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BRIEF RESEARCH REPORT

Emergency Medical Services

Emergency medical service interpretation of Physician Orders for Life-Sustaining Treatment (POLST) in cardiopulmonary arrest

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Abstract

Objective: Physician Orders for Life-Sustaining Treatment (POLST) forms exist in some form in all 50 states. This study evaluates emergency medical service (EMS) practitioners interpretation of the POLST in cardiopulmonary arrest.

Methods: This study used a prospective convenience sample of California Bay Area EMS practitioners who reviewed 6 fictional scenarios of patients in cardiopulmonary arrest and accompanying California POLST forms. Based on the cases and POLST, EMS practitioners identified patient preference for "attempt resuscitation," "do not attempt resuscitation/DNR," or "unsure" and subsequently selected medical interventions (ie, chest compressions, defibrillation, and so on). They also rated their confidence in POLST use and interpretation.

Results: In scenarios of cardiopulmonary arrest and POLST that indicated do not resuscitate (DNR)/do not attempt resuscitation (DNAR) and full treatment, only 45%–65% of EMS practitioners correctly identified the patient as DNR/DNAR. EMS practitioners were more likely to interpret the POLST correctly in scenarios where patients were DNR/DNAR but indicated selective treatment (86%; 168/196) or comfort-focused treatment (86%; 169/196). In cardiopulmonary arrest scenarios where the patient was correctly identified as DNR/DNAR, EMS practitioners frequently selected defibrillation, advanced airway, or epinephrine as appropriate treatment. For all 6 scenarios, there was no statistical difference in response selection with level of training (emergency medical technician/paramedics) or type of EMS personnel (fire based/private).

Conclusion: The POLST is a powerful tool to convey medical treatment preferences; however, there is significant variation in the interpretation and application by EMS practitioners. To improve the POLST effectiveness, the authors suggest more EMS input into POLST development, concise language that defines resuscitation, and more EMS education about clinical application.

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1 | INTRODUCTION

1.1 | Background

Emergency medical service (EMS) practitioners frequently make important decisions about life-prolonging treatment in the field. As first responders, stabilizing an acute medical problem while trying to gather information about patient preferences for end-of-life care is a difficult task. In 1994, ethicists in Oregon designed the first the Physician Orders for Life-Sustaining Treatment (POLST) to address this challenge and support medical professionals, both in and out of hospital settings, to provide treatment aligned with a patient's goals of care.[1] The POLST is a form containing medical orders that can be voluntarily completed by people with serious illness to communicate preferences for cardiopulmonary resuscitation (CPR) as well as other medical treatment such as hydration, antibiotics, and intubation.[1,2]

1.2 | Importance

POLST forms have become increasingly more commonplace and are now a widely accepted adjunct to the advance directive.[3] POLST exist in some form in all 50 states, many of which are adapted to local state protocols and standards of care.[4] To serve their purpose, POLST forms are short and concise but must also be useful and comprehensible to their 3 intended audiences: patients, physicians, and EMS practitioners. Despite their ubiquity, there are very limited studies of EMS attitudes, use, and interpretation of POLST forms.[5–8] One survey of emergency medical technicians (EMTs) concluded that 93% found the forms useful in cardiopulmonary arrest but only 63% found the form helpful in guiding treatment for patients with a pulse and breathing.[5] In a separate study by Mirarchi et al, significant variations in EMS practitioner responses to POLST forms and case scenarios demonstrated underlying confusion in the understanding of the Pennsylvania POLST.[7] One systematic literature review found moderate strength of evidence that treatment limitations on POLST may reduce treatment intensity among patients with serious illness in the prehospital setting; however, limitations in analysis do not allow an understanding of specifically when discordant interpretation occurs.[9]

1.3 | Goals of this investigation

The primary objective of this study is to determine EMS practitioner interpretation and application of the POLST. The secondary objective is to assess EMS practitioner confidence with applying the POLST to different clinical scenarios.

The Bottom Line

A study of 196 emergency medical services (EMS) in the Bay Area region of California applying the state's Physician Orders for Life-Sustaining Treatment (POLST) document to 6 fictional scenarios of cardiopulmonary arrest showed significant variations in the interpretation and application of POLST by EMS professionals. These results highlight the need for ongoing EMS input and education regarding the development and use of these advanced care documents.

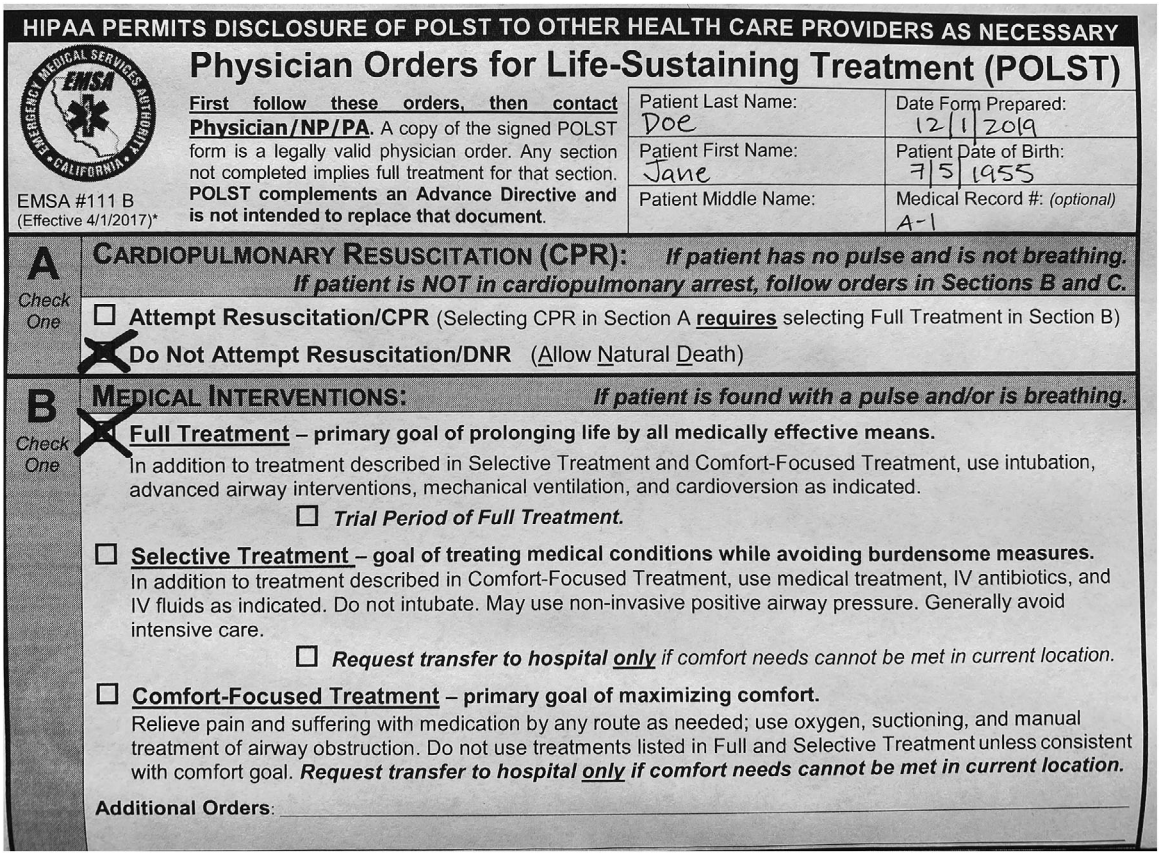
2 | METHODS

2.1 | Study design, setting, and selection of participants

This is a prospective study that used an internet-based survey (Google forms, Mountainview, CA; Qualtrics, Seattle, WA; Appendix 1) with a convenience sample of California Bay Area EMS practitioners between September 2021 and November 2021. Local EMS agency stakeholders (Alameda, Contra Costa, San Francisco, Coastal Valleys, San Mateo, CA) were asked to disseminate a recruitment letter from the senior author requesting distribution of the survey link to EMT/paramedics.

2.2 | Intervention

Participants were asked to review fictional cases of patients in cardiopulmonary arrest and accompanying fictional mock California POLST forms (Table 1 and Figure 1). On the California POLST (Figure 1), for patients with no breathing or pulses, there is an option to "attempt resuscitation" or "do not attempt resuscitation/DNR." For patients with a pulse or breathing, there is an option for "full treatment," "selective treatment" and "comfort-focused treatment." These fictional POLST forms specified patient preferences as medical orders in the event of cardiopulmonary arrest (POLST Part A) and if they were breathing and had a pulse (POLST Part B). The cases were identical to those used by the Pennsylvania-based study by Mirarchi et al; however, because the study was adapted to the California POLST and EMS system, a panel of local California EMS and palliative care experts reviewed correct responses. Cases 1 and 4 are identical to assess internal consistency of participants. Participants were also asked questions regarding participant confidence, comfort, and experience with POLST training. The cases were piloted on EMT and paramedics before distribution. They reviewed the pilot survey and provided input on readability, clinical appropriateness, and length of time for completion. Feedback was integrated into the survey design.



HIPAA PERMITS DISCLOSURE OF POLST TO OTHER HEALTH CARE PROVIDERS AS NECESSARY

Physician Orders for Life-Sustaining Treatment (POLST)

EMSA #111 B
(Effective 4/1/2017)*

First follow these orders, then contact Physician/NP/PA. A copy of the signed POLST form is a legally valid physician order. Any section not completed implies full treatment for that section. **POLST complements an Advance Directive and is not intended to replace that document.**

Patient Last Name: Doe	Date Form Prepared: 12/1/2019
Patient First Name: Jane	Patient Date of Birth: 7/5/1955
Patient Middle Name:	Medical Record #: *(optional)* A-1

A Check One — **CARDIOPULMONARY RESUSCITATION (CPR):** *If patient has no pulse and is not breathing. If patient is NOT in cardiopulmonary arrest, follow orders in Sections B and C.*

☐ **Attempt Resuscitation/CPR** (Selecting CPR in Section A **requires** selecting Full Treatment in Section B)

☒ **Do Not Attempt Resuscitation/DNR** (Allow Natural Death)

B Check One — **MEDICAL INTERVENTIONS:** *If patient is found with a pulse and/or is breathing.*

☒ **Full Treatment – primary goal of prolonging life by all medically effective means.**
In addition to treatment described in Selective Treatment and Comfort-Focused Treatment, use intubation, advanced airway interventions, mechanical ventilation, and cardioversion as indicated.

☐ ***Trial Period of Full Treatment.***

☐ **Selective Treatment – goal of treating medical conditions while avoiding burdensome measures.**
In addition to treatment described in Comfort-Focused Treatment, use medical treatment, IV antibiotics, and IV fluids as indicated. Do not intubate. May use non-invasive positive airway pressure. Generally avoid intensive care.

☐ ***Request transfer to hospital only if comfort needs cannot be met in current location.***

☐ **Comfort-Focused Treatment – primary goal of maximizing comfort.**
Relieve pain and suffering with medication by any route as needed; use oxygen, suctioning, and manual treatment of airway obstruction. Do not use treatments listed in Full and Selective Treatment unless consistent with comfort goal. ***Request transfer to hospital only if comfort needs cannot be met in current location.***

Additional Orders: _____

FIGURE 1 Sample mock California Physician Orders for Life-Sustaining Treatment (POLST). HIPAA, health insurance portability and accountability act; NP, nurse practitioner; PA, physician assistant

For each fictional scenario, EMS practitioner interpretation of the POLST was compared with the correct answer determined by expert consensus. Correct answers (bold, Table 2) were considered those that correctly identified the patient preference for resuscitation using (Part A) POLST and then subsequently chose medical interventions that were consistent with that choice and clinical scenario. EMT and paramedic options for medical intervention were appropriate to their defined local scope of practice. For example, survey choices for EMTs did not allow for the selection of an advanced airway (ie, intubation/supraglottic airway), thus the analysis of advanced airway selection is limited to only paramedic participants. Using a Likert scale, participants were asked to self-assess if they "know how to use a POLST" to make medical decisions about resuscitation and treatment.

Responses were anonymous. The survey was ≈20 minutes in length, and participants received a $20 gift card for participation. The Strengthening the Reporting of Observational Studies in Epidemiology guidelines were applied.[10] The University of California San Francisco Institutional Review Board approved the study.

2.3 | Analysis

For each of the 6 scenarios, participant submissions were evaluated for correct interpretation based on expert consensus. Participant self-assessed knowledge confidence was then compared with the correct interpretation of the 6 scenarios. Chi-square analysis was performed to assess for statistical significance in the correct interpretation in different training levels (EMT/paramedic), years of experience (≤5 years/≥6 years), and type of EMS system (fire based/private).

3 | RESULTS

3.1 | Characteristics of study participants

There were 196 study participants from 6 bay area counties. The slight majority of participants were paramedics (60.1%; 119/196). The average age of the participants was 33.3 years (range, 18–60 years), with a mean of 10.4 years and median of 8.5 years of EMS experience (range, 0–38 years). The majority of participants identified as male (73.1%, 131) and were private EMS based (59.1%, 117). Only 34.3% of participants reported prior formal training on POLST. The summary of participant demographic data is provided in Table 1.

3.2 | Main results

In cases of cardiopulmonary arrest and POLST that indicated DNR/DNAR full treatment (Cases 1, 3, and 4) 45%–65% of EMS

TABLE 1 Demographic description of survey participants

Characteristic	Mean	Minimum	Maximum
Age, years	33.2	18	60
EMS experience, years	10.4	0	38
	Frequency	Total (N = 196), %	
Sex			
Female	61	31.1	
Male	130	66.3	
Non-binary	2	1.0	
Declined to answer	4	1.5	
Level of EMS training			
EMT	78	39.8	
Paramedic	118	60.2	
Type of EMS system			
Fire based	81	41.3	
Private	115	58.7	
Prior training on POLST			
No	56	28.6	
Yes, self-training	70	35.7	
Yes, formal training	68	33.7	
Yes, other[a]	4	2.0	

Abbreviations: EMS, emergency medical services; EMT, emergency medical technician; POLST, Physician Orders for Life-Sustaining Treatment.
[a]Other answers included "mother is a palliative care social worker," "on the job," "from other field providers," and "speaking with hospice."

practitioners correctly identified the patient as DNR/DNAR. In Case 1, where a patient had a ventricular tachycardia arrest and a POLST that indicated DNR/DNAR and full treatment, 65% (128/196) of EMS practitioners correctly identified the patient as DNR/DNAR. Of those who correctly selected DNR/DNAR, 19% (24/128) defibrillated the patient and 1% (1/128) initiated CPR. For paramedics who correctly selected DNR/DNAR, 21% (17/82) placed an advanced airway, 18% (15/82) gave epinephrine, and 12% (10/82) placed an intraosseous line. In Case 4, which is clinically identical, the EMS practitioner interpretation (69%; 136/196; correctly selected DNR/DNAR) and frequency of intervention selected were similar (eg, 18.4%; 25/136; defibrillated patients after selecting DNR/DNAR). Between Cases 1 and 4, 89.2% (175/196) of respondents gave identical answers, thus demonstrating a degree of internal consistency of participants.

In Case 2, where a patient had a ventricular fibrillation arrest and a POLST that indicated DNR/DNAR and selective treatment, 86% (168/196) of EMS practitioners correctly identified the patient as DNR/DNAR. In Case 3, where a patient had a respiratory arrest and a POLST that indicated DNR/DNAR and full treatment, 45% (89/196) correctly identified the patient as DNR/DNAR. Of the paramedics who correctly selected DNR/DNAR, 72% (42/58) used an advanced airway on this patient. In Case 5, where a patient had a respiratory arrest and a POLST that indicated DNR/DNAR and comfort-focused treatment, 86% (169/196) of patients correctly identified the patient as DNR/DNAR. In Case 6, where a patient had a respiratory arrest and a POLST that indicated attempt CPR and full treatment, 95% (186/196) correctly selected attempt resuscitation.

Using a chi-square analysis for each of the 6 cases, the correct assessment of POLST status was not associated with training level (paramedic/EMT) or type of EMS system (fire based/private). With the exception of 1 scenario, correct assessment of POLST status was not associated with years of experience (≤5 years/≥6 years; Appendixes 2–4).

In the beginning of the survey, using a Likert scale, participants were asked if they "know how to use a POLST" to decide to resuscitate or provide medical interventions for a patient. Participant confidence in POLST use is compared with the number of cases the participants interpreted correctly (Table 3). When providers were asked at the conclusion of the survey an additional question about finding "POLSTs confusing," there was an overall even distribution between participants who strongly agree/agree (37%; 68/183), were neutral (28%;51/183), or strongly disagree/disagree (35%;64/183). Lastly, when EMS practitioners were asked what their ideal method for additional POLST training would be, 32% (62/195) preferred online modules, 23% (45/195) preferred video, 10% (20/195) preferred simulation with actors, and 30% (59/195) preferred a hybrid method. In addition, several comments included "any method will work," "all of the above," and "training in EMT/paramedic school and review during annual policy."

3.3 | Limitations

The major limitation of this study is applying discordance in survey selection to real-world clinical scenarios of patients who are critically ill. Other limitations include a participation bias; those who participated in the study might have predisposing training experiences or interest in the topic that might limit generalizability. Moreover, because the methodology sought a convenience sample, it is unknown how many total EMS practitioners received the survey and the overall response rate. Moreover, because both EMS systems and POLST have significant geographic variation, it is unclear how generalizable these findings are beyond California; however, the variation in EMS practitioner interpretation does seem comparable with the Pennsylvania-based study from 2013 to 2014 by Mirarchi et al. This suggests that challenges with the POLST interpretation are perhaps a system-wide EMS challenge that has not changed significantly during the past few years.

An additional limitation, inherent to electronic survey data, is the possibility of "mis-clicks" errors, where the selected answer is not what the participant intended. As an example, in Scenario 1, there was a single participant who selected DNR/DNAR and chose CPR, and this likely represents a "mis-click" given how incongruous the answer; however, this was an overall infrequent event (<1%; 1/196).

TABLE 2 EMS practitioner POLST interpretation

		EMS practitioner POLST interpretation, n = 196		
		Attempt resuscitation, n (%)	DNR/DNAR, n (%)	Unsure, n (%)
Case 1: a 66-year-old woman with chest pain, shortness of breath, and diaphoresis. Vital signs were the following: P, 110; RR, 30; SaO_2, 97% RA; T, 37°C; and BP, 130/70. The patient was given O_2, aspirin, and nitroglycerin en route. Prehospital ECG showed acute ST-segment elevation anterior wall MI. The family provided a list of medications and the POLST document. Abruptly the patient's clinical status changed during transport: she became unresponsive and developed VT/VF arrest. **POLST scenario**: DNR/DNAR–full treatment **Correct responses**: DNR/DNAR; interventions: none ± bag valve mask	EMT	30 (38)	46 (59)	2 (3)
	Paramedic	28 (24)	82 (69)	8 (7)
	Total	58 (30)	128 (65)	10 (5)
	Frequency of interventions selected			
	None	1 (2)	**84 (66)**	2 (20)
	Bag valve mask	51 (88)	**40 (31)**	8 (80)
	Chest compressions	47 (81)	1 (1)	5 (50)
	Defibrillation	53 (93)	24 (19)	8 (80)
	Advanced airway[a]	24 (86)	17 (21)	6 (75)
	Epinephrine[a]	24 (86)	15 (18)	6 (75)
	Intraosseous line[a]	21 (75)	10 (12)	6 (75)
Case 2: a 70-year-old man with a history of diabetes, hypertension, high cholesterol, and coronary artery disease status post-CABG 10 years ago. The patient was experiencing chest pain, clammy, and in mild distress. Vital signs were the following: T, 36 C; P, 60; BP, 100/60; RR, 22; SaO_2, and 98% RA. The family gave a list of medications and the POLST document. Abruptly, the patient became unresponsive without palpable pulses; the monitor showed VF. **POLST scenario**: DNR/DNAR–selective treatment **Correct responses**: DNR/DNAR; interventions: none ± bag valve mask	EMT	11 (14)	64 (82)	3 (4)
	Paramedic	13 (11)	104 (88)	1 (1)
	Total	24 (12)	**168 (86)**	4 (2)
	Frequency of interventions selected			
	None	0	**109 (65)**	2 (50)
	Bag valve mask	19 (79)	**57 (34)**	2 (50)
	Chest compressions	16 (67)	1 (1)	1 (25)
	Defibrillation	14 (58)	8 (5)	1 (25)
	Advanced airway[a]	0	0	0
	Epinephrine[a]	8 (62)	10 (10)	1 (100)
	Intraosseous line[a]	6 (46)	9 (9)	1 (100)
Case 3: an 87-year-old man called 911 with a complaint of sudden shortness of breath. The patient was agitated, confused, and in severe respiratory distress. Vital signs were the following: P, 130; RR, 50; BP, 70/50; T, 37°C; SaO_2, and 78% on non-rebreather. The patient's wife gave a list of medications and the POLST document. Abruptly, the patient went into respiratory arrest. **POLST scenario**: DNR/DNAR–full treatment **Correct responses**: DNR/DNAR; interventions none ± bag valve mask	EMT	43 (55)	31 (40)	4 (5)
	Paramedic	48 (41)	58 (49)	12 (10)
	Total	91 (46)	**89 (45)**	16 (8)
	Frequency of interventions selected			
	None	1 (1)	**16 (18)**	2 (13)
	Bag valve mask	87 (96)	**72 (81)**	13 (81)
	Chest compressions	30 (33)	3 (3)	2 (13)
	Defibrillation	35 (38)	8 (9)	4 (25)
	Advanced airway[a]	45 (94)	42 (72)	7 (58)
	Epinephrine[a]	20 (42)	16 (45)	2 (17)
	Intraosseous line[a]	33 (69)	22 (38)	3 (25)

(Continues)

4 | DISCUSSION

Overall, EMS practitioners had the most variation and, thus, difficulty interpreting POLST forms that indicate DNR/DNAR full treatment. The most striking example of this confusion in interpretation is Case 3 (DNR/DNAR full treatment), where <50% of EMS practitioners correctly selected DNR/DNAR. Although the POLST attempts to clearly distinguish DNR/DNAR as a medical order that only applies during cardiopulmonary arrest (Part A), and full treatment as a medical order that applies to patients who are breathing and have a pulse (Part B), in applied clinical practice these terms seem to be confusing.

TABLE 2 (Continued)

		EMS practitioner POLST interpretation, n = 196		
		Attempt resuscitation, n (%)	DNR/DNAR, n (%)	Unsure, n (%)
Case 4: a 66-year-old man with chest pain, shortness of breath, and diaphoresis. Vital signs were the following: P, 110; RR, 30; SaO_2, 97% RA; T, 37 C; and BP, 130/70. The patient was given O_2, aspirin, and nitroglycerin en route. Prehospital ECG showed acute ST-segment elevation anterior wall MI. The family provided a list of medications and the POLST document. Abruptly the patient's clinical status changed during transport: he became unresponsive and developed VT/VF arrest. **POLST scenario**: DNR/DNAR–full treatment **Correct responses**: DNR/DNAR; interventions: none ± bag valve mask	EMT	25 (32)	49 (63)	4 (5)
	Paramedic	23 (19)	87 (74)	8 (7)
	Total	48 (24)	**136 (69)**	12 (6)
	Frequency of interventions selected			
	None	0	**88 (65)**	2 (17)
	Bag valve mask	42 (88)	**44 (32)**	10 (83)
	Chest compressions	42 (88)	5 (4)	5 (42)
	Defibrillation	47 (98)	25 (18)	6 (50)
	Advanced airway[a]	21 (91)	18 (21)	4 (50)
	Epinephrine[a]	21 (91)	17 (20)	5 (63)
	Intraosseous line[a]	20 (87)	13 (15)	4 (50)
Case 5: a 52-year-old man with chest pain, shortness of breath, and diaphoresis. Vital signs were the following: P, 110; RR, 30; SaO_2, 97% RA; T, 37 C; and BP, 130/70. The patient was given O_2, aspirin, and nitroglycerin en route. Prehospital ECG showed acute ST-segment elevation anterior wall MI. The family provided a list of medications and the POLST document. Abruptly, he became unresponsive and developed respiratory arrest in the back of the ambulance. **POLST scenario**: DNR/DNAR–comfort-focused treatment **Correct response**: DNR/DNAR; interventions: none ± bag valve mask	EMT	8 (10)	69 (88)	1 (1)
	Paramedic	13 (11)	100 (85)	5 (4)
	Total	21 (11)	**169 (86)**	6 (3)
	Frequency of interventions selected			
	None	4 (19)	**97 (57)**	2 (33)
	Bag valve mask	17 (81)	**71 (42)**	4 (67)
	Chest compressions	3 (14)	2 (1)	0
	Defibrillation	3 (14)	1 (1)	1 (17)
	Advanced airway[a]	3 (23)	3 (3)	0
	Epinephrine[a]	2 (15)	3 (2)	0
	Intraosseous line[a]	2 (15)	6 (6)	4 (80)
Case 6: a 90-year-old man with sudden shortness of breath. The patient was agitated, confused, and in severe respiratory distress. Vital signs were the following: P, 120; RR, 46; BP, 84/60; T, 37 C; SaO_2, and 72% on non-rebreather. His wife gave you a list of medications and the POLST document. Abruptly, the patient went into respiratory arrest. **POLST scenario**: attempt CPR–full treatment **Correct responses**: attempt resuscitation; interventions: any combination except none	EMT	74 (95)	4 (5)	0 (0)
	Paramedic	112 (95)	3 (3)	3 (3)
	Total	**186 (95)**	7 (4)	3 (22)
	Frequency of interventions selected			
	None	**2 (1)**	0	0
	Bag valve mask	**184 (99)**	5 (71)	2 (67)
	Chest compressions	**129 (69)**	1 (14)	2 (67)
	Defibrillation	**126 (68)**	1 (14)	1 (33)
	Advanced airway[a]	**110 (59)**	2 (67)	3 (100)
	Epinephrine[a]	**75 (40)**	1 (33)	1 (33)
	Intraosseous line[a]	**90 (48)**	3 (100)	1 (33)

Note: Bold indicates correct responses.

Abbreviations: BP, blood pressure; CABG, coronary artery bypass graft; CPR, cardiopulmonary resuscitation; DNR/DNAR, do not resuscitate/do not attempt resuscitation; ECG, electrocardiogram; EMS, emergency medical service; MI, myocardial infarction; P, pulse; POLST, Physician Orders for Life-Sustaining Treatment; RA, room air; RR, respiratory rate; SaO_2, oxygen saturation; T, temperature; VF, ventricular fibrillation; VT, ventricular tachycardia.

[a]Paramedic-only intervention. Percentages calculated in this row proportion of only paramedic responses.

TABLE 3 Emergency medical service practitioner confidence in Physician Orders for Life-Sustaining Treatment (POLST) knowledge versus correct interpretation

		Number of correct case interpretations						
Statements		**1**	**2**	**3**	**4**	**5**	**6**	**Total**
At the beginning of the survey before reading cases								
"I know how to use a POLST to decide when to resuscitate a patient."	Strongly disagree	0	1	3	1	0	3	8
	Disagree	0	0	0	0	0	1	1
	Neutral	1	0	2	1	3	4	11
	Agree	6	11	17	17	21	36	108
	Strongly agree	0	5	15	7	10	31	68
	Total	7	17	37	26	34	75	196
"I know how to use a POLST to decide which medical interventions to provide."	Strongly disagree	0	0	2	0	0	2	4
	Disagree	1	0	0	0	1	3	5
	Neutral	1	2	6	1	5	6	21
	Agree	5	10	20	20	21	49	125
	Strongly agree	0	5	9	5	7	15	41
	Total	7	17	37	26	34	75	196
At the end of the survey after reading all cases								
"I find POLSTs confusing."	Strongly agree	1	1	1	3	2	3	11
	Agree	2	3	14	7	9	25	60
	Neutral	1	7	9	7	13	16	53
	Disagree	1	5	11	5	8	28	58
	Strongly disagree	0	1	1	1	1	3	7
	Total	5	17	36	23	33	75	189[a]

[a]The final item allowed for "other" as a response.

In Case 2 (DNR/DNAR selective treatment) and Case 5 (DNR/DNAR comfort-focused treatment), there is less variation in POLST interpretation, whereby ≈ 86% of participants correctly identified the patient as DNR/DNAR in each scenario. Although this represents a clear majority, in real-life clinical scenarios, attempting resuscitation for 86% of patients with a POLST that clearly states DNR/DNAR is not acceptable medical practice. In reality, POLST forms might not be as readily available, and there might be more confusion as to whether a patient is in a state of cardiopulmonary arrest, thus making correct identification likely much lower than 86%.

After correctly interpreting the POLST selection, EMS practitioners selected appropriate medical interventions for each case that should be congruous to the POLST and clinical scenario. There was considerable variation in the medical interventions selected. In Case 1 (DNR/DNAR full treatment), of the 128 participants who correctly selected DNR/DNAR, 19% (24/128) continued to defibrillate and 17% of paramedics (17/82) pursued an advanced airway despite those both being considered resuscitative measures. The California POLST does not clearly define resuscitation/CPR. However, the California Emergency Medical Services Authority defines resuscitative measures to be withheld with DNR/DNAR orders as "chest compressions (CPR), assisted ventilation (breathing), endotracheal intubation, defibrillation, and cardiotonic drugs (drugs which stimulate the heart)."[11] In all scenarios, bag valve mask was considered an acceptable answer because the survey was unable to distinguish if this was a resuscitative effort or intended to provide comfort.

Overall, EMS practitioner self-assessments in "know how to use a POLST" to resuscitate a patient or provide medical interventions were not accurately reflected in the number of scenarios correctly interpreted (Table 3). There were some participants who strongly disagreed with the statement but still interpreted the answers correctly. Conversely, there were several that agreed or strongly agreed that they knew how to use a POLST to decide when to resuscitate or provide medical interventions to a patient but incorrectly interpreted more than half of the scenarios. Overall, confidence in POLST interpretation did not trend with the ability to correctly interpret POLST.

Based on the findings in these data, the authors of this study have several focused recommendations that might improve the effectiveness of EMS practitioner POLST use. First, more concise language can be included in the POLST itself or in local EMS protocols that specifically defines resuscitation. By explicitly stating that DNR/DNAR means "no defibrillation," "no intubation," or "no epinephrine," this might provide helpful disambiguation in clinically challenging scenarios. In general, local POLST development and revision should rely heavily on EMS input because they are one of the primary users.

Second, we recommend more targeted EMS practitioner education about the clinical application and interpretation of POLSTs. Only one-third of EMS practitioners report receiving formal POLST training (Table 1). EMS practitioners expressed an interest in a variety of training formats, including virtual, simulation training, or hybrids. Simulation training would allow EMS practitioners to practice communication skills for code status clarification in a low-risk environment. Future areas of research might focus on EMS practitioner use of POLST for transportation decisions, medical interventions when patients are not in a state of cardiopulmonary arrest, and the use of online medical control and POLST interpretation.

In summary, the POLST is a powerful tool to convey medical treatment preferences; however, there is significant variation in the interpretation and application by EMS practitioners. To improve the POLST effectiveness, the authors suggest more EMS input into POLST development, concise language defining resuscitation, and EMS education about clinical application.

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CONFLICTS OF INTEREST

The authors of this study have no conflicts of interest to disclose.

AUTHOR CONTRIBUTIONS

Amelia M. Breyre conceived the study, obtained funding, and drafted the manuscript. Nicolaus Glomb, Eric Isaacs, and Karl A. Sporer assisted with project development and trial design. Haley Vertelney was responsible for survey development and writing portions of the manuscript. Glen Davenport was responsible for survey design and analysis. All authors contributed substantially to manuscript revision. Amelia M. Breyre takes responsibility for the paper as a whole.

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SUPPORTING INFORMATION

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