% of all Category A incidents must also be attended by a fully equipped emergency ambulance within a specified time of the start of the incident which is set at 14 minutes in Cardiff, 21 minutes in Powys, Ceredigion, Gwynedd and Anglesey and 18 minutes elsewhere in Wales
Category B	Serious but not life threatening condition/injury	95% of all Category B incidents must be attended by a fully equipped emergency ambulance within the 14/18/21 minute time period from the start of the incident
Urgent Journey	Neither life threatening or serious condition/injury	95% of all Urgent calls must be in hospital within 15 minutes of the time when the doctor specified that the patient should arrive

In December 2011, a number of changes took place to ambulance response time standards, from that point only the most serious calls,<sup>5a</sup> Category A (immediately life-threatening), were guaranteed an emergency blue light response. All other calls would receive an appropriate response, either face-to-face or telephone assessment, based on clinical need.

### FIGURE 50: 2011 – OCTOBER 2015

CATEGORY	DESCRIPTION	TARGET / MEASURE
Category A	Immediately life-threatening	A monthly all-Wales average performance of 65% of first responses to Category A calls arriving within 8 minutes
		A monthly minimum performance of 60% of first responses to Category A calls arriving within 8 minutes in each Unitary Authority area
Category C	Urgent and Planned	Planned face-to-face assessment - a monthly all-Wales average of 95% of first responses within 30 minutes
		Planned clinical telephone assessment - a monthly all-Wales average of 95% of calls receiving call back for clinical triage within 10 minutes

Category B was removed as a call category and the codes within there either upgraded to Category A (the codes considered most serious) or for the majority of Category B calls, included in a revised Category C. For the first time, Health Care professional Calls would be prioritised and classified as Category A or C in the same way as emergency 999 calls.

For operational purposes the ambulance service split Category A into Red 1 and Red 2. Red 1 calls are the most time critical and cover patients who have suffered a cardiac arrest or have stopped breathing; Red 2 calls are serious but less immediately time critical and cover all other potentially life-threatening conditions. A number of these Red 2 calls turn out after assessment or initial treatment to be suitable for referral to another agency such as primary care. From February 2015 information for RED 1 and RED 2 calls was published by Stats Wales.<sup>6a</sup>

### **Clinical Response Model**

In early 2015, the increasing confidence in the commissioning arrangements for ambulance services, provided the Welsh Government with sufficient confidence to launch a clinical review of

ambulance targets in Wales, led by the ambulance services medical director, Dr Brendan Lloyd. The review found that the 8-minute response time target was introduced 41 years ago and was based on evidence which suggests it only improves outcomes for people who have suffered an outof-hospital cardiac arrest.

The clinical review demonstrated that there was little evidence that an 8-minute response will make a difference to the vast majority of people's outcomes following treatment about 95% of people who access the Welsh Ambulance Service.<sup>7a</sup>

As such a radical pilot for ambulance response time targets in Wales was proposed that segregated patients into 3 categories:

### FIGURE 51: POST OCTOBER 2015

CATEGORY	DESCRIPTION	TARGET / MEASURE
Red	Immediately life-threatening	65% of emergency responses to arrive within 8 minutes
Amber	Serious but not immediately life threatening	No set targets / A range of measures contained within the Ambulance Quality Indicators
Green	Neither serious or life threatening	No set targets / A range of measures contained within the Ambulance Quality Indicators

Under the model, only the most serious calls, categorised as Red, are subject to a time-based target (65% of these calls to have a response time within 8 minutes).

### FIGURE 52

CATEGORY	SUB-DIVISION	TYPES OF CONDITIONS
Red	N/A	Cardiac arrest/major haemorrhage
Amber	Amber 1	Stroke within 4 hours/chest pain
	Amber 2	Stroke outside 4 hours/ resolved fits
Green	Green 2	Expected deaths/not imminent labour
	Green 3	Sick person vomiting/eye injuries

The responsibility for the allocation of individ MPDS codes to each category rest with the Clinical Prioritisation Assessment Software (CPAS) Group within the Welsh Ambulance Service. This group is chaired by the Assistant Medical Director and senior representatives from across the operational, medical and qua directorate of the ambulance service.

All other calls receive a response, either face-to-face or by telephone, based on an assessment of clinical need. For operational purposes the Welsh Ambulance Service sub-divides the categories to allow control room staff to prioritise the next response.

dual	During the establishment of the pilot model,
	the group established that the majority of Red 1
	calls, would form the new Red Category (a small
	number of codes were re-categorised to Amber)
t	whilst the majority of Red 2 calls would form the
	new Amber Category (a small number were re-
lity	categorised to Red). <sup>8a</sup>

# **Technical Appendix: 4**

Independent **Evaluation – Public and Corporate Economic Consultants (PACEC)** 

A 12 month pilot was enacted on 1st of October 2015, as part of the pilot an independent evaluation of the model was commissioned by EASC. Following a competitive tender process the Public and Corporate Economic Consultants in partnership with the Medical Care Research Unit at the University of Sheffield were appointed to undertake this evaluation.

In September 2016 the pilot was extended for a further 6 months to allow the independent evaluation to complete.

The final evaluation report was provided to EASC and published in January 2017.9ª The evaluation found there to be a clear and universal acknowledgement, both from WAST and external stakeholders, that moving to the new clinical model was appropriate and beneficial and did not find evidence for reverting to the old model.

The report made a number of recommendations for improvement, which are outlined below:

- A need to review the call categories outside Red, in particular the Amber category. There is concern that the latter is too large and not sufficiently discriminatory in terms of prioritising patients with high acuity illness, and that for some calls this is resulting in unacceptably long waits.
- Investment in information systems which will provide opportunities to both enhance and make more seamless the call management and dispatch process and provide more robust information to support further development both internally and externally. The approved and planned replacement of the CAD system will be a key factor in supporting further development and improvement of the clinical model.

Providing alternative response options a multifactorial problem. Some factors l within the emergency ambulance servic requiring identification of calls which m best be served by these options but also having the infrastructure, workforce proand training to provide them at necessa scale. Others are outside the ambulance service and are concerned with the wide system provision of suitable alternative services, at the time they are needed and with clear agreed access and referral pathways that will allow ambulance service clinicians to safely transfer care.

•

There is variation between health boards, ٠ indicating that wider system processes for managing calls that do not need transporting to an acute hospital are better in some areas than others. There is scope to increase hear and treat and see and treat if the right

is	pathways are in place that allow and support
lie	confident and safe clinical decision making
ce,	by clinicians in the clinical hub or at scene
night	with a patient.
ofile	The committee welcomed the report and
ry	accepted all of the recommendations. In February
!	2017, the Cabinet Secretary announced that
er	on the basis of the report and the plan from
!	EASC to deliver the recommendations that
d	the clinical model would be implemented on a
	permanent basis. <sup>10a</sup>
vice	

# **Technical Appendix: 5**

### Welsh Ambulance **Service Functions**

### Call Cycle Process

When you call 999 a telephone operator will ask you which emergency service you need. In a medical emergency you will be connected with the Ambulance Service.

Welsh Ambulance Service operate a virtual call handling environment to ensure that all 999 calls are answered as quickly as possible. This means that whenever possible calls will be routed to the local clinical contact centre however if all call handlers are already dealing with 999 calls you will be routed to any available 999 call handler in Wales.

Once connected callers are asked about the consciousness and breathing status of the patient to ensure that immediately life-threatening emergencies are identified as soon as possible. Once this information is obtained the caller will be asked to describe what has happened.

This information is entered into our Computer Aided Dispatcher (CAD) system which integrates with an electronic version of the Medical Priority Dispatch System (MPDS). The EMD will then ask some additional questions including:

- the patient's age, sex and medical history
- whether the patient is breathing, conscious, bleeding seriously or has had persistent chest pain
- the type of injury and how it happened

Asking these questions enables the EMD to offer advice and ensure the most appropriate assistance is provided. The answers to the questions provide a prioritisation code which informs the type of assistance provided.

### Computer Aided Dispatch System

The ambulance services in Wales, in common with other emergency services, uses a Computer Aided Dispatch System (CAD). These sophisticated systems are able to utilise and host a large range of systems such as mapping, telephony and radio's and are able to track all of the incidents and resources available to the ambulance service.

In 2016 the Welsh Ambulance Services was supported with a significant financial investment to upgrade its CAD system to the latest technology. The Alert C3 system went live in Wales during November 2017 and whilst the initial project aimed to replicate the abilities of the previous CAD system, a rollout programme for additional functionality is now in place.

As part of initial implementation additional functionality was provided. Auto-Dispatch to Emergency calls prioritised as Red (Immediately Life-Threatening) allows the CAD system to allocate resources based on a set of preconfigured parameters. The system is able to allocate much quicker than manual dispatch and is quality checked by a dispatcher at the same time to ensure the decision is correct. The Clinical Support Desk function was also improved through the implementation of a single dedicated queue of patients populated based on strict criteria. Previously the clinicians would spend time reading through existing calls to find the most appropriate patients which took time. The new functionality speeds up appropriate care for more patients and improves reporting of Clinical Support Desk operations.

### FIGURE 53: JOB ROLES

JOB TITLE	ROLE
Emergency Medical Dispatcher (Call Handler)	Receives and pl in the Clinical C
Allocator/Dispatcher	Reviews prioriti dispatches the provided in the
CCC Clinician	Reviews incider secondary triag patients
Paramedic	Paramedics res Support, Traum of acute and cli administer a var
Emergency Medical Technician (EMT)	The Emergency or form part of support and ad
Urgent Care Services	UCS primarily to hospitals but ca emergencies as They monitor p
Advanced Paramedic Practitioner	APPs have com advanced level, absence of full there is comple

### Types of Ambulance Service **Emergency Response**

The delivery of an emergency ambulance service system is complex and is dependent on a range of staff groups and vehicle to provide effective services. The following tables aim to provides a summary of roles, responses and capabilities that are available to the Welsh Ambulance Service.

rioritises emergency, urgent and routine calls received Contact Centres

- sed incidents requiring ambulance response and most appropriate response based on guidelines Clinical Response Model
- nts suitable for Clinical Telephone Assessment or e to clinically assess the most appropriate response for
- pond to emergency calls and can provide Advanced Life na Care, Cardiac Care and treatment for a wide variety inical conditions including invasive techniques and riety of therapeutic drugs and medications
- Medical Technician (EMT) works alongside paramedics a double EMT crew. EMTs can provide emergency life minister certain therapeutic drugs and medications
- ransfer patients from home to hospital or between an also respond to a number of pre-determined first responders prior to the arrival of an EMS vehicle. patients with in situ cannula and /or syringe drivers pleted a relevant master's degree and practice at
- have the capability to make sound judgements in the information and to manage varying levels of risk when x, competing or ambiguous information or uncertainty

### FIGURE 54: RESPONSE TYPES

RESPONSE TYPE	CAPABILITY
Emergency Ambulance	Respond to all types of emergency calls and undertake urgent and emergency transfers for medically unwell patients. Crewed by two clinicians and capable of conveying patients to a place of definitive care.
Rapid Response Vehicle	Respond to all types of emergency calls. Crewed by only one clinician, and unlike the emergency ambulance, have very limited ability to convey patients.
Urgent Care Vehicle	UCS supports the Emergency Medical Services (EMS) to provide safe transport for stable patients requiring urgent transport or transfer. UCS crews can undertake emergency transfers where a medical or nursing escort is travelling with the patient.
Hazardous Area Response Vehicles (HART)	HART provide a specialist response to incidents where their advanced Hazardous Area training is required. This includes fire, RTC, chemical, building collapse, water, height, difficult patient rescue etc. They are equipped with specialist equipment.
Emergency Medical Retrieval and Transfers Service (EMRTS)	EMRTS are an aeromedical response using rotary wing helicopters. The response and subsequent transport are rapid but dependent on landing zones and weather. Calls are selected by an EMRTS clinician as suitable.
Clinical Desk	Conducts 'Hear and Treat" consultations with patients accessing the 999 system to provide resolution of case, self-care advice, referral to alternative points of care or admission to hospital via alternative means.

### FIGURE 55: BACK UP REQUESTS

REQUEST TYPE	RESPONSE MODE	RESPONSE REQUIRED
Priority 1 (P1)	Blue Lights and Sirens	Nearest available responder to provide immediate support plus a conveying vehicle
Priority 2 (P2)	Blue Lights and Sirens	Nearest available conveying vehicle
Priority 3 (P3)	Normal Road Speed	Nearest appropriate conveying vehicle
Priority 4 (P4)	Normal Road Speed within 1-4 hours	Planned appropriate resource to meet the patients' needs

### **Ideal and Suitable Responses**

In order to support dispatchers and allocators with the decision making process around which resource to send to each call based on the MPDS code, the Welsh Ambulance Service has developed a patients' centred response matrix that aligns the most appropriate (ideal) response or next best response (suitable) to each individual MPDS code.

By using the matrix, dispatchers are able to make clinically appropriate decisions for the allocation of the next resource. As an example most MPDS codes related to stroke, have an Emergency Ambulance as the ideal resource, with the logic being that in order for these patients to receive the best level of care in the timeliest manner, they need a resource to attend with the capability of transporting them to hospital.

Rapid Response Vehicles are considered a suitable response to these calls, they are able to provide a level of clinical assessment and re-assurance, they have very limited patient transportation capabilities, as such their contribution to the patients care and clinical outcome is severely limited for patients with a stroke.

### **Clinical Desk**

Over a number of years, Welsh Ambulance Service's research and development resulted in the Clinical Support Desk being identified as a key element of the Clinical Response Model implemented in October 2015.

The Clinical Support Desk (CSD) staffed by clinicians, both nurses and paramedics who undertake a key role in providing quality care to service users by providing secondary triage to suitable callers within the 999 stream identifying alternative care pathways which may be more suitable than a trip by ambulance to the Emergency Department.

They clinicians can also assist Health Care Professional in managing appropriate transport for patient admissions and provide information from the local directory of services for operational staff and non-clinical CCC colleagues. Secondary triage is undertaken utilising the Manchester Triage System Telephone Triage and Advice (MTS TTA) model. This tool provides consistency in clinical decision making by guiding registered clinicians through a set of algorithms.

# **Technical Appendix: 6**

### Medical Prioritisation Dispatch System

To ensure that ambulance services appropriately respond to demand, they must use prioritisation systems that allow them to differentiate between patients conditions and decide which patient receives the next response.

The Welsh Ambulance Service uses the Medical Priority Dispatch System (MPDS) for this purpose. MPDS is used by approximately 3,000<sup>11a</sup> services across the globe. It is a system that allows ambulance control room staff to obtain vital information about the patient and the scene. This information can then be used to select the appropriate response and to provide immediate lifesaving advice over the phone.<sup>12a</sup>

In May 2018, the three clinical contact centres in Wales were awarded the International Academies of Emergency Dispatch Centre of Excellence status.<sup>13a</sup> Only 250 services worldwide have achieved this status that recognises the delivery of the highest standards of compliance when using MPDS.

The MPDS system generates a specific dispatch code that is composed of three main pieces of information.<sup>14a</sup> A number of codes also have suffix letter as a 4th component, this suffix provides further detail about the incident such as environmental factors. The first component consists of a number from 1 to 37 that indicates the specific protocol card that has been selected following initial questions to the caller. Each protocol card contains a range of questions related to a patient's condition.

### The protocol cards are listed below:

- 1. Abdominal Pain/Problems
- 2. Allergies (Reactions)/ Envenomation (Stings, Bites)
- 3. Animal Bites/Attacks
- 4. Assault/Sexual
- 5. Back Pain (Non-Traumatic/Non-Recent)
- 6. Breathing Problems
- 7. Burns (Scalds)/Explosions
- 8. Carbon Monoxide/Inhalation/HAZMAT/CE
- 9. Cardiac or Respiratory Arrest/Death
- 10. Chest Pain
- 11. Choking
- 12. Convulsions/Seizures
- 13. Diabetic Problems
- 14. Drowning/Diving/SCUBA Accident
- 15. Electrocution/Lightning
- 16. Eye Problems/Injuries
- 17. Falls
- 18. Headache
- 19. Heart Problems/A.I.C.D.

### N.B. Cards 33, 34, 36 and 37 are not currently in use by the Welsh Ambulance Service.

The second component is a letter from A to E including the Greek letter  $\Omega$ , this letter denote the type of response that a patient may need for their condition based on the answers given by the caller.

TECHNICAL APPENDIX: 6

	20.	Heat/Cold Exposure
	21.	Haemorrhage/Lacerations
	22.	Inaccessible Incident/Entrapments
	23.	Overdose/Poisoning (Ingestion)
	24.	Pregnancy/Childbirth/Miscarriage
	25.	Psychiatric/Suicide Attempt
	26.	Sick Person
	27.	Stab/Gunshot/Penetrating Trauma
BRN	28.	Stroke (CVA)/Transient Ischemic Attack (TIA
	29.	Traffic/Transportation Incidents
	30.	Traumatic Injuries
	31.	Unconscious/Fainting (Near)
	32.	Unknown Problem (Man Down)
	33.	Inter-Facility Transfer/Palliative Care
	34.	Automatic Crash Notification (A.C.N.)
	35.	HCP (Health-Care Practitioner) Referral
		(United Kingdom only)
	36.	Flu-Like Symptoms (Possible H1N1)

37. Inter-Facility Transfer specific to medically trained callers

and	The final component is a number. This number
tes	relates to further specific information about an
for	individual patient's condition.
У	
# **Technical Appendix: 7**

# **Additional Activity Information and Analysis\***

#### Step 2: Activity - Calls

Figure 56 shows total number of 999 calls answered by the Welsh Ambulance Service Clinical Contact Centres against the total number of 999 calls prioritised through the Medical Priority Dispatch System for the period 1st April 2016 – 31st March 2018. This information excludes duplicate calls and calls that are passed to another ambulance service.

The lowest number of 999 calls answered was 36,216 in April 2016. The highest number of calls answered was 54,879 in December 17. The month by month variation in calls ranges from -13.6% to 30.6%. The largest month by month variation can be seen in November 2017 – December 2017. Calls increased by 12849 (30.6%).

#### Step 3: Activity - Incidents

Figure 57 shows total number of incidents generated in each of the ambulance service response categories following calls being prioritised through the Medical Priority Dispatch System for the period 1st April 2016 – 31st March 2018.



\*The impact of the implementation of a new Computer Aided Dispatch system and the resultant changes in operational practices in November 2017 cannot be fully quantified, but is a likely confounding factor in the apparent step change in activity for the November 2017 – December 2017 period.



It includes all incidents recorded in the ambulance service computer aided dispatch system with a medical priority dispatch code.

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For the total incident volume there is 2.2% increase in incident demand, equivalent to an additional 9456 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -11% to 12%.

For Red there is a 14.6% increase in incident demand, equivalent to an additional 2567 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -16.8% to 27.5%.

For Amber (Amber 1 and 2 combined) there is a 7.6% increase in incident demand, equivalent to an additional 20389 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -12.5% to 16.1%.

For Amber 1 there is a 15.3% increase in incident demand, equivalent to an additional 25,037 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -13.8% to 19.7%.

For Amber 2 there is a 4.4% decrease in incident demand, equivalent to 4,648 decrease in incidents when comparing 2017/17 with 2017/18. The month by month variation in demand ranges from -10.3% to 11%.

For Green 2 there is a 14.1% decrease in incident demand equivalent to a 4840 decrease in incidents when comparing 2016/17 with 2017/18. The month by month variation ranges from -22% to 14.5%.

For Green 3 there is an 8.2% decrease in incident demand equivalent to an 8,660 decrease in incidents when comparing 2016/17 with 2017/18. The month by month variation ranges from -11% to 10.2%.

# Step 3: Activity – Incident by Condition 1

Figure 58 demonstrates each condition in the Amber category and the relative volume

#### FIGURE 58:

ABDOMINAL PAIN/PROBLEMS ALLERGIES(REACTIONS)/ENVENOMATION ANIMAL BITES/ATTACKS ASSAULT/SEXUAL ASSAULT BACK PAIN (NON-TRAUMA/NON-RECEN **BREATHING PROBLEMS** BURNS(SCALDS)/EXPLOSION CARBON MONOXIDE/INHALATION/HAZO CARDIAC/RESPIRATORY ARREST/DEATH CHEST PAIN CHOKING CONVULSIONS/FITTING DIABETIC PROBLEMS DROWNING(NEAR)/DIVING/SCUBA ELECTROCUTION/LIGHTNING EYE PROBLEMS/INJURIES FALLS HAEMORRHAGE/LACERATIONS HEADACHE HEALTH CARE PROFESSIONAL HEART PROBLEMS/A.I.C.D HEAT/COLD EXPOSURE INACCESSIBLE INCIDENT/OTHER ENTRAF INTERFACILITY EVALUATION/TRANSFER OVERDOSE/POISONING (INGESTION) PREGNANCY/CHILDBIRTH/MISCARRIAGE PROQA COMPLETED ON CARDSET PSYCH/ABNORMAL BEHAVIOUR/SUICIDE SICK PERSON – SPECIFIC DIAGNOSIS STAB/GUNSHOT/PENTRATING TRAUMA STROKE – CVA TRAFFIC/TRANSPORTATION ACCIDENTS TRANSFER/INTERFACILITY/PALLIATIVE TRAUMATIC INJURIES, SPECIFIC UNCONSCIOUS/FAINTING(NEAR) UNKNOWN PROBLEM - COLLAPSE-3RD TOTAL

generated by each. Amber 1 is a significantly larger category than Amber 2.

	ANDERI	AMDER 2
	5,230	1,022
٧S	2,053	500
	71	69
	10	2,981
T)	2,169	1,209
	71,117	10,260
	373	1,530
CHEM	534	482
	10	2
	96,504	1
	1,500	2
	17,097	8,569
	727	5,920
	259	114
	72	
		34
	28,309	50,423
	19,162	9,617
	914	1,380
	4,679	3
	4,679 6,770	3 3,212
	4,679 6,770 180	3 3,212 250
P	4,679 6,770 180 136	3 3,212 250 88
Ρ	4,679 6,770 180 136 	3 3,212 250 88 2
P	4,679 6,770 180 136  678	3 3,212 250 88 2 18,718
P	4,679 6,770 180 136  678 2,111	3 3,212 250 88 2 18,718 1,954
P :	4,679 6,770 180 136  678 2,111 1	3 3,212 250 88 2 18,718 1,954 
P :	4,679 6,770 180 136  678 2,111 1 451	3 3,212 250 88 2 18,718 1,954  24,130
P : :	4,679 6,770 180 136  678 2,111 1 1 451 29,626	3 3,212 250 88 2 18,718 1,954  24,130 13,447
P 	4,679 6,770 180 136  678 2,111 1 451 29,626 6	3 3,212 250 88 2 18,718 1,954  24,130 13,447 208
P 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	4,679 6,770 180 136  678 2,111 1 451 29,626 6 19,754	3 3,212 250 88 2 18,718 1,954  24,130 13,447 208 13,130
P 2 2 2 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4,679 6,770 180 136  678 2,111 1 451 29,626 6 19,754 2,843	3 3,212 250 88 2 18,718 1,954  24,130 13,447 208 13,130 13,308
P 	4,679 6,770 180 136  678 2,111 1 451 29,626 6 19,754 2,843 	3 3,212 250 88 2 18,718 1,954  24,130 13,447 208 13,130 13,308 3
	4,679 6,770 180 136  678 2,111 1 451 29,626 6 19,754 2,843  5,631	3 3,212 250 88 2 18,718 1,954  24,130 13,447 208 13,130 13,308 3 11,369
	4,679 6,770 180 136 	3 3,212 250 88 2 18,718 1,954  24,130 13,447 208 13,130 13,308 3 11,369 9,348
P 	4,679 6,770 180 136  678 2,111 1 451 29,626 6 19,754 2,843  5,631 32,881 5	3 3,212 250 88 2 18,718 1,954  24,130 13,447 208 13,130 13,130 13,308 3 3 11,369 9,348 4,671

#### Step 3:

#### Activity – Incidents (Clinical Support Desk)

Figure 59 shows the volume of incidents dealt with Clinical Support Desk (CSD) for the period 1st April 2016 – 31st March

2018. A proportion of these incidents will still require transport to hospital, which may be by ambulance, taxi or their own transport.





For Amber (Amber 1 and 2 combined) there is an 84.9% increase in incidents stopped by the CSD, equivalent to an additional 2,880 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -25.7% to 57%.

For Amber 1 there is a 187.7% increase in incidents stopped by the CSD, equivalent to an additional 1,162 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -40% to 161%.

For Amber 2 there is a 61.9% increase in incidents stopped by the CSD, equivalent to an additional 1718 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -24.6% to 54.7%.

### Step 3:

Activity – Incidents (Cancelled) Figure 60 demonstrates the number of incidents being cancelled by the caller prior to the



For Amber (Amber 1 and 2 combined) there is 129.5% increase in incidents cancelled pre ar equivalent to an additional 10771 incidents whether the second se comparing 2016/17 with 2017/18. The month month variation in demand ranges from -20 to 74.7%.

For Amber 1 there is a 217.4% increase in incidents cancelled pre-arrival, equivalent to

# ambulance arriving at the scene for the period 1st April 2016 – 31st March 2018.

sa	
rival,	
hen	
by	
%	

an additional 5,195 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -25% to 82.6%.

For Amber 2 there is a 94% increase in incidents cancelled pre-arrival, equivalent to an additional 5,576 incidents when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -23.7% to 69.8%.

#### Step 3:

#### Activity – Changes in prioritisation

Figure 61 show the numbers of incidents stopped in Amber 1 and Amber 2 due to the patient's condition being re-prioritised for the period 1st April 2016 – 31st March 2018.

These instances occur when subsequent 999 calls are received for the same incident, but following re-prioritisation, a different category of response is required. In these instances the original incident will be closed and a new incident generated under the new priority.



Step 4:

Figure 62 and Figure 63 demonstrates the The clinical model is designed to minimise the relationship between the numbers of incidents number of multiple vehicle arrivals at scene for requiring an attendance at scene, against the Amber incidents by sending the right resource number of vehicles that attended the scene for the first time that is able to manage a patient's the period 1st April 2016 – 31st March 2018. condition. There are a number of Amber incidents where it is accepted that multiple resource may be appropriate (such as chest pain).



#### • FIGURE 62: AMBER 1 INCIDENTS REQUIRING ATTENDANCE AT SCENE VERSUS THE NUMBER OF VEHICLES ARRIVING AT THE SCENE

Activity – Attendance at Scene





• FIGURE 63: AMBER 2 INCIDENTS REQUIRING ATTENDANCE AT SCENE VERSUS THE NUMBER OF VEHICLES ARRIVING AT THE SCENE For Amber (Amber 1 and 2 combined) there is 1.2% increase in incidents requiring attendan scene equivalent to an additional 3,086 incide when comparing 2016/17 with 2017/18. The month by month variation in demand ranges from -11.7% to 10.3%.

For Amber (Amber 1 and 2 combined) there is a 1.4% increase in the number of vehicles attending scene, equivalent to a decrease of 4,601 attendances when comparing 2016/17 with 2017/18. The month by month variation demand ranges from -12.9 to 10.9%. For Amber 1 there is an 11.4% increase in incidents requiring attendance at scene, equivalent to an additional 18,132 incidents w comparing 2016/17 with 2017/18. The month month variation in demand ranges from -13.7 to 16.8%.

For Amber 1 there is a 7.4% increase in the number of vehicles attending scene, equivalent to an additional 15,720 incidents when comparing

	(7)	

а	2016/17 with 2017/18. The month by month
ce at	variation in demand ranges from -14.7%
ents	to 18.5%.
	For Amber 2 there is a 16.5% decrease in incidents
	requiring attendance at scene, equivalent to a
	15,046 decrease in incidents when comparing
	2016/17 with 2017/18. The month by month
	variation in demand ranges from -14.9%
	to 12.4%.
in	For Amber 2 there is an 18.4% decrease in
	incidents requiring attendance at scene,
	equivalent to a 20,321 decrease in incidents when
	comparing 2016/17 with 2017/18. The month by
vhen	month variation in demand ranges from -16.8%
by	to 11.6%.
7%	

# Activity - First Vehicle to Scene

Figure 64 and Figure 65 demonstrate the type of vehicle arriving first at the scene of Amber 1 and 2 incidents over period 1st April 2016 - 31st March 2018.







Incidents

## Activity – Back Up Request

Figure 66 and Figure 67 demonstrate the volume and types of back up being requested by resources on scene for the period 1st April 2016 – 31st March 2018.





Activity – Non-Conveyance

Figures 68 and Figure 69 demonstrate the numbers of incident resulting in a nonconveyance to hospital during the period 1st April 2016 – 31st March 2018.





#### Step 5:

### Activity – Conveyance

Figure 70 and Figure 71 demonstrate the relationship between the numbers of incidents requiring transport to hospital from scene, against the number of vehicles that attended the hospital for the period 1st April 2016 – 31st March 2018. More than once vehicle may attend the hospital per incident if there are more than

one patient, or if the patients being transported require a certain level of intervention or clinical skill set.

It should be noted that this metric relates to incidents only, the vehicle may be carrying one or more patients.







# **Technical Appendix: 8**

# **Additional Performance Information and Analysis**

### Step 2: Calls

Figure 72 shows quarterly comparisons of the average percentage of 999 calls answered within 6 seconds over each quarter during the period. There is a decrease in the average percentage of 999 calls answered within 6 seconds when comparing each quarter from 2016/17 with 2017/18. There was a 6% decrease

when comparing quarter 1 2016/17 with quarter 1 2017/18, a 5% decrease when comparing quarter 2 2016/17 with quarter 2 2017/18, a 5.9% decrease when comparing quarter 3 2016/17 with quarter 3 2017/18 and a 3.7% decrease when comparing quarter 4 2016/17 with quarter 4 2017/18.

• FIGURE 72: % CALLS ANSWERED IN 6 SECONDS AVERAGE QUARTERLY COMPARISONS



### Step 3:

#### **Response Time**

Figure 73 shows the relationship between Am incident volume (where an incident requires attendance at scene) and the response time performance against median, 65th and 95th percentiles for the period 1st April 2016 – 31st March 2018.

Median Response - 53.1% increase (an average additional 7.32 minutes) when comparing 202 with 2017/18. The month by month variation ranges from -6.9% to 36.7%.



nber	65th Percentile Response - 65.17% increase
	(an average additional 12.94 minutes) when
	comparing 2016/17 with 2017/18. The month by
	month variation ranges from -9.6% to 45.7%.
t	
	95th Percentile Response - 76.63% increase
	(an average additional 66.97 minutes) when
ge	comparing 2016/17 with 2017/18. The month by
16/17	month variation ranges from -21% to 67.68%.

#### • FIGURE 73: AMBER INCIDENT VOLUME VERSUS RESPONSE TIME PERCENTILE

#### **Clinical Indicators**

Figure 74 shows performance against the clinical indicators (excluding ROSC) the period 1st April 2016 - 31st March 2018.

#### Stroke patients

An average of 95.8% of patients during 2016/17 and 96.5% of patients during 2017/18 were documented as receiving the appropriate care bundle. The month by month variation ranges from 93.4% to 98.1%.

#### Older patients with suspected hip fracture

An average of 68% of patients during 2016/17 and 75.7% of patients during 2017/18 were documented as receiving the appropriate care bundle. The month by month variation ranges from 61.7% to 79.2%.

### ST segment elevation myocardial infraction (STEMI) patients

An average of 65.8% of patients during 2016/17 and 68.8% of patients during 2017/18 were documented as receiving the appropriate care bundle. The month by month variation ranges from 52.4% to 77.5%.

#### Suspected sepsis patients

An average of 98.8% of patients during 2016/17 and 96.7% of patients during 2017/18 were documented as receiving the appropriate care bundle. The month by month variation ranges from 92.7% to 100%.

### Patients with a suspected febrile convulsion aged 6 years and under

An average of 82.7% of patients during 2016/17 and 100% of patients during 2017/18 were documented as receiving the appropriate care bundle. The month by month variation ranges from 66.7% to 100%.

#### Hypoglycaemic patients

An average of 85% of patients during 2016/17 and 86.3% of patients during 2017/18 were documented as receiving the appropriate care bundle. The month by month variation ranges from 77% to 90.1%.





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