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Clinical paper

Factors that influence paramedic decision-making about resuscitation for treatment of out of hospital cardiac arrest: Results of a discrete choice experiment in National Health Service ambulance trusts in England and Wales

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Abstract

Background: During out of hospital cardiac arrest (OHCA) paramedics must make decisions to commence, continue, terminate or withhold resuscitation. These decisions are known to be complex, subject to variability and often dependent on provider preference. This study aimed to understand paramedic decision-making regarding the commencement of resuscitation using a discrete choice experiment.

Methods: A discrete choice experiment between October-December 2022 surveying paramedics from ten National Health Service ambulance trusts in England and Wales. Respondents were presented with fourteen vignettes, each comprising thirteen attributes, and asked to decide if they would provide resuscitation or not.

Results: Eight hundred and sixty-four paramedics completed the survey (61.8% male, median age 36 years (IQR 17.1)) and half had < 5 years clinical experience (n = 443 (51.2%). Respondents expressed a general preference to offer resuscitation (p = <0.01). All attributes except patient gender were statistically significant and important regarding an offer of resuscitation. Cut-offs where an offer of resuscitation was less likely were patient age of 73 years (p=>0.05), mild dementia (p = >0.05) and moderate frailty (p = <0.01). Paramedic characteristics of female gender, longest (>10 years) and shortest (<5 years) period qualified, lower academic qualification, lower skill level and attending fewer OHCA's were more likely to result in an offer of resuscitation.

Conclusion: During OHCA paramedics use objective and non-objective factors to make pragmatic decisions regarding an offer of resuscitation. Future research should focus on how best to support paramedics to make decisions during OHCA, how variability in decision-making impacts patient outcomes and how this relates to patient and public expectations.

Keywords: Paramedic, Cardio pulmonary resuscitation, Decision-making

Background

Out of hospital cardiac arrest (OHCA) is a time-critical event. National Health Service (NHS) ambulance services provide resuscitation to 30,000 OHCA's annually in the United Kingdom.[1] However, survival rates remain poor[2] and not all causes of OHCA are reversible. With increasingly aged and comorbid populations most patients found with OHCA are unlikely to respond positively to resuscitation.[3] Current recommendations suggest cardiopulmonary resuscitation (CPR) should be considered a conditional therapy and that resuscitation providers should define appropriate criteria for withholding resuscitation.[4]

When faced with a patient experiencing OHCA paramedics must make a decision to commence, continue, terminate or withhold resuscitation[5], but these decisions are known to be complex, involve conscious and unconscious influences deriving from the clinical presentation, personal and medical beliefs, knowledge of patient

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preferences[6], as well as paramedic competence[7] and experience.[8] Many of these factors are not considered in current resuscitation guidelines regarding the commencement of CPR.[4]

As a consequence, there exists variability in paramedic decision making[6] often resulting in the delivery of inappropriate resuscitation.[9,10] Although an offer of resuscitation is often based upon clinical knowledge and experience, these decisions are frequently subject to provider preference[9], family wishes and futility judgements.[11] Understanding paramedic preferences regarding which factors influence their decision to offer resuscitation is receiving increasing international attention and is essential in order to ensure alignment with evidence-based practice, consistency of decision-making and improve patient outcomes. This study aims to understand paramedic decision making regarding the commencement of resuscitation within the context of the unique characteristics that comprise OHCA events using discrete choice experiment (DCE) methods.

Methods

Discrete choice experiments

DCEs are a stated preference survey method designed to elicit responses that reveal the underlying preferences, priorities and the relative importance of key features of a set of alternative hypothetical scenarios. DCE's operate on the assumption that multiple attributes influence decision-making and that all decisions involve trade-offs between the range of elements that constitute the influential attributes. They rely on an individual's knowledge or perceptions of their own preferences, and on their ability to make trade-offs between alternatives. DCE methodology offers a means through which the nuances of decision-making can be understood, by providing insights into the often, implicit trade-offs made, which are not easily accessed through other research methods.[12] DCE's have been used to explore clinician preferences in various settings such as the intensive care unit[13] and the trauma unit[14] and CPR preferences of seriously ill adults[15], but have not yet been used to explore the preferences of paramedics making decisions regarding resuscitation during OHCA.

In this paper we report a DCE study designed to understand the relative importance of different factors in the paramedic decision-making process during OHCA. The DCE was designed following good research practices for the Conjoint Analysis Task Force.[16]

Design of the DCE

Identification/refinement and selection of attributes and levels

A systematic literature review was used to identify paramedic decision-making in clinical practice regarding commencement of resuscitation. Findings from the review were used to develop an interview schedule used in a qualitative study in which paramedics participated in a one-to-one interview to discuss their perceptions and experiences of decision making during OHCA. Phenomenological analysis revealed 72 clinical, patient and scene specific attributes regarded as influential to decision-making during OHCA. The long list of attributes underwent a process of prioritisation or quantitative ranking. An opportunistic sample of paramedics (n = 7) (some in a position of responsibility regarding internal resuscitation policy/audit) ranked each attribute using a 5-point Likert scale, where 1 was the most important/relevant to them, and 5 the least important/relevant. A 5-point Likert scale was selected as it was anticipated some attributes/levels would be of equal importance and it was essential to capture this. Respondents had the opportunity to suggest additional attributes and levels. From this exercise a final list of 13 attributes and 48 levels were constructed (Table 1).

Experimental design and construction of choice tasks

A specialised software programme, Lighthouse Studio (v9.15.0, https://www.sawtoothsoftware.com)[17] was used to generate an optimal experimental design from the attributes and levels. The software created 14 choice sets, 12 random and two fixed, regarding an offer of resuscitation. The two fixed choice sets included one where the attribute levels would theoretically result in the decision to offer resuscitation and one where the attribute levels would theoretically result in a decision to withhold resuscitation. Restrictions were imposed in the design to prevent implausible combinations of attributes and levels (for example younger patient age and frailty). The decision of interest (to offer resuscitation or not) was a binary response to the hypothetical vignette and reflects routine clinical practice whereby paramedics are faced with one patient at a time and must decide whether or not to offer resuscitation to that patient.

The choice sets (vignettes) were then reviewed by a sample of paramedics (n = 4) to ensure attributes and levels *could* plausibly occur together and ensure scenario face validity. Definitions of attributes were provided to ensure common interpretation across respondents. Pilot testing of the DCE vignettes was undertaken alongside a 'think aloud' approach[18], where this same group of four paramedics sat with the researcher and verbalised what/how they were thinking, helping to reveal vague or confusing questions, or other issues in need of clarification. A final internal pilot was conducted with a wider group of paramedics (n = 7) providing a final opportunity to refine vignette wording and structure.

Preference elicitation and data collection

Data collection was undertaken between October and December 2022. All NHS ambulance trusts in England and Wales were approached regarding study participation. Eligible respondents were registered paramedics who provided resuscitation to patients in real OHCA events as part of their role and who had done so in the previous 12 months. Paramedics were alerted to the opportunity to participate by individual trust communications. Respondents were provided with an electronic link to a participant information sheet followed by the electronic survey. Each participant provided demographic data then completed the DCE. A sample vignette is included in Fig. 1.

Data analysis

Summary statistics were used to describe the characteristics of the sample. Vignette responses were analysed using limited dependent variable multiple logistic (hierarchical) regression modelling. The decision to provide resuscitation or not was modelled as a function of the patient factors/levels described in the vignettes and the characteristics of the decision makers (paramedic level factors) allowing the investigation of which patient factors (and levels) drive or inhibit the clinical decision to resuscitate, as well as which characteristics of the decision-makers influence the clinical decision to resuscitate (observed heterogeneity). Interaction of clinician characteristics (covariates) with patient factors allows exploration of how the importance of patient factors/levels may vary by clinician characteristic (eg, age, years of clinical experience, highest academic achievement, etc).

Data were analysed to establish a), overall preference b) the importance and relative importance of attributes and levels c) the significance of clinician characteristics on the decisions/choice to offer

Table 1 – Final list of attributes and levels.

Attributes	Levels
Patient age (years)	26, 31, 47, 56, 65, 73, 89, 97
Patient gender	Male, Female
Initial rhythm	Asystole, Pulseless Electrical Activity (PEA), Ventricular Fibrillation (VF)
No flow interval	Less than 15 minutes
Reversible causes	Possible reversible causes No known reversible causes
Knowledge of a valid DNACPR or Advanced Directive	Yes there is a valid DNACPR or Advanced Directive advising no CPR No, there is no valid DNACPR or Advanced Directive advising no CPR
Location of OHCA	Private dwelling Public location
Initial witnesses to the event	Family or friends Members of the public None
Bystander CPR	Yes No
Patients baseline quality of life	Independent Independent with occasional assistance Regular assistance with most activities Assistance with all aspects of daily living
Dementia	No cognitive decline or dementia Age associated memory loss Mild cognitive impairment Mild dementia Moderate dementia Moderately severe dementia Severe dementia
Frailty	Not frail (CFS 1–3) Vulnerable to frailty (CFS 4) Mildly frail (CFS 5) Moderately frail (CFS 6) Severely frail (CFS 7) Very severely frail or terminally ill (CFS8 or 9)
Family wishes	Family say the patient would not wish to be resuscitated Family wishes are unknown Family will leave all decisions to the paramedic Family insist on the patient being resuscitated

resuscitation or not. The model reports ratio-scaled (1–100) importance scores (coefficients (R^2)) which are relative to the other attributes in the study and summarise the mean preference or importance of each attribute regarding an offer of resuscitation. The intercept [alternative specific constant (ASC) representing underlying preferences for treatment over no treatment, all else constant] and model parameters are assumed to be random and normally distributed. A positive R^2 value for a level or attribute in the model represents a driver of a decision to offer resuscitation, whereas a negative R^2 value represents a decision to withhold resuscitation. p-Values of < 0.05 are statistically significant. Incomplete survey responses were removed from the analysis where appropriate.

Ethics

Ethics approval for this study was received from Northumbria University Research Ethics Committee **[49282]** and the Health Research Authority **[IRAS 317321]**. All respondents provided electronic consent prior to completion of the DCE.

Results

There were 864 respondents in the study (61.8% male, median age 36 years (IQR 17.1)) and half had < 5 years clinical experience (51.2%). Most respondents had provided adult resuscitation more than twice in the last 12 months and had done so in the last 3 months (84.3%). Respondents derived from ten out of eleven NHS ambulance trusts in England and Wales. A minority of respondents opted to provide no demographic data (Table 2). The average time taken to complete the DCE was 30 minutes 18 seconds.

Overview of discrete choice experiment results

There were 10,368 observations of discrete decisions regarding an offer of resuscitation. There was a generic general preference to offer resuscitation to patients described in the hypothetical vignettes (resuscitate n = 6015 (58%) v do not resuscitate n = 4353 (42%)). No respondents indicated withholding resuscitation to all patients in the vignettes and all respondents provided the expected responses to the 2 fixed choice sets regarding offering or withholding resuscitation.

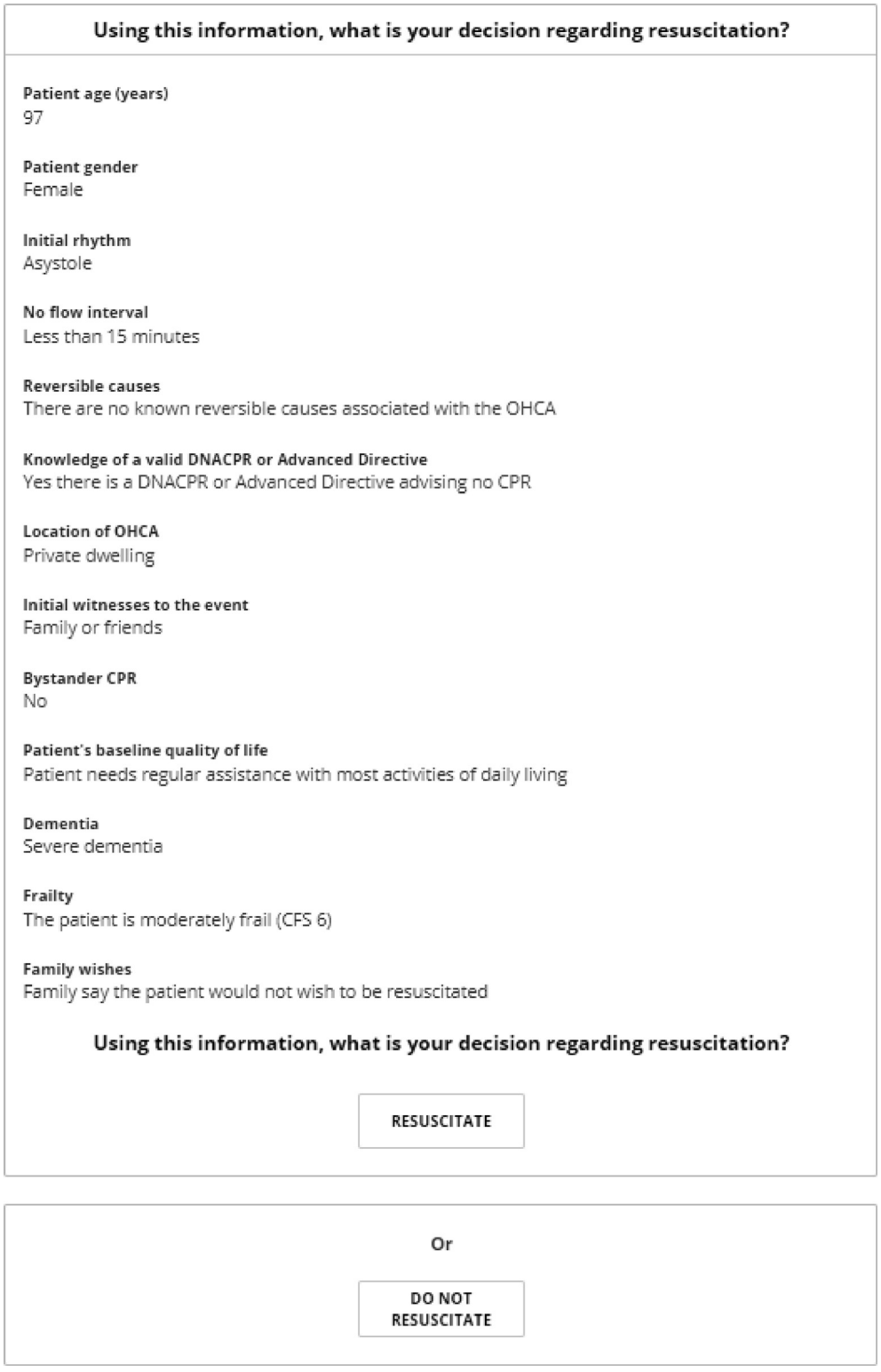

Fig. 1 – Sample vignette.

Attributes

Analysis indicated all attributes were important in a decision to offer resuscitation, the most significant were knowledge of valid DNACPR/ Advanced Directive (R^2 = 19.22 (95% CI 19.05–19.38, p=<0.01)), family wishes (R^2 = 10.67 (95% CI 10.54–10.80, p=<0.01) and patient age (R^2 = 10.3 (95% CI 10.20–10.39, p=<0.01). Other attributes such as reversible causes (R^2 = 2.45 (95% CI 2.35–2.55, p=<0.05) had less of an influence on a decision to offer resuscitation. Patient gender had little influence on the overall decision. The ASC is negative and statistically significantly (R^2 = -8.09 (95% CI −11.61 to −4.56, p=<0.01)), indicating a general preference from all respondents to offer resuscitation (Table 3).

Table 2 – Respondent characteristics.

Respondent characteristics	
	Respondent n(%)
Total n(%)	864 (100)
Respondent Age	
21–30 years	281 (32.5)
31–40 years	271 (31.4)
41–50 years	200 (23.1)
51 years or above	110 (12.7)
Prefer not to say	2 (0.2)
Median age	36 years (IQR 17.1)
Respondent Gender	
Male	534 (61.8)
Female	319 (36.9)
Prefer not to say	11 (1.3)
Years as a qualified paramedic	
Up to 2 years	175 (20.3)
2 to 5 years	268 (31)
6 to 10 years	168 (19.4)
More than 10 years	242 (28)
Prefer not to say	11 (1.3)
Skill level	
Newly Qualified paramedic	176 (20.4)
Paramedic	377 (43.6)
Rapid Response Vehicle paramedic	54 (6.3)
Specialist/Critical Care paramedic	101 (11.7)
Other	144 (16.7)
Prefer not to say	12 (1.4)
Religion	
Yes	114 (13.2)
No	713 (82.5)
Prefer not to say	37 (4.3)
Highest educational qualification	
GCSE/CSE/O Level	25 (2.9)
AS/A Level	27 (3.1)
Undergraduate qualification	608 (70.4)
Post graduate qualification	139 (16.1)
Other	57 (6.6)
Prefer not to say	8 (0.9)
Estimated number of times respondent provided resuscitation in last 12 months	
1 or 2 times	80 (9.3)
Between 3 and 5 times	277 (32.1)
Between 6 and 10 times	258 (29.9)
More than 10 times	238 (27.5)
Unsure	8 (0.9)
Prefer not to say	3 (0.3)
Estimated number of months since respondent last provided adult resuscitation	
In the last 3 months	728 (84.3)
Between 4 and 6 months	94 (10.9)
Between 7 and 12 months	36 (4.2)
Prefer not to say	6 (0.7)

Attribute levels

The influence of each level varied regarding the decision of interest. An offer of resuscitation was positively influenced by younger patient age, PEA or shockable rhythm, no flow interval < 15 minutes, reversible causes, absence of a DNACPR/advanced directive, public location, presence of members of the public, bystander CPR, when the patient previously had the best quality of life (least dependency on others, dementia or frailty) and when family confirm resuscitation would be desired.

Analysis highlighted the cut-offs, areas that exist within some attributes where respondent attitudes change regarding an offer of resuscitation; these were patient age of 73 years (R^2 = -1.79 (95% CI −89.17 to −0.73, p=>0.05)), mild dementia (R^2 = 1.10 (95% CI −2.11 to −0.10, p=>0.05) and moderate frailty status (R^2 = -3.35 (95% CI −4.35 to −2.34, p=<0.01). Levels and their significance are shown in Table 4.

Overview of covariates

Differences between covariates and coefficients for all levels were unremarkable and were not statistically significant. Regarding the ASC, all respondents, regardless of gender, indicated a general preference to offer resuscitation, although female paramedics and those

Table 3 – HB analysis for the decision to offer or withhold resuscitation.

Attribute	R^2	95% CI	p value
Patient age (years)	10.3	10.20–10.39	<0.01
Patient gender	1.28	1.21–1.34	>0.05
Initial rhythm	9.16	9.01–9.31	<0.01
No flow interval	9.44	9.26–9.61	<0.01
Reversible causes	2.45	2.35–2.55	<0.05
Knowledge of valid DNACPR/Advanced Directive	19.22	19.05–19.38	<0.01
Location of OHCA	5.62	5.50–5.74	<0.01
Initial witnesses to the event	2.79	2.71–2.87	<0.01
Bystander CPR	7.69	7.55–7.84	<0.01
Patient's baseline quality of life	7.34	7.24–7.44	<0.01
Dementia	4.85	4.71–4.99	<0.01
Frailty	9.19	9.04–9.34	<0.01
Family wishes	10.67	10.54–10.80	<0.01
ASC	−8.09	−11.61 to −4.56	<0.01

significant at $p < 0.05$.

DNACPR, do not attempt cardiopulmonary resuscitation; OHCA, out of hospital cardiac arrest; CPR, cardiopulmonary resuscitation; ASC, alternative specific constant.

preferring not to say were 5 times more likely to do so than their male counterparts (R^2 = -15.53 and -14.73 respectively versus R^2 = −3.5 (all R^2 p=<0.01)). Respondents qualified as a paramedic for the longest (>10 years) and shortest (<5 years) duration, and those with the lowest academic qualifications (educated to undergraduate level) were more likely to make an offer of resuscitation compared to those qualified for 6–10 years or those with a postgraduate qualification. Respondents in specialist or critical care roles were more likely to withhold resuscitation than those in all other roles. A decision to offer resuscitation was inversely related to the number of OHCAs attended in the previous 12 months (all R^2 = p=<0.05) (Table 5).

Discussion

To our knowledge this is the first DCE to explore patient and paramedic factors that influence an offer of resuscitation to patients with OHCA in England and Wales. Our analysis indicates a general preference to offer resuscitation, which is unsurprising given current guidelines prevent withholding resuscitation unless irreversible signs of death or a written advance directive are present.[4] Furthermore, even when paramedics are aware that resuscitation would be futile or inappropriate, they still often start or continue treatment.[19,20].

Respondents indicated patients with younger age were much more likely to receive an offer of resuscitation, which is concurrent with previous research[21] and which has also reported younger age is associated with longer[22] and more aggressive resuscitation efforts.[7] The fact respondents in this study would withhold resuscitation in individuals with advanced age suggests they may believe older patients may not want resuscitation, or perceive advanced age to be incompatible with optimal outcomes[23] or is inappropriate.[10] Younger patients have an improved chance of survival following OHCA[24] and do so with more favourable neurological outcomes[25]. Whilst these individuals have fewer risk factors, fewer comorbidities and less ischemia[26], it is OHCA factors rather than chronological age and comorbidity that influence survival.[27]Respondents in this study indicated the cut-off regarding an offer of resuscitation was 73 years, roughly concurrent with previous research.[10] However, although survival rates do decline with age, even in individuals aged ≥ 90 years, defined subsets with a survival rate of more than 10% do exist and neurological outcome remains similar regardless of age,[28] suggesting the validity of this cut-off requires further investigation. Careful consideration is necessary when making any treatment decisions during OHCA solely for the reason of advanced age.

Respondents indicated they would make an offer of resuscitation in the presence of favourable objective indicators such as initial shockable rhythm[3], a witnessed OHCA and bystander CPR[29], but would withhold resuscitation otherwise. In addition, analysis suggests paramedics consider other determinants of a successful resuscitation attempt that are disregarded in current guidelines, such as a poor quality of life[30] prior to the OHCA or in those with dementia, where resuscitation is three times less likely to be successful than in individuals who are cognitively in-tact and where those who are conveyed to hospital usually die with 24 hours.[24]

Whilst these factors are often subjective and may be difficult to determine, particularly during an OHCA, this finding suggests some paramedics anticipate individuals with increased dependency will not survive resuscitation or will forgo a good neurological recovery, and that resuscitation is therefore inappropriate. However, how quality of life impacts survival from OHCA is unclear. Andrew et al (2017) reported quality of life is prognostic of reduced odds of survival to hospital and favourable recovery at 12 months following OHCA,[31] whilst Beesems et al (2015) argue resuscitation related factors and not comorbidity determine outcomes.[27] The fact cut-offs regarding patient age and dementia did not reach statistical significance indicates some paramedics may be inclined to give the patient the 'benefit of the doubt' regarding the chance of success, and in a belief CPR outweighs any risks.

In the current study respondents indicated mild frailty (CFS 1–5) had a ceiling effect regarding an offer of resuscitation. This corresponds with other research suggesting paramedics consider how 'worn out' a patient appears,[20] and that resuscitation is often withheld when a first physical impression of the patient is 'poor' or 'bad'.[5] Several studies conclude that in individuals with frailty who undergo resuscitation outcomes are very unfavourable.[32,33] Despite the absence of policy or practice recommendations regarding frailty and OHCA, respondents clearly recognise that frailty can complement other prognostic factors in determining poor outcomes from

Table 4 – Utility scores by attribute and level regarding the decision to offer or withhold resuscitation.

Attribute and level	R^2	SD	95% CI	P value
Patient age (years)				
26	10.14	25.17	8.46–11.82	<0.01
31	18.01	19.75	16.69–19.33	<0.01
47	27.83	10.35	27.13–28.52	<0.01
56	10.61	12.86	9.75–11.46	<0.01
65	38.07	14.81	37.08–39.05	<0.01
73	−1.79	15.94	−89.17 to −0.73	>0.05
89	−14.69	10.29	−15.38 to −14.01	<0.01
97	−88.16	15.21	−89.17 to −87.15	<0.01
Patient gender				
Male	0.45	10.64	−0.26–1.16	>0.05
(Female)	(-0.45)	(10.64)	(-1.16–0.26)	(>0.05)
Initial rhythm				
Asystole	−69.07	15.40	−70.10 to −68.05	<0.01
Pulseless electrical activity (PEA)	22.14	13.73	21.22–23.05	<0.01
Ventricular fibrillation (VF)	46.93	18.81	45.68–48.19	<0.01
No flow interval				
Less than 15 minutes	61.31	17.51	60.14–62.47	<0.01
(More than 15 minutes)	(-61.31)	(17.51)	(-62.47 to −60.14)	(<0.01)
Reversible causes				
Possible reversible causes	15.52	10.46	14.82–16.21	<0.01
(No known reversible causes)	(-15.52)	(10.46)	(-16.21 to −14.82)	(<0.01)
Knowledge of a valid DNACPR or Advanced Directive				
Yes there is a DNACPR or Advanced Directive advising no CPR	−159.28	20.99	−160.68 to −157.88	<0.01
No there is no known DNACPR or Advanced Directive advising no CPR	86.85	16.29	85.76–87.93	<0.01
Unknown	72.43	14.40	71.47–73.39	<0.01
Location of OHCA				
Private dwelling	−36.51	11.83	−37.30 to −35.72	<0.01
(Public location)	(36.51)	11.83	(35.72—–37.30)	(<0.01)
Initial witnesses to the event				
Family or friends	−12.68	11.31	−13.44 to −11.93	<0.01
Members of the public	13.26	10.08	12.59–13.93	<0.01
None	−0.58	16.80	−1.70 to 0.54	>0.05
Bystander CPR				
Yes	49.99	14.09	49.05–50.93	<0.01
(No)	(-49.99)	14.09	(-50.93 to −49.05)	<0.01
Patient's baseline quality of life				
Independent	51.04	11.78	50.25–51.83	<0.01
Independent with occasional assistance	15.59	19.19	14.31–16.87	<0.01
Regular assistance with most activities	−36.12	20.27	−37.47 to −34.77	<0.01
Assistance with all aspects of daily living	−30.51	11.23	−31.26 to −29.76	<0.01
Dementia				
No cognitive decline or dementia	11.67	22.40	10.17–13.16	<0.01
Age associated memory loss	9.04	11.99	8.24–9.84	<0.01
Mild cognitive impairment	3.59	15.91	2.53–4.65	<0.01
Mild dementia	−1.10	15.08	−2.11 to −0.10	>0.05
Moderate dementia	17.31	14.69	16.33–18.29	<0.01
Moderately severe dementia	−14.77	16.35	−15.86 to −13.68	<0.01
Severe dementia	−25.73	22.47	−27.22 to −24.23	<0.01
Frailty				
Not frail (CFS 1–3)	42.73	14.04	41.79–43.66	<0.01
Vulnerable to frailty (CFS 4)	21.43	12.41	20.60–22.26	<0.01
Mildly frail (CFS 5)	19.81	13.38	18.92–20.70	<0.01
Moderately frail (CFS 6)	−3.35	15.03	−4.35 to −2.34	<0.01
Severely frail (CFS 7)	−6.37	17.42	−7.53 to −5.21	<0.01
Very severely frail or terminally ill (CFS 8 or 9)	−74.25	21.93	−75.71 to −72.79	<0.01
Family wishes				
Family say the patient would not wish to be resuscitated	−78.84	17.82	−80.03 to −77.65	<0.01
Family wishes are unknown	13.44	14.62	12.47–14.42	<0.01
Family will leave all decisions to the paramedic	6.11	11.91	5.31–6.90	<0.01

(*continued on next page*)

Table 4 (continued)

Attribute and level	R^2	SD	95% CI	P value
Family insist on the patient being resuscitated	59.29	13.52	58.39–60.19	<0.01
ASC	−8.09	52.89	−11.61 to −4.56	<0.01

significant at p=<0.05.

SD, Standard Deviation; CI, Confidence Interval; DNACPR, do not attempt cardiopulmonary resuscitation; OHCA, out of hospital cardiac arrest; CPR, cardiopulmonary resuscitation; CFS, clinical frailty scale; ASC, alternative specific constant.

Table 5 – Covariates interacted with HB model.

Covariate	n	R^2	95% CI	P value
Respondent gender				
Male	534	−3.5	−8.05 to −1.05	<0.01
Female	319	−15.53	−21.10 to −9.95	<0.01
Prefer not to say	11	−14.73	−45.56 to −16.10	<0.01
Years as a qualified paramedic				
Up to 2 years	175	−20.14	−26.73 to −13.54	<0.01
2 to 5 years	268	−7.62	−13.91 to −1.32	<0.01
6–10 years	168	5.55	−1.34 – 12.44	<0.01
>10 years	242	−9.43	−16.36 to −2.49	<0.01
Prefer not to say	11	−6.29	−29.80 – 17.22	<0.01
Highest academic qualification				
GCSE/ CSE/O Level	25	−11.77	−7.38 – 30.98	>0.05
AS/A Level	27	−25.68	−40.82 to −10.53	<0.01
Undergraduate	609	−9.63	−14.22 to – 5.04	<0.01
Postgraduate	139	3.52	−5.34 – 12.38	<0.01
Other	57	−11.44	−25.96 – 3.08	<0.01
Prefer not to say	8	2.62	−21.76 – 27.05	<0.01
Number of OHCA's attended in last 12 months				
1 or 2 times	80	−10.98	–23.49 – 1.53	<0.01
3 – 5 times	277	−15.94	−21.88 to −9.99	<0.01
6 – 10 times	258	−10.01	−16.35 to −3.66	<0.01
>10 times	238	4.25	−2.81 – 11.31	<0.01
Unsure	8	−20.78	−54.90 – 13.34	<0.01
Prefer not to say	3	15.67	12.79 – 18.63	<0.01
Skill				
NQP	176	−20.36	−26.28 to −14.43	<0.01
Paramedic	377	−10.8	−16.11 to −5.48	<0.01
RRV paramedic	54	−6.8	−20.78 to −7.18	<0.01
Specialist or critical care paramedic	101	15.85	5.73 – 25.96	<0.01
Other	144	−2.09	−10.86 – 6.68	<0.05
Prefer not to say	12	−21.9	−45.38 −1.58	<0.01

OHCA, out of hospital cardiac arrest; GCSE, general certificate of secondary education; A-Level, advanced level; NQP, newly qualified paramedic; RRV, rapid response vehicle.

resuscitation.[34] However, frailty cannot be accurately measured at the time of the OHCA[35] and to date is not routinely used in paramedic practice to underpin decision-making.[36]

That respondents indicated they were more likely to make an offer of resuscitation when the OHCA was in a public location or when the general public were present may be explained by the difficulty in having conversations regarding withholding resuscitation in such settings, and likely compounded by the fact public perceptions of survival from resuscitation are optimistic.[37] In such situations there is likely a degree of social desirability to appear to be doing something in the presence of members of the public[38], who may not understand, or who may look unfavourably on, decisions to withhold resuscitation.

In this study, male respondents, those qualified for longer, higher academic qualifications, those exposed to the most OHCA events and paramedics with higher skill level were more likely to withhold resuscitation. It is likely this reflects increased experience and familiarity with managing OHCA events. Respondents with more experience and higher skill level are likely to have witnessed many unsuccessful resuscitation attempts, helping to refine and inform their decision-making. In their study, Dyson et al (2016) found increased paramedic exposure to OHCA was associated with reduced odds of attempted resuscitation but increased survival[39], underpinning how improved decision-making influences patient outcomes. In addition to the consideration of objective, clinical factors and scientific knowledge, paramedics also use heuristic, tacit

knowledge[40] to help inform decision-making. Why female respondents were more likely to offer resuscitation remains unclear, but this finding has been reported elsewhere.[41] Paramedics with less clinical experience and skill may benefit from additional education and support to help develop decision-making skills during OHCA.

These findings have implications for clinical practice. There are clearly ethical dilemmas in making an offer of resuscitation discriminated by advanced age or subjective measurements such as quality of life, dementia or frailty. Nevertheless, respondents in this study have indicated that these factors are considered important when making an offer of resuscitation. These factors are likely used to determine appropriateness of treatment and likelihood of success. It remains unclear how decisions made in this way reflect patient and public expectations.

Strengths and limitations

This study has used novel methods to determine the preferences, priorities, cut-offs and relative importance of key features involved in an offer of resuscitation in OHCA. The vignettes used for data collection were systematically and rigorously constructed to ensure validity, relevance and plausibility. The DCE achieved a good response rate and included respondents from all but one NHS ambulance trust in England and Wales, providing a broad perspective of paramedic decision making in OHCA.

Whilst the vignettes were robustly constructed and comprised a wide-ranging list of attributes, it is acknowledged much of the information in the vignettes is unknown in real OHCA events. In addition, the vignettes made no reference to environmental conditions, or the emotional and physical stress and cognitive load experienced by the paramedic, meaning the vignettes may lack sensitivity to decision-making contexts. The design process of most published DCE studies is under-reported, consequently attributes and levels in this study were not based on published data. It is acknowledged this may lead to bias or reduce external validity. It is conceivable that when faced with a 'real-life' OHCA respondents would make different decisions regarding an offer of resuscitation than those they have indicated in this study. We were unable to collect any information on those who declined to participate in the study.

Conclusion

During OHCA paramedics use objective and non-objective factors to make pragmatic decisions regarding an offer of resuscitation. Perceptions of non-objective factors and their cut-offs are often subjective and open to interpretation, which may explain the variability in decision-making. Future research should focus on how best to support paramedics to make decisions during OHCA, how variability in decision-making impacts patient outcomes and how this relates to patient and public expectations.

CRediT authorship contribution statement

Karl Charlton: Writing – original draft, Validation, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Angela Bate:** Conceptualization, Data curation, Writing – review & editing of the manuscript, Validation and Formal analysis, Methodology, Supervision and Software.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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