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CAN A PARTNERSHIP BETWEEN GENERAL PRACTITIONERS AND AMBULANCE SERVICES REDUCE CONVEYANCE TO EMERGENCY CARE?

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Abstract

Background: Emergency services are facing increasing workload pressures, and new models of care are needed. We evaluate the impact of a service development involving a partnership between emergency ambulance crews and general practitioners (GPs) on reducing conveyance rates to the Emergency Department (ED).

Methods: The service model was implemented in the West Midlands of England. Call handlers identified patients with needs that could be addressed by a GP using locally agreed criteria. GPs supported the assessment of such patients either at scene or by telephone. Routine data were collected between October 2012 until November 2013, from the ambulance service Computer Aided Dispatch (CAD) system. Logistic regression models were used to determine the likelihood for patients being transported to ED.

Results: Of 23,395 emergency contacts during the evaluation period, 1903 (8.1%) patients were triaged to GP supported assessment. Mean age (SD) was 61.8 (27.9) years; 42.9% were aged 75 years and over. 1221 (64.2%) had face to face GP assessment and 682 (35.8%) via telephone. 1500 (78%) of those who received GP support were not transported to hospital. After controlling for confounders, those aged greater than 75 years (OR 0.67; 95% CI 0.52, 0.86), and females (OR 0.64; 95% CI 0.51, 0.82) were less likely to be transported, while those who received GP

telephone input rather than face to face assessment were more likely to be transferred to an ED (OR 2.14; 95% CI 1.69, 2.72)

Conclusion

Support of the paramedic service by GPs enabled patients to avoid transfer to an ED, potentially avoiding subsequent hospital admission, reducing costs and improving quality of care for patients that are not in need of hospital services. However, use of services in the days following the call was not assessed, and hence the overall impact and safety requires further evaluation.

What this paper adds

Section 1: What is already known on this subject

1. There is increasing demand for emergency ambulance services, attendance at Emergency Departments and increasing unplanned hospital admissions in the UK.
2. Evidence suggests that a great proportion of this demand could be effectively managed in primary care, hence the need for models of care that enable this.

Section 2: What this study adds

In an ambulance service in the West Midlands of England, a service model involving GP face to face and telephone support to ambulance crews allowed substantial number of patients to avoid transport to hospital. Although the subsequent use of emergency or outpatient services by these patients was not evaluated, this study suggests such a model has potential for considerable efficiencies and cost savings for the health care system.

Introduction

The urgent and emergency care system in the National Health Service (NHS) is under pressure and struggling to meet a number of key targets. Over the last 30 years there has been an increase in emergency ambulance service calls from 1.5 million to over 6 million a year, with only about 10% of these calls being for truly life-threatening conditions ¹. The 2005 report from the English Department of Health, “Taking Healthcare to the Patient: Transforming NHS Ambulance Services”, described ongoing concerns about the proportion of patients who are transported without a clear clinical indication for emergency hospital admission ². Estimation of avoidable emergency ambulance use ranges between 30% and 52%³.

Long waits and patient dissatisfaction could be avoided by improving the clinical decision making process in the pre-hospital setting, including providing alternatives to ambulance transportation to ED ². Evidence suggests that a significant proportion of conditions can be managed in primary care^{4,5}, and the primary care skills of General Practitioners/ Family Physicians (GPs/FPs) could be applied to support reduction of the proportion of hospital admissions and inappropriate attendances to ED ⁶⁻⁸. GPs are particularly skilled in dealing with complexity and managing uncertainty, and supporting patients to maximise independence and choice. However, in the UK, it remains relatively rare for doctors to work in the field of pre-hospital care/emergency medicine. In addition, there is also a national shortage of GPs, with a shortfall of applications for GP specialist training and slower growth in the GP workforce compared to population growth⁹.

Various approaches to improving pathways of care within urgent care have been tried in pre-hospital and ED settings ¹⁰. A systematic review suggested that paramedics lack the competence

to safely and reliably predict which patients needed ED treatment and which can be left at home¹⁰. More recently, there have been promising pre-hospital interventions that have focused on increasing the skills of paramedic personnel to treat patients at scene rather than convey to hospital.

In some health systems, doctors, predominantly from an emergency medicine or anaesthetic background^{11 12} attend patients in the pre-hospital setting to support emergency care management, but evidence about using GPs in this setting is lacking. In this study, we evaluated a new model of emergency ambulance response in which paramedic crews from the ambulance service were supported by GPs' to provide alternatives to transfer to hospital^{13 14}.

METHODS

Setting

The service was set in Worcestershire, a mixed urban-rural county that faces challenges in urgent and emergency care similar to other parts of the UK. In 2013 its population was 566,169, with 19.3% aged more than 65 years (average for England 16.4%). It has a predominantly white population (95% compared with the national average of 84%¹⁵). Within the county there are some pockets of deprivation but overall it is relatively affluent. It is served by 67 general medical practices, and there are two hospitals with emergency departments. In addition, there are several nurse led minor injury units.

Intervention

A pilot study had been conducted in 2008-09 in which members of the local British Association of Immediate Care charity (BASICS) were asked to support the West Midlands Ambulance Service (WMAS). The WMAS control room was given guidance on the types of patients that a BASICS doctor should be sent to. During the pilot, 218 patients were attended. It was estimated that 42% of the attended patients would have required onward transport to hospital if the doctor had not been present.

In mid-2012, the decision was made by NHS Worcestershire (the former Primary Care Trust), the new local Clinical Commissioning Groups and West Midlands Ambulance Service (WMAS) to expand the service, concentrating on non-trauma cases where the skills of a GP would have greatest impact. The service development aimed to enhance the treatment options for patients for whom an emergency ambulance had been called and, where clinically appropriate, avoid ED transfers by offering care closer to home. Alternative treatment options included the provision of self-care advice, a prescription or referral to alternative community care pathways (e.g. intermediate care teams, social services, community hospitals or referral back to the patient's own registered GP for follow-up and treatment).

The care pathway is shown in figure 1. Upon receipt of an emergency 999 call ambulance control staff stream calls through a standard priority dispatch protocol and after conducting an initial assessment arrange an appropriate response according to locally agreed triage criteria (Box 1). This includes either assigning a paramedic crew team and/or an on-call GP who attends the patient in their own vehicle. In addition, in cases where an ambulance is dispatched first, the attending ambulance crew is able to contact the on-call GP for telephone advice or request face to face attendance if it is felt that this may lead to a more appropriate outcome than transfer of the patient to an ED.

Box 1. Triage criteria use by ambulance control/paramedics

The triage criteria to identify the types of cases that were considered most suited to GP supported assessment were developed jointly between West Midlands Ambulance Service and the Medical Director of Worcestershire Primary Care Trust. Training in the use of the triage criteria took place both with Control room staff and paramedics. Types of calls included the following:

1. Non-specific (non-cardiac) chest pain
2. Abdominal pain including suspected renal and biliary colic and cholecystitis
3. Patients with shortness of breath whose other observations (PsO₂, blood pressure and overall assessment) do not indicate a life threatening episode
4. Patients with a presumed non life-threatening infection such as a urinary tract or chest infection or cellulitis
5. Patients with an acute confusional state especially those patients where transferring the patient to hospital is not in the patient's best interests
6. Patients undergoing palliative care whose treatment plan is to remain at home if at all possible
7. Children with non life-threatening problems such as ear ache, cough, abdominal pain, diarrhoea and vomiting
8. Patients with minor trauma not requiring X-ray including small cuts and lacerations
9. Patients with mental health problems
10. Patients who may have requested on attendance on multiple occasions who are assessed on the specific occasion as having a non-life threatening problem
11. Non-time critical bariatric patients, where extrication / transportation may be challenging and the input of a Doctor may support in identifying alternative pathways for management of the patient
12. Patients refusing to travel to hospital but are excluded from the WMAS non-conveyance policy (e.g. high risk patient groups such as learning difficulties / dementia)
13. Patient with a likely transient ischaemic attack who have fully recovered from the incident (paramedics were recommended to discuss the specific case with the doctor on the telephone)
14. Patients with non-traumatic limb and back pain e.g. exacerbation of long standing knee, hip, back problems
15. Patients who have fallen in whom trauma requiring X-ray or hospital care is not considered likely to be required
16. Patients with a presumed diagnosis of lower limb (below the knee) DVT with no suggestion of a pulmonary embolus or extension into the thigh
17. Muscular pain requiring alternative methods of pain management (e.g. non-traumatic back pain)
18. Headache / migraine where the patient is FAST negative
19. Allergies (non-anaphylactic) requiring alternative medicinal options (out of Paramedic scope of practice e.g. oral antihistamines)

The service operates 1200-2000 hours, Monday to Friday with one GP available to support the ambulance crews, and on Saturday, Sunday and public holidays between 0800-2000 hours there are two GPs available. The local Primary Care Trust (later the Clinical Commissioning Group) managed a rota of participating GPs to provide cover across these periods, and also arrange payments to the GPs. The ambulance crews included qualified Health and Care Professions Council (HCPC) registered paramedics that are able to conduct advanced life and trauma support procedures in adult and children, and ambulance technicians who have had a lower level of training. Paramedics and ambulance control staff were informed about the project via email and by means of a printed weekly briefing, with guidance on types of patients that could be referred for GP supported assessment (Box 1). GPs in the UK are specialty doctors who have undergone a minimum of 10 years' medical education, including 3 years' specialist postgraduate training. GPs are not trained in the management of patients who have suffered major trauma; however, their broad training allows them to safely and competently manage the full range of acute primary care needs, including palliative care.

All GPs included in the register to work in the local region were invited to participate in the new service provided they were clinically active, met necessary occupational health requirements, and had no outstanding performance concerns. Twenty GPs joined the project in October 2012, increasing to 35 by November 2013. GPs participated in a mandatory one-day training on pre-hospital care (Box 2) aimed at preparing them to apply their GP skills and expertise in the context of an ambulance response setting.

Both during the GP training and the briefing to other staff, it was emphasised that making an appropriate clinical decision for the patient was paramount and that any reduction in hospital attendance numbers was a consequence, rather than aim of the service.

A one day course was delivered to all GPs who participated in the new service. Key elements were:

- A description of the new service and the interface with the ambulance service. This included the use of an ambulance digital radio
- Update on the management of patients with chest pain, shortness of breath, psychiatric emergencies and paediatrics
- Cardiopulmonary resuscitation including the use of a modern automated external defibrillator
- Appropriate use of alternative (often community based) care pathways
- Appropriate use of medical prescriptions in context of the service development
- Familiarisation with medication to be carried by the GP, including emergency drugs (for example adrenaline, glucagon) as well as commonly used antibiotics, analgesics and other equipment used in general practice.
- Familiarisation with elements of equipment carried by ambulance, for example oxygen cylinder, nebuliser, emergency drugs

Box 2 GP induction course

Study Population:

Eligible patients were those of any age for whom contact had been made to the 999 emergency ambulance service directly or indirectly (through a third party) during the evaluation period (5th October 2012 to 6th November 2013) at times when the GP service was available. The study population were those patients that WMAAS call handlers or ambulance crew assessed as having a problem that was appropriate for GP telephone or face to face assessment.

Data collection:

Data related to source of call, time of contact, demographics, location, chief complaint and patients' conveyance were retrieved from the ambulance service Computer Aided Dispatch (CAD) system. Calls originated from the general public or community based services (such as care homes, community nursing and other GP services) .

Statistical Analysis:

We determined the proportion of all eligible patients for whom a GP was involved and the percentage that were not transported to hospital. Characteristics of patients who were conveyed to hospital vs. not conveyed were explored with chi-square (χ^2) and Kruskal Wallis tests, as appropriate. Unadjusted and adjusted ORs of the likelihood of patients being transported were obtained from standard logistic regression models. For each variable, the following reference categories were selected: age (≤ 75 years); age (≤ 5 years); type of consultation (face to face interview versus telephone); call type source (General public versus Community services); priority dispatch group assigned red (urgent), green (less urgent) and Community services; working day (Monday to Friday) and weekend. The analysis was carried out using the STATA 13 software package (Stata Corp, 4905 Lakeway Drive, Special Edition, College Station, Texas 77845 USA).

Results

A total of 23,395 emergency "999" calls were received by the ambulance service during the evaluation period of which 1903 (8.1%) were referred for GP supported assessment. Of these,

90.6% were calls from members of the public, and 9.4% were emergency referrals from community-based services.

In total, 1221 (64.1%) were assessed face-to-face by a GP and 682 (35.8%) had GP telephone advice provided to the attending ambulance crew. Baseline characteristics of the patients are displayed in Table 1. Mean age (SD) was 61.8 (27.9) years, with 42.9% (817) patients aged 75 years and over.

Following GP input, 403 (21.2%) patients were transported to an ED compared with the overall average of 61% for all emergency calls to the ambulance service (figure provided by WMAS). Of the 1500 (78.8%) patients who were not transported to hospital, 1026 (68.4%) had received a face-to-face assessment by a GP and 474 (32.6%) advice via telephone. Table 2 compares the characteristics of those who were transferred to the ED with those who were not.

Table 1: Characteristics of study population

	N=1,903
	% (N)
Gender (%)	
Female	1043 (54.8)
Male	762 (40.0)
Not recorded	98 (5.1)
Age (%)	
0-5 years	161 (8.5)
6-15 years	25 (1.3)
16-30 years	138 (7.3)
31-60 years	378 (19.9)
61+ years	1,201 (63.1)
Chief Complaint	
Cardio/cerebrovascular	348 (18.3)
Respiratory problems	276 (14.5)
Neurological problems	194 (10.2)
Musculoskeletal problems	340 (17.9)
Gastrointestinal problems	192 (10.1)
General medical problems/other medical problems	346 (18.2)
Mental	61 (3.2)
Trauma & injuries	40 (2.1)
Other miscellaneous problems	106 (5.6)
Working day (%)	
Monday	182 (9.6)
Tuesday	116 (6.1)
Wednesday	159 (8.4)
Thursday	129 (6.8)
Friday	151 (7.9)
Saturday	564 (29.6)
Sunday	602 (31.6)
Ambulance Dispatch Priority Group (%)	
Green	848 (44.6)
Red	875 (46.0)
Community base services	177 (9.4)
Outcome of at-scene assessment	
Non-conveyance (referral to community-based service or selfcare advice)	1500 (78.8)
Conveyance to hospital	403 (21.2)

Table 2: Associations between call variables and conveyance to an emergency department

	Conveyed to ED N=403	Non-conveyance N=1500	P-value
	N (%)	N (%)	
Gender			p<0.001
Female	186 (17.3)	857 (82.2)	
Male	190 (24.9)	572 (75.1)	
Age			p=0.063
0-5 years	38 (23.6)	123 (76.4)	
6-15 years	9 (36.0)	16 (64.0)	
16-30 years	38 (27.5)	100 (72.5)	
31-60 years	82 (21.7)	296 (78.3)	
61+ years	236 (19.7)	965 (80.4)	
Age 75+			p<0.001
0-75 years	262 (24.1)	824 (75.9)	
75+ years	141 (17.3)	676 (82.7)	
Chief Complaint			p=0.022
Cardio/cerebrovascular	86 (24.7)	262 (75.3)	
Respiratory problems	72 (26.1)	204 (73.9)	
Neurological problems	37 (19.1)	157 (80.9)	
Musculoskeletal problems	51 (15.0)	289 (85.0)	
Gastrointestinal problems	40 (20.8)	152 (79.2)	
General medical problems/other medical problems	66 (19.1)	280 (80.9)	
Mental	17 (27.9)	44 (72.1)	
Trauma & injuries	9 (22.5)	31 (77.5)	
Other miscellaneous problems	25 (33.6)	81 (76.4)	
Working day			p=0.144
Monday	35 (19.2)	147 (80.8)	
Tuesday	31 (26.7)	85 (73.3)	
Wednesday	42 (26.4)	117 (73.6)	
Thursday	30 (23.3)	99 (76.7)	
Friday	37 (24.5)	114 (75.5)	
Saturday	118 (20.9)	446 (79.1)	
Sunday	110 (18.3)	492 (81.7)	
Ambulance Dispatch Priority Group (%)			p=0.267
Green	176 (20.7)	672 (79.3)	
Red	218 (24.9)	658 (75.1)	
Community based services	9 (5.1)	169 (94.9)	
Source of call			p<0.001
Public	394 (23.0)	1,330 (77.0)	
Community based services	9 (5.1)	169 (94.9)	

Type of GP input			p<0.001
Face to Face assessment	195 (16.0)	1,026 (84.0)	
Telephone advice	208 (30.1)	474 (69.5)	

Table 3: Unadjusted and fully adjusted odds ratios of type of conveyance across selected covariates

Variable	Unadjusted OR & 95% CI [‡]	Adjusted OR & 95% CI [†]
Gender		
Male	1.00	1.00
Female	0.65 (0.52,0.82)	0.64 (0.50,0.81)
Age groups		
0-5 years	1.00	1.00
6-15 years	1.82 (0.74, 4.45)	1.88 (0.69, 5.15)
16-30 years	1.23 (0.73, 2.07)	1.26 (0.69, 2.30)
31-60 years	0.89 (0.58, 1.39)	0.95 (0.56, 1.60)
61+ years	0.79 (0.54, 1.17)	0.94 (0.58, 1.52)
Age 75+		
0-75 years	1.00	1.00
75+ years	0.65 (0.52,0.82)	0.67 (0.52,0.86)
Chief Complaint		
Cardio/cerebrovascular	1.00	1.00
Respiratory problems	1.07 (0.74,1.54)	1.14 (0.78, 1.67)
Neurological problems	0.72 (0.47,1.11)	0.67 (0.43, 1.05)
Musculoskeletal problems	0.54 (0.37, 0.79)	0.55 (0.35, 0.86)
Gastrointestinal problems	0.80 (0.52,1.23)	1.36 (0.83, 2.23)
General medical problems/other medical problems	0.72 (0.50,1.03)	0.67 (0.45, 1.00)
Mental	1.18 (0.64,2.17)	1.03 (0.52, 2.07)
Trauma & injuries	0.88 (0.40,1.93)	0.86 (0.35, 2.14)
Other miscellaneous problems	0.91 (0.54,1.54)	0.86 (0.41, 1.82)
Working day		
Monday	1.00	1.00
Tuesday	0.73 (0.43,1.23)	0.65 (0.37,1.14)
Wednesday	0.82 (0.53,1.24)	0.57 (0.35, 0.92)
Thursday	0.68 (0.45,1.05)	0.50 (0.31,0.81)
Friday	0.93 (0.54,1.24)	0.76 (0.41,1.41)
Saturday	1.12 (0.65,1.95)	0.86 (0.47,1.56)
Sunday	1.10 (0.66,1.84)	0.85 (0.49,1.49)
Ambulance Dispatch Priority Group		
Community base services	1.00	1.00
Green	4.92(2.46, 9.81)	5.34 (2.57, 11.09)
Red	6.22 (3.12,12.38)	6.32 (3.03, 11.17)
Source of call		
Community base services	1.00	1.00
General Public	5.56 (2.82,10.98)	5.49 (2.64, 11.40)
Type of GP input		

Face to face assessment	1.00	1.00
Telephone advice	2.30 (1.85,2.88)	2.14 (1.68, 2.72)

[‡]Adjusted odds ratio (OR) from standard logistic regression models. Multiple adjustment of all variables listed above.

Table 3 displays both unadjusted and fully adjusted ORs of conveyance across the selected study characteristics. Females were less likely to be transported than male patients (adjusted OR 0.64; 95% CI 0.51, 0.82), as were patients aged over 75 years (adjusted OR 0.67; 95% CI 0.52, 0.86). Calls from the public were five to six times more likely to be transported than those from community based services; for those prioritised to the Green dispatch urgency OR 5.34 (95% CI 2.57, 11.09), and those in Red urgency OR 6.32 (95% CI 3.03, 11.17). Patients who received telephone advice as opposed to face-to-face assessment by the GP were more likely to be transported (OR 2.14; 95% CI 1.69, 2.72).

While presenting complaints were significantly associated with conveyance of patients in the bivariate analysis (p=0.022) shown in Table 2, this became statistically non-significant after multiple adjustment of other factors using logistic regression (see Table 3) with the exception that musculoskeletal problems were less likely to be conveyed compared with patients with cardio/cerebrovascular (adjusted OR 0.55; 95% CI 0.35, 0.86).

ⁱSafety and service experience

During the pilot normal ambulance service governance and patient safety systems were adhered to. No adverse effects or patient complaints were reported during this period. Informal feedback from paramedic personnel was universally positive regarding working alongside the GP.

Similarly, feedback from the participating GPs was positive, and there was a general commitment to work the shifts.

Discussion

This study has found that assigning emergency ambulance calls for GP on-scene assessment and advice (face to face or via telephone) enables a substantial proportion of calls to be managed without conveyance of the patient to an ED. After controlling for potentially confounding factors, patients who were female and those who were over 75 years were less likely to be transferred to ED than other patients. Increasing age is likely to be associated with increasing frailty, co-morbidities and end-of-life care, but data to confirm this were not available in this study. However, the differences in transfer to ED according to the patient's gender, after controlling for age, is less explicable. In addition, those who received telephone input from a GP rather than face to face assessment were more likely to be transferred. Patients who had musculoskeletal problems were also less likely to be conveyed to an ED than others.

A small proportion (9.4%) of the patients had been referred from community services (such as care homes, community nursing and GP services) and, surprisingly they were substantially less likely to be conveyed to an ED than where the call had come from a member of the public. This raises questions about the appropriateness of such calls which requires further investigation. They included calls from care homes mainly during the weekend, at times when a GP might not be available, and it appears that an alternative response to calling an emergency ambulance might have been more appropriate.

Feasibility. The study has demonstrated the feasibility of implementing an innovative service model that uses existing available local health services (GPs and ambulance services) in a coordinated effort managed by those commissioning urgent and emergency care. It has established a framework for the scope of GPs' input, working alongside paramedics in the pre-hospital setting. It has the potential to be applicable in other areas with relatively little implementation costs, making use of GP skills to prevent unneeded hospital attendance, and possible admission. From informal feedback, the service appeared to be highly valued by ambulance crews and participating GPs, there were no critical incidents and no patient complaints were received. The scheme integrated the skills and experience of GPs into an ambulance service, and appeared to be acceptable to patients and the community services to whom patients were referred.

Sustainability. Informal feedback from both patients and ambulance service colleagues is that having a doctor present was significantly appreciated as it offered a wide range of options for patients. However, the extent to which GPs remain committed to involvement in this type of service model needs further evaluation. Currently, the service has been running in the area studied for 4 years (October 2012 to October 2016), indicating a continuing interest from GPs to participate. There is increasing interest in general practice for careers in which doctors derive increased job satisfaction from a widely based portfolio of jobs, and the opportunity to work sessions with an ambulance service fits with this trend ¹⁶.

Limitations

The study was limited to use of routine health service data and it was conducted in one area with a single ambulance service, and hence the transferability of the scheme to other areas is unknown. Although informally, the scheme was positively rated by patients, GPs and paramedics, the impact on clinical outcomes, subsequent use of NHS services, and acceptability from patient and NHS perspectives was not formally evaluated. In addition, it is not possible to judge the extent to which the patients who were attended by a GP would have been conveyed or not had this clinical input been unavailable.

The reduction in conveyance to ED and potentially in hospital admissions may have occurred in the context of increased work and costs elsewhere in the healthcare system. In particular, it was beyond the scope of the evaluation to determine whether patients who were not transferred to an emergency department subsequently accessed either the emergency care system directly in the hours or days following the call, and whether any delay in accessing care may have led to consequent increased lengths of stay in hospital.

Involvement of GPs in the pre-hospital setting working with ambulance services have been reported in other countries, includes GPs attending ambulance service patients who have not been triaged (emergency cases) in Australia¹⁷ and Norway¹⁸, and patients who have been triaged (non-emergency cases) in Belgium¹³. Another urban model in Brussels¹³ has similarities with the study model evaluated here, with about 25% of the cases attended by a GP being subsequently conveyed to hospital. It also appears that there is interest in this model in the Middle East; for example, GPs have been recruited in Qatar¹⁹ as a mobile doctor service in collaboration with the ambulance service.

In England, the Urgent and Emergency Care Review emphasised the need to provide responsive urgent care service outside of hospital ²⁰. GPs have an important role to play in achieving this, but further research is required to explore the productivity and clinical and cost effectiveness of GPs compared to extended scope paramedics (emergency care practitioners) ²¹⁻

23.

Conclusion

This study has evaluated the use of GPs in supporting an emergency ambulance service address the needs of patients who call the emergency service. Support of the paramedic service by GPs enabled patients to avoid transfer to an ED, potentially avoiding subsequent hospital admission, reducing costs and improving quality of care for patients that are not in need of hospital services. However, use of services in the days following the call was not assessed, and hence the overall impact and safety requires further evaluation.

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