National Institute for Health and Care Excellence

Final

Chapter 4 Paramedic remote support

Emergency and acute medical care in over 16s: service delivery and organisation

NICE guideline 94

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Disclaimer

Healthcare professionals are expected to take NICE clinical guidelines fully into account when exercising their clinical judgement. However, the guidance does not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of each patient, in consultation with the patient and, where appropriate, their guardian or carer.

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Chapter 4 Paramedic remote support

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4 Remote access to clinical advice by ambulance staff

4.1 Introduction

Paramedics and other ambulance clinicians are well trained but expected to manage a broad range of conditions in the out-of-hospital environment. In the UK, paramedics operate as autonomous practitioners, whereas in other countries on-line medical support and advice is an established component of emergency medical systems. Mobile communication technologies have now advanced to a stage where real-time access to clinical advice, remotely from the scene of an incident, is now a possibility for UK ambulance services.

The remote provision of senior clinical advice to paramedics and other ambulance clinicians may be of value in providing authorisation for clinical interventions beyond the existing scope of practice or in assisting with clinical decision making. Examples of this could include remote interpretation of an electrocardiograph to facilitate direct access to a specialist centre, or the provision of support with decisions relating to whether a patient requires immediate transfer to an Emergency Department or could undergo alternative management in the community.

Given the uncertainty regarding this issue in UK ambulance services, the guideline committee sought to determine if immediate access to senior decision makers by ambulance staff could improve outcomes and utilisation of NHS resources.

4.2 Review question: Does the provision of immediate access by ambulance staff to clinical advice, using remote decision support reduce NHS resource usage and improve outcomes?

Table 1: PICO characteristics of review question

Population	Adults and young people (16 years and over) with a suspected AME.
Intervention(s)	Independent paramedic decision making (transport to ED or advice at scene only): • Standard paramedics • Advanced paramedics with additional post registration training (for example, paramedic practitioner or emergency care practitioner).
Comparison(s)	Remote expert-supported paramedic decision making including: • Telephone consultations • Telemedicine systems.
Outcomes	• Number of patients seeking further contacts after initial assessment by paramedic (GP, 999, ED, 111) OR Re-contact rates within 72 hours (CRITICAL) • Quality of life (CRITICAL) • Mortality (CRITICAL) • Conveyance (carriage) rates (CRITICAL) • Total avoidable adverse events as reported by the study (CRITICAL) • Patient satisfaction (CRITICAL) • Number of hospital admissions (IMPORTANT) • Staff satisfaction (IMPORTANT)
Study design	• Systematic reviews (SRs) of RCTs, RCTs, observational studies only to be included if no relevant SRs or RCTs are identified.

For full details see review protocol in Appendix A.

4.3 Clinical evidence

No relevant clinical evidence identified.

4.4 Economic evidence

Published literature

No relevant economic evaluations were included. One economic evaluation was identified but excluded due to limited applicability.[25] This is listed in Appendix H, with reasons for exclusion given.

The economic article selection protocol and flow chart for the whole guideline can found in the guideline's Appendix 41A and Appendix 41B.

4.5 Evidence statements

Clinical

No relevant clinical evidence was identified.

Economic

No relevant economic evaluations were identified.

4.6 Recommendations and link to evidence

Recommendations	-
Research recommendations	**RR2. Are paramedic remote decision-support technologies clinically and cost effective?**
Relative values of different outcomes	The number of patients seeking further contacts after initial assessment by paramedic (GP, 999, ED or 111) or re-contact rates within 72 hours, quality of life, mortality and conveyance (carriage) rates were considered by the committee to be critical outcomes. Total avoidable adverse events as reported by the study, patient and/or satisfaction, number of hospital admissions and staff satisfaction were considered important outcomes.
Trade-off between benefits and harms	The committee chose to formulate a research recommendation as no direct evidence was identified which answered the question. Evidence was identified in various settings which were not thought sufficiently representative of the general population of undifferentiated acute medical emergencies, in contrast to well-characterised disease pathways (for example, ST-elevation myocardial infarction, trauma or hyper-acute stroke). In addition, no evidence was identified which was directly relevant to the UK clinical context. Advanced emergency care systems elsewhere may use doctors or employ a variety of sophisticated transport systems. For example, France's Service Aeromedical d'Urgence (SAMU) has both doctor-based and paramedic-based (firemen) systems working in parallel. A German study of a community-based urgent response system for stroke included a mobile CT scanner in the ambulance. The committee noted that remote decision support could be beneficial whereby decisions about management can be made on site and may mean treatment could be started earlier or transport of some patients to hospital could be avoided. This might be particularly valuable in rural locations. However, the lack of evidence meant that the committee decided to make a recommendation for further research.
Trade-off between net effects and costs	No economic evaluations were included. The committee discussed the cost implications of the provision of a formal remote advice service on a national level, which would require the availability of 24-hour support from a senior healthcare professional (for example, a GP, advanced nurse practitioner or advanced paramedic). The committee considered that this could have high cost implications that would not be justifiable, given the lack of directly applicable evidence to show clinical benefit. It is likely to be more cost-effective in rural locations where the time until life-saving treatment could be considerably reduced by pre-hospital treatment. Alternatively, less severely ill patients might avoid a long journey to hospital.
Quality of evidence	No evidence was found which matched the protocol and was relevant to the UK context.
Other considerations	There is currently a variable provision of remote clinical support for paramedics in the UK. Further research is required to assess the clinical and cost effectiveness of providing remote support. The committee noted that if access to remote support modalities was already being provided, this should not be discontinued or discouraged, but rather that the introduction of such services should be accompanied by systematic evaluation as an explicit part of the policy initiative. Practice varies across the country in how paramedics access remote clinical support and the absence of research evidence prevents a recommendation on how such

Recommendations	**-**
Research recommendations	**RR2. Are paramedic remote decision-support technologies clinically and cost effective?**
	support should be configured. This might include how remote support systems would facilitate 'see and treat' decisions and potentially reduce conveyance rates, and the mechanism by which support was accessed, for example, telephone access to a general practitioner to support decision making or access to diagnostic technologies. Given the variation in service provision, the evaluation of a new or an enhanced remote support service would need to characterise how the new service differed from the current comparator service, and should employ a research design which allowed the separation of potential intervention effects from secular trends. From a legal perspective it would be important to determine where liability resides for clinical decision-making (that is, with the remote "supporter" or the "on-site" paramedic). The committee noted that electronic communications may be less reliable in rural areas and these populations could be disadvantaged (for example, poor mobile phone network coverage). However, remote support may be valuable in scenarios where the nearest hospital is some distance away. There are potential cultural barriers which should be considered when assessing this technology.

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Appendices

Appendix A: Review protocol

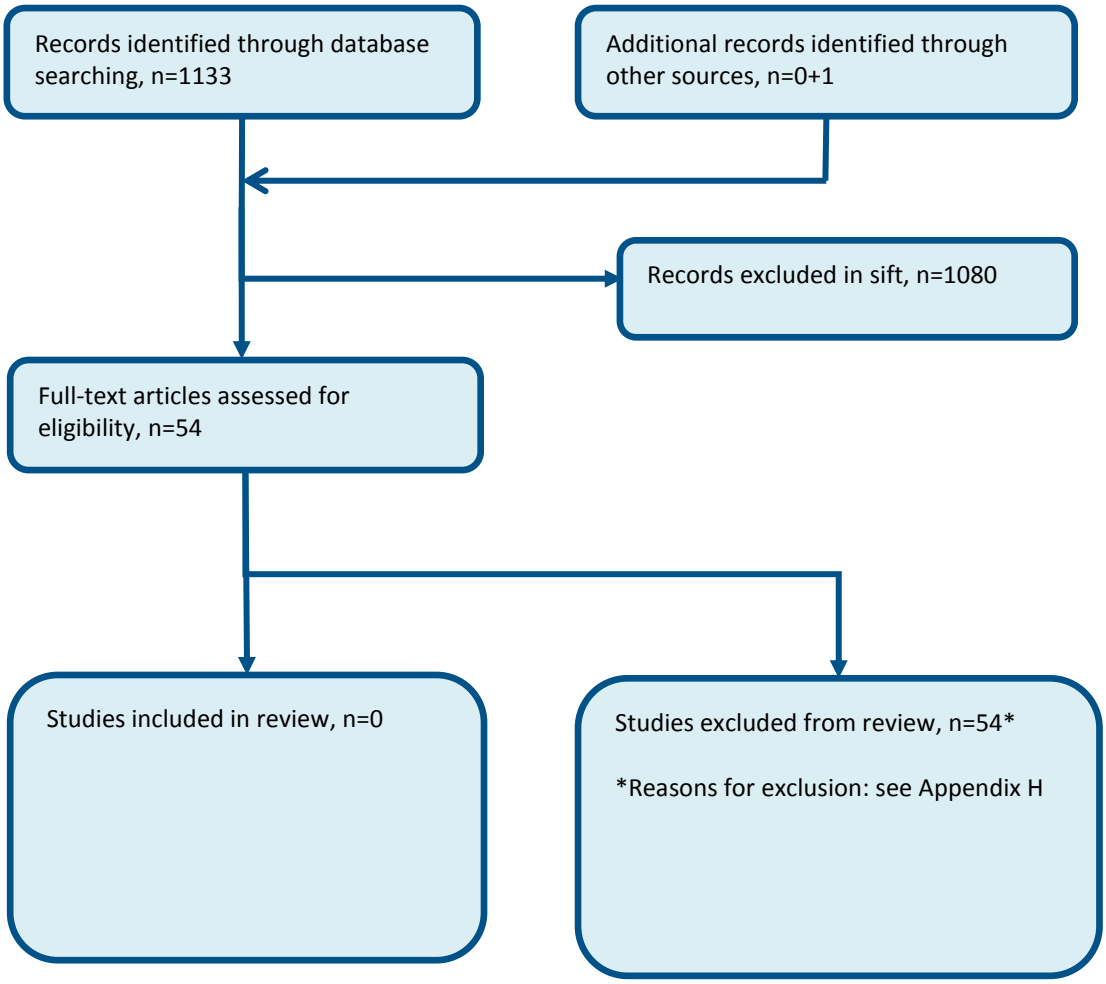
Table 2: Review protocol: Ambulance staff remote access to clinical advice

Review question: Does the provision of immediate access by ambulance staff to clinical advice, using remote decision support reduce NHS resource usage and improve outcomes?	
Objective	To determine if immediate access by ambulance staff to senior decision makers improves outcomes and NHS resources.
Rationale	The first point of contact with an emergency referral is associated with the highest level of uncertainty. Paramedic ambulance staff are well-trained to handle uncertainty but may need time to arrive at a binary decision to continue treatment at home or transfer the patient to hospital. This decision may be reached faster, or more securely, if it is made with the support of specialist advice, accessed using remote technologies or telephone consultations.
Population	Adults and young people (16 years and over) with a suspected AME.
Intervention	Independent paramedic decision making (transport to ED or advice at scene only): • Standard paramedics • Advanced paramedics with additional post registration training (for example, paramedic practitioner or emergency care practitioner).
Comparison	Remote expert-supported paramedic decision making including: • Telephone consultations • Telemedicine systems.
Outcomes	• Number of patients seeking further contacts after initial assessment by paramedic (GP, 999, ED or 111) OR Re-contact rates within 72 hours (CRITICAL) • Health-related quality of life (CRITICAL) • Mortality (CRITICAL) • Conveyance (carriage) rates (CRITICAL) • Total avoidable adverse events as reported by the study (CRITICAL) • Patient satisfaction (CRITICAL) • Number of hospital admissions (IMPORTANT) • Staff satisfaction(IMPORTANT)
Exclusion	-
Search criteria	The databases to be searched are: Medline, Embase, the Cochrane Library. Date limits for search: No date limits. Language: English only.
The review strategy	Systematic reviews (SRs) of RCTs, RCTs, observational studies only to be included if no relevant SRs or RCTs are identified.
Analysis	Data synthesis of RCT data or observational study data (as appropriate). Meta-analysis where appropriate will be conducted. Studies in the following subgroup populations will be included: • Frail elderly. In addition, if studies have pre-specified in their protocols that results for any of these subgroup populations will be analysed separately, then they will be included. The methodological quality of each study will be assessed using

Review question: Does the provision of immediate access by ambulance staff to clinical advice, using remote decision support reduce NHS resource usage and improve outcomes?	
	the Evibase checklist and GRADE.
Key papers	-
Number of clinical questions	-

Appendix B: Clinical article selection

Figure 1: Flow chart of clinical article selection for the review of paramedic remote access to clinical advice



Appendix C: Forest plots

No relevant clinical evidence identified.

Appendix D: Clinical evidence tables

No relevant clinical evidence identified.

Appendix E: Economic evidence tables

No studies were included.

Appendix F: GRADE tables

No relevant clinical evidence identified.

Appendix G: Excluded clinical studies

Table 3: Studies excluded from the clinical review

Study	Reason for exclusion
Abrashkin 2016[1]	No relevant outcomes
Adeyinka 1996[2]	Review article detailing the development of tele-ambulance workstations
Amarenco 2007[3]	Incorrect intervention (video conferencing patients to aid diagnosis)
Ball 2006[4]	Article with no data to present
Banitsas 2005[5]	Looks at the technology and operational side of telemedicine
Banitsas 2006[6]	No outcomes of interest
Barrett 2016[7]	No relevant outcomes
Beauchamp 2009[8]	Incorrect intervention (those with no medical training instructed using a telephone-directed protocol to assess airway placement
Benger 2002[9]	Descriptive paper only
Bergrath 2011[12]	Looks at the technology and operational side of telemedicine
Bergrath 2012[11]	EMS physician present in ambulance. No outcomes of interest
Bergrath 2013[10]	No outcomes of interest
Birati 2008[13]	Telemedicine to instruct patients to perform CPR
Bøtker 2016[14]	Incorrect comparison – types of symptoms
Brouns 2015[15]	Abstract only
Buscher 2014[16]	Looks at the technology and operational side of telemedicine
Bussiéres 2016[17]	Incorrect comparison; no relevant outcomes
Cabrera 2002[18]	Economic evaluation
Cho 2015[19]	No extractable outcomes
Cicero 2015[20]	No outcomes of interest
Correa 2011[21]	Test run of telemedicine focusing on operational side
Criss 2002[22]	Magazine article. No data presented
Curry 1998[23]	Review of the implementation of telemedicine
Czaplik 2014[24]	Review of the requirements for the use of telemedicine
Dietrich 2014[25]	Economic evaluation
Ebinger 2014[26]	No telemedicine
Espinoza 2015[27]	Study protocol
Fakhraldeen 2016[28]	Incorrect intervention - does not constitute 'remote' support
Felzen 2016[29]	No relevant outcomes
Gagliano 1998[30]	Magazine article
Grim 1989[31]	Attempts to justify the need for telemedicine
Hara 2015[32]	No extractable outcomes
Hsieh 2010[33]	Looks at the technology and operational side of telemedicine
Hubert 2014[34]	No outcomes of interest
Itrat 2016[35]	No extractable outcomes
Joanna2017[36]	This is an article which discussed one scheme where the

Study	Reason for exclusion
	paramedics were trained to refer patients to a GP service. Incorrect study design, inappropriate intervention, no comparison group.
Kawakami 2016[37]	Different system which was not applicable to UK practice
Keane 2009[38]	Incorrect intervention (telemedicine in the ED)
Krumperman 2015[39]	No extractable outcomes
Langabeer 2016[40]	Different system which was not applicable to UK practice
Liman 2012[41]	Tele medicine prototype and its feasibility
Lippman 2016[42]	No relevant outcomes
Mandellos 2004[43]	Looks at the technology and operational side of telemedicine
Morrison 2013[44]	Incorrect population (rural area and mid-level health care workers)
Nagata 2016[45]	Incorrect intervention – time at scene
Nordberg 1996[46]	Report on telemedicine; no data presented
Nordberg 1999[47]	Updated report on telemedicine; no data presented
Papai 2014[48]	Different system which was not applicable to UK practice
Pedley 2005[49]	Looks at the technology and operational side of telemedicine
Raaber 2016[50]	Different system which was not applicable to UK practice
Terkelsen 2002[51]	No outcomes of interest
Wendt 2015[52]	Different system which was not applicable to UK practice
Yperzeele 2014[53]	Looks at the technology and operational side of telemedicine
Zanini 2008[54]	Different system which was not applicable to UK practice

Appendix H: Excluded economic studies

Reference	Reason for exclusion
Dietrich 2014[25]	This study was assessed as not applicable. The study compares a mobile stroke unit to an ambulance; hence, telemedicine/remote support is not the only difference between the intervention and the comparator. There is some uncertainty regarding the applicability of data on resource use and costs from Germany to current UK NHS context. QALYs were not assessed, as only costs were compared. Estimates of relative effectiveness are obtained from a study that compared a fully equipped mobile stroke unit to conventional stroke treatment.